

THE ASSOCIATION OF SOCIAL SUPPORT AND LEISURE TIME
PHYSICAL ACTIVITY WITH MENTAL HEALTH AMONG
INDIVIDUALS WITH CANCER

by

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LIST OF ABBREVIATIONS

Abbreviation	Description
LTPA	Leisure Time Physical Activity

ABSTRACT

Individuals with cancer often report high levels of negative social and psychological symptoms such as anxiety, depression, and social isolation. Despite the importance of emotional, information, and tangible support and leisure time physical activity (LTPA) participation among individuals with cancer, there is limited quantitative studies that examine how those factors are associated with mental health of individuals with cancer. Therefore, we aimed to investigate the mediating role of LTPA in the relationship between emotional, information, and tangible support and mental health among individuals with cancer. This study used Health Information National Trends Survey (HINTS), a national data set published in 2017. Path analysis revealed that that emotional, information, and tangible social support had direct effects on mental health. Moreover, the results of this study indicated that only emotional support was a significant predictor of LTPA among individuals with cancer. The results of the bootstrapping test indicated that there was a significant mediating effect of LPTA on the relationship between emotional support and mental health. That is, individuals with cancer who perceived emotional support tended to engage in LTPA and thus reported better mental health. Results of this study emphasizes the value of emotional support for LTPA participation and mental health among individuals with cancer. Healthcare professionals including recreational therapists who work with individuals with cancer need to implement a variety of emotional support groups for cancer patients and survivors.

I. INTRODUCTION

Cancer is the second leading cause of death and the most costly medical condition in the United States, making it the most debilitating illness (American Cancer Society, 2017). Prior studies have suggested that the cancer diagnosis is associated with a variety of physical, social, and psychological challenges (Li et al., 2015; Stringer, 2008; Towers & Berry, 2007). In terms of cancer patients and survivors, the continuous treatment negatively affects their perception of health and wellbeing (Hill, 2016). Moreover, literature on cancer suggests that individuals with cancer report high levels of negative social and psychological symptoms such as anxiety, depression, and social isolation (Bower, 2008; Stringer, 2008). Thus, it is imperative for health care professionals to improve quality of life among individuals with cancer.

Social scientists strive to create ways in which individuals with cancer improve mental health. A growing body of literature suggests that any type of social support serves as an important role in reducing negative psychological problems and symptoms among individuals with cancer (Eom et al., 2013; Roland, Rodriguez, Patterson, & Trivers, 2013). In cancer research, informational, tangible, and emotional support were the most commonly studied social support (Wong et al., 2014). For example, Mardanian-Dehkordi and Kahangi (2018) found that lower levels of informational support from family, friends, and relatives were associated with higher fatigue scores among cancer patients. Kershaw and colleagues (2004) indicated that receiving financial support was one of the most worrisome issues for cancer patients.

Among those types of social support, Ganz and colleagues (2003) emphasized the value of emotional support for health among individuals with cancer. Sherbourne and

Stewart (1991) defined emotional support as "the expression of positive affect, empathetic understanding, and the encouragement of expressions of feelings" (p. 707). Research demonstrates that cancer patients who perceived higher levels of emotional support tended to report higher mental health and quality of life (Ganz et al., 2003; Hill, 2016). These studies suggested that emotional support serves as an essential coping mechanism for promoting quality of life among individuals with cancer.

Another important element in promoting mental health among individuals with cancer is participation in leisure time physical activity (LTPA). Empirical studies have provided evidence that LTPA involvement is positively associated with mental health among individuals with cancer (Brunet, Love, Ramphal, & Sabiston, 2014). By participating in LTPA, for example, individuals with cancer are likely to develop the ability to utilize coping resources and reduce psychological distress (Culos-Reed et al., 2010; Fitzpatrick, 2018). In addition, prior studies have suggested that social support plays an important role in facilitating LTPA involvement and decreasing negative social and psychological symptoms among individuals with cancer (Paxton et al., 2010; Phillips & McAuley, 2013; Sherman, Heard, & Cavanagh, 2010).

Despite the importance of social support and LTPA participation, limited quantitative studies exist examining a casual-effect relationship between social support and mental health among individuals with cancer. The majority of previous studies have focused mainly on the effects of social support on coping resources (Kershaw et al., 2004; Pasek, Bazaliski, & Sawicka, 2016). In addition, there are relatively few studies that have examined the mediating role of LTPA in the relationship between social support and mental health among individuals with cancer. Therefore, the purpose of this

thesis was to investigate the mediating role of LTPA in the relationship between social support and mental health among individuals with cancer. Specifically, this thesis proposed a hypothesized conceptual model (Figure 1). Also, the following four hypotheses were tested as part of this model:

H1: Social support has a direct positive effect on mental health among individuals with cancer.

H2: Social support has a direct positive effect on leisure time physical activity among individuals with cancer.

H3: Leisure time physical activity has a direct positive effect on mental health among individuals with cancer.

H4: Leisure time physical activity has a mediating effect on the relationship between social support and mental health among individuals with cancer.

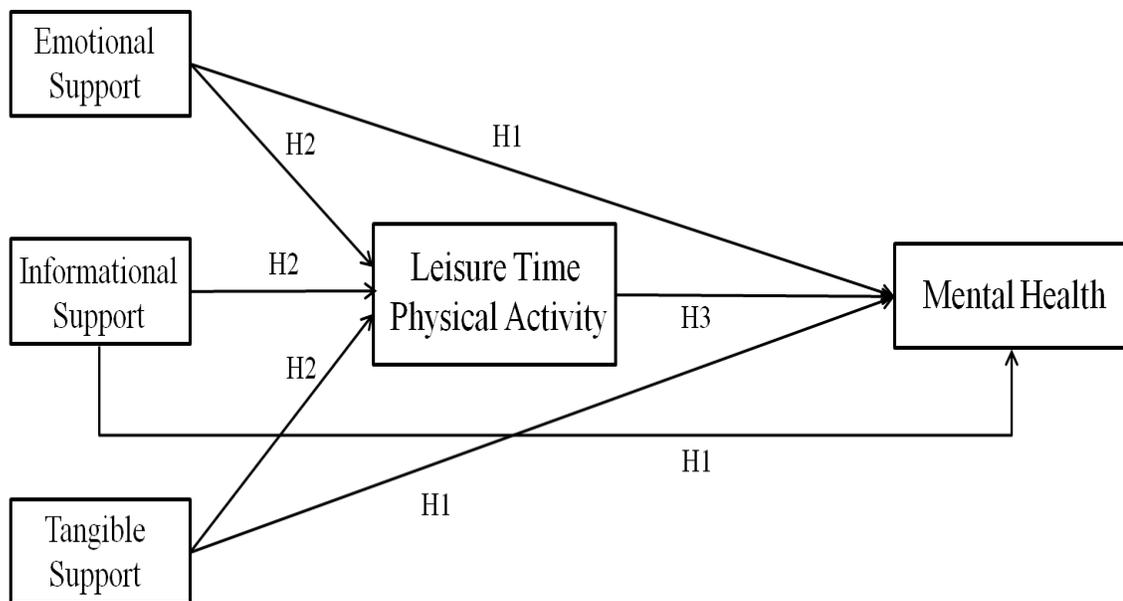


Figure 1. A hypothesized conceptual model

II. LITERATURE REVIEW

Mental Health among People with Cancer

According to the Centers for Disease Control and Prevention (CDC, 2018), the number of new cases has increased from 1999 through 2015 (Figure 2). CDC reported that the number of new cases is expected to increase from about 1.5 million per year in 2010 to 1.9 million per year in 2020. In terms of the prevalence of cancer, there are 5,178,802 people living in the United States who were diagnosed with cancer from 2010 to 2014 (CDC, 2018). The data showing the estimated cancer prevalence percentage by age groups indicated that the highest percentage were reported between the ages of 70 and 79 (6.49%), followed by between the ages of 80 or older (5.94%) and between the ages of 60 and 69 (4.36%). In this data, among older adults aged 60 or older, males were more likely to be diagnosed with cancer than women. According to the American Cancer Society (2019), the most common cancers in women were breast cancer, followed by lung and bronchus cancer, and colorectal cancer. For men, the most common cancers were prostate cancer, followed by lung and bronchus cancer, and colorectal cancer.

Compared to the general population, individuals with cancer were more likely to report social and psychological problems and concerns (Hartung et al., 2017; Linden, Vodermaier, MacKenzie, & Greig, 2012). More specifically, individuals with cancer often experience social and psychological challenges such as anxiety, depression, social and emotional loneliness, and a sense of hopelessness (Chochinov, 2001; Deckx et al., 2015; Mehnert et al., 2014; Smith, 2015; Stark & House, 2000). For example, emotional loneliness was also found to be more prevalent among cancer patients when compared with those without cancer (Deckx et al., 2015). Based on the 2010 Behavioral Risk Factor

Surveillance System (BRFSS) data, Zhao and colleagues (2014) found that cancer survivors (13.7%) were more likely to report depression than those without cancer (8.9%). Mehnert and colleagues (2014) reported that about 40% of cancer patients met the strict diagnostic criteria for mental disorders which is the Diagnostic and Statistical Manual of Mental Disorders (DSM). The highest prevalence of mental disorders was found in patients with breast cancer (42%), followed by head and neck cancer (41%). Given the prevalence of mental disorders in cancer patients and its potential negative effects on health-related behaviors and health outcomes, there is a strong need for developing psycho-ontological interventions for individuals with cancer.

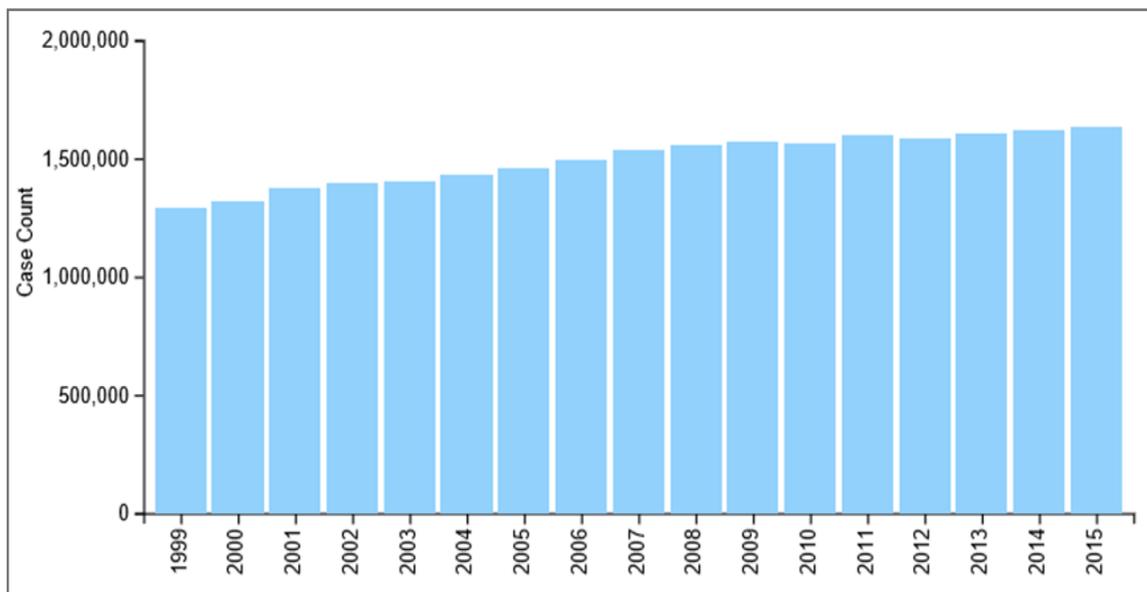


Figure 2. Annual number of new cancers, 1999-2015 (CDC, 2018)

Social Support

Researchers have defined the concept of social support in different ways. For example, Albrecht and Adelman (1987) defined social support as “verbal and nonverbal communication between recipients and providers that reduces uncertainty about the situation, the self, the other, or the relationship, and functions to enhance a perception of

personal control in one's life experience" (p. 19). This definition emphasizes the processes and functions of communication among people, which can help them become more confident in controlling a certain situation, especially a stressful situation. According to Gottlieb (2000), social support refers to the "process of interaction in relationships which improves coping, esteem, belonging, and competence through actual or perceived exchanges of physical or psychosocial resources" (p. 28). This definition highlights that an interactive process in which people interact with each other can provide a wide range of benefits (i.e., coping, esteem, belonging, and competence). According to the National Cancer Institute, social support refers to "a network of family, friends, neighbors, and community members that is available in times of need to give psychological, physical, and financial help" (National Cancer Institute [NCI], n.d.). This definition emphasizes the importance of establishing good social networks with people. More importantly, this definition suggests the specific types of support, such as psychological support, physical support, and financial assistance.

Researchers have categorized social support into the various types of behaviors. For example, Schaefer, Coyne, and Lazarus (1981) described three types of social support:

1. Emotional support: intimacy and attachment, reassurance, and being able to confide in and rely on another—all of which contribute to the feeling that one is loved or cared about, or even that one is a member of the group, not a stranger.
2. Informational support: giving information and advice which could help a person solve a problem and providing feedback about how a person is doing

3. Tangible support: direct aid or services and can include loans, gifts of money or goods, and provision of services such as taking care of needy persons or doing a chore for them. (pp. 385-386).

Helgeson and Cohen (1996) indicated that "it [emotional support] includes listening, "being there," empathizing, reassuring, and comforting. It also can permit the expression of feelings that may reduce distress" (p. 135). Although such expressions of emotion may not directly lead to solving a problem, it can help elevate an individual's mood, which may in turn help resolve the problem. Informational support is *communication* that provides useful or needed information. For example, when an individual was diagnosed with cancer, they may need more information about their condition and treatment options. In that case, it will be important to find someone to talk to and who can provide useful information, such as doctors, nurses, and health care providers. Tangible support refers to any physical/instrumental/financial assistance provided by others. Individuals who were diagnosed with cancer may need material goods or actions to help them in challenging situations. Similar to Schaefer et al.'s three types of social support, House (1981) described four categories of social support: emotional, instrumental, informational, and appraisal support. The first three types of support are theoretically consistent with Schaefer et al.'s conceptualization. As the fourth type of support, they proposed appraisal support that refers to the provision of information relevant to self-evaluation, such as constructive feedback, affirmation, and social comparison.

Social Support and Mental Health

Prior studies have found that cancer patients often experience mental illness after their cancer diagnoses (Chapple & Ziebland, 2002; Khan, Mahmood, Badshah, Ali, & Jamal, 2006; Vahdaninia, Omidvari, & Montazeri, 2010;). A number of studies identified social support as an important contributor to improving mental health among individuals with cancer (Backer 2000; Dobkin et al., 1998; Eom et al., 2013; Goodwin et al., 2001; Monat & Lazarus, 1991; Parker, Baile, de Moore, & Cohen, 2002; Roland et al., 2013; Sapp et al., 2003; Wong et al., 2014). Specifically, an increase in perceived social support resulted in lower levels of hopelessness (Yağmur & Duman, 2016) and anxiety and depression (Applebaum et al., 2014; Eom et al., 2013; Pinar, Okdem, Buyukgonenc, & Ayhan, 2012; Shaheen Al Ahwal et al., 2015) among cancer patients. Several studies have suggested that emotional support may serve as the most essential coping resource for cancer patients (Kershaw et al., 2004; Pasek et al., 2016; Schroevers, Ranchor, & Sanderman, 2013). Pasek and colleagues (2016) found that of major types of social support (i.e., emotional, informative, instrumental, material, and spiritual support), emotional support, such as understanding, assistance, and sympathy, was the most demanded type of support among cancer patients, followed by informative support and spiritual support. Similarly, Kershaw and colleagues (2004) revealed that along with acceptance coping strategy, women with advanced breast cancer frequently utilized emotional support coping strategy. In this study, greater use of emotional support as one type of coping strategies was significantly associated with higher quality of life. A longitudinal study by Schroevers et al. (2013) found that perceived availability of daily emotional support (e.g., feelings of respect, trust, listening) significantly predicted

depressive symptoms at 3 months after cancer diagnosis. However, levels of emotional support at 3 months after cancer diagnosis did not predict future depressive symptoms at 15 months.

Helgeson et al. (1996) reviewed descriptive, correlational, and intervention studies to explore the role of social support in shaping psychological adjustment among cancer patients. In particular, this study focused on the distinct role of each type of social support (i.e., emotional, informational, and instrumental). This review study found that prior descriptive studies have shown that among the three types of social support, emotional support was most desired by cancer patients. Similarly, correlational studies have provided evidence that emotional support was the strongest predictor of psychological adjustment in patients with cancer. Helgeson and Cohen also suggested that in group intervention settings, emotional support from a relatively new social relationship, such as other cancer patient participants, may not be effective in improving psychological adjustment because the relationship can be considered as "artificial" and "not intimate." Instead, emotional support offered by existing social network members, such as family members and friends, may have a greater influence on adjustment. More recently, Hill (2016) examined the association of emotional and instrumental social support with mental health and quality of life. This study found that cancer patients with higher levels of emotional social support seeking tended to show lower scores on depression and higher scores on quality of life. However, instrumental social support seeking was not a significant predictor of mental health and quality of life. Results from Hill's study corroborated previous literature that found emotional support, especially from a spouse, family member, or friend, was the most essential form of social support in a

cancer population (Dakof & Taylor, 1990; Redman, Burns, & Sagert, 1986).

Social Support and Leisure Time Physical Activity

Numerous studies have provided evidence that social support can improve LTPA participation across diverse populations. For example, a study by Smith, Banting, Eime, O’Sullivan, and Uffelen (2017) reviewed 27 articles to systematically examine the association between social support and physical activity in older adults. They found that eight studies examined the association between physical activity levels and social support from friends or family separately. Results indicated that five studies of the eight studies revealed a positive association of physical activity with social support from family, and four studies of the eight studies reported a positive relationship between physical activity and social support from friends. This result suggests that the majority of studies reviewed (> 50%) demonstrated an important role of social support in shaping physical activity behaviors in older adults. Another review study by Greaves et al. (2011) reviewed 30 dietary and physical activity interventions to identify intervention components that affected change in diet and/or physical activity in adults at risk of type 2 diabetes. The authors suggested that adding social support component (e.g., engaging significant others, such as family and friends in interventions) led to increased effectiveness in interventions.

Booth and colleagues (2000) examined the correlates of physical activity among older adults, and they found that a significantly greater proportion of those who were physically active reported that they frequently received support and encouragement from their friends and family to be physically active. In addition, some studies with ethnic minority population (e.g., Latina immigrants) have revealed that people with high levels

of social support were significantly less likely to be sedentary than those with low support (Castro, Sallis, Hickmann, Lee, & Chen, 1999; Eyster, Brownson, Donatelle, King, Brown, & Sallis, 1999; Marquez & McAuley, 2006; Sternfeld, Ainsworth, & Quesenberry, 1999; Wilcox, Castro, King, Housemann, & Brownson, 2000).

Focusing on cancer patients and survivors, it is well-documented that social support can improve LTPA participation (e.g., Stacey, James, Chapman, Courneya, & Lubans, 2015). For example, Phillips et al. (2014) found that breast cancer survivors who perceived higher levels of social support from family and friends were more likely to participate in LTPA. McNeely et al. (2006) reviewed six randomized controlled trials that examined the effectiveness of physical activity programs for breast cancer patients and survivors. They found that in all reviewed studies, participants reduced symptoms of physical and mental fatigue as a result of their participation in physical activity programs. Coleman, Berg, and Thompson (2014) examined the role of perceived social support provided by family, friends, and significant others in shaping physical activity in cancer survivors diagnosed within the past 4 years. They found that cancer survivors with higher levels of social support, especially from friends, were more likely to walk for exercise. This result shows that greater social support from friends, such as words of encouragement and a strong feeling of love, might have provided more opportunities for cancer survivors to participate in physical activity in their leisure time.

Moreover, Brunet, Love, Ramphal, and Sabiston (2013) examined the mediating effect of social support on the relationship between stress and physical activity in adolescents and young adults with cancer. Specifically, this study assessed two different forms of social support, such as perceived social support and social support group

involvement. The former was assessed to identify the degree to which individuals' social relationships provided various types of social support (i.e., attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance). The latter was measured by asking participants to indicate if they had been involved in a support group designed to help obtain support from cancer patients' existing social circle (e.g., mentors and peers in groups). The hierarchical regression analyses revealed that both perceived social support and support group involvement were positively associated with levels of physical activity. Based on these results, this study suggested that providing adolescents and young adults with cancer with support groups, such as mentors and peers, are particularly important in that those types of support groups may better understand the cancer-related and age-related stressors and thus, make them feel as if they have adequate support from existing support network members. Moreover, they suggested that engaging adolescents and young adults with cancer in community-based programs or events, such as camps, may be an effective way of increasing perceived social support levels. A recent qualitative study by Cummins et al. (2017) conducted face, semi-structured interviews with cancer survivors to identify barriers and facilitators to physical activity. This study identified five interrelated themes. One of themes was "the importance of others." For example, cancer survivors stated that others, such as family and friends, helped them return to physically active lifestyle through encouragement and peer support. Cancer survivors also highlighted the importance of obtaining advice about physical activity from health professionals. This result suggests that social support plays a significant role in shaping physical activity behaviors among people with cancer.

Leisure Time Physical Activity and Mental Health

For the general population, there is a large body of evidence supporting the positive impact of physical activity on mental health. For example, Stephens (1988) conducted a cross-sectional epidemiologic study that examined the relation of varying amounts of leisure-time physical activity on levels of depression and anxiety. This study found that higher levels of physical activity participation were associated with little or no symptoms of anxiety and depression. In individuals performing moderate amounts of physical activity, there was a decrease in depressive symptoms, and this was particularly true for women and older populations. Similarly, Goodwin (2003) used data from the National Comorbidity Survey to examine the association between regular physical activity and mental disorders among those who did and did not report regular physical activity. As a result, they revealed that regular physical activity was associated with a significantly decreased prevalence of current major depression and anxiety disorders. Paffenbarger et al. (1994) found an inverse relation between physical activity and subsequent risk of depression in the Harvard Alumni study. Results showed that respondents who expended 1000–2499 calories per week in walking, stair climbing, and sports play were at 17% less risk of developing clinical depression than their less-active peers. Those who expended 2500 or more calories per week were 28% less likely to develop clinical depression.

For a cancer population, it is also well-documented that physical activity, especially leisure-time physical activity (LTPA), plays an important role in improving mental health by decreasing negative feeling such as stress, depression, low level of self-esteem, and anxiety (Brunet et al., 2014; Culos-Reed et al., 2010; Fitzpatrick, 2018; Irwin

et al., 2008; Mack, Meldrum, Wilson, & Sabiston, 2013). For example, Kolden et al. (2002) examined the effect of 16-week group exercise program including both aerobic and resistance training for breast cancer survivors. In this study, program participants showed a reduction in depressive symptoms and improvement in quality of life (e.g., reduced distress, enhanced wellbeing). Similarly, after completion of a 10-week group exercise program including diverse activities, such as gymnastics, relaxation, walking, and jogging, breast cancer patients reported reduced anxiety and depression and improved maximal oxygen uptake and body image (Mehnert et al., 2011).

In addition to structured exercise programs, several studies focused on the effect of LTPA (i.e., physical activity performed during leisure time; unstructured) on mental health among individuals with breast cancer. A population-based study of breast cancer patients found that participation in low- and moderate-intensity LTPA was associated with better mental health (i.e., low levels of depression) (Kang et al., 2017). Another population-based study of rural breast cancer survivors revealed that those who met physical activity guideline (i.e., ≥ 500 MET-mins/week) showed significantly lower scores on depression than those who reported physical activity levels less than 500 MET-mins/week (Rogers, Markwell, Courneya, McAuley, & Verhulst, 2011). In the recent study, Ho et al. (2019) examined relationships among fatigue, physical activity, depressive symptoms, and quality of life among childhood cancer survivors. They found that about 50% of cancer survivors reported cancer-related fatigue between "half the time" and "all the time" in the past week. Participation in LTPA helped alleviate a feeling of fatigue, and depressive symptoms and ultimately, promoted perceived quality of life in cancer survivors.

Zopf and colleagues (2016) examined the extent to which physical activity levels influence physical and mental health in prostate cancer patients with bone metastases. They found that the majority of prostate cancer patients (71%) did not meet the current aerobic exercise guidelines for cancer survivors (≥ 150 min of moderate intensity or ≥ 75 min of vigorous exercise per week or an equivalent combination). Moreover, results indicated that prostate cancer patients who did not meet the aerobic exercise guidelines had significantly lower scores on physical and mental health as measured by the 36-item Short-Form Health Survey (SF-36) scale than those who met the guidelines.

Conroy, Wolin, Blair, & Demark-Wahnefried (2017) investigated the effect of light and moderate-to-vigorous intensity physical activity on mental quality of life in older cancer survivors. In this study, mental quality of life was measured with regard to four sub-domains, such as vitality, emotional role functioning, social role functioning, and mental health. Results indicated that light intensity physical activity was positively associated with mental quality of life in older women with cancer, while controlling for moderate-to-vigorous intensity physical activity. As for this result, the authors suggested that light physical activity, such as social participation (e.g., visit with friends or family, attend church), contributed most to that relationship. However, this association was not significant in older men with cancer. Moreover, this study found that older men with cancer who reported higher levels of moderate-to-vigorous physical activity were more likely to score higher on mental quality of life. This association, however, was not significant in older women with cancer. These findings show that participation in light and/or moderate-to-vigorous intensity physical activity had a positive impact on mental health in older cancer survivors. However, it seemed obvious that there are gender

differences in associations between physical activity and mental health.

Thraen-Borowski, Trentham-Dietz, Edwards, Koltyn, and Colbert (2013) examined the association between physical activity, social participation, and health-related quality of life (i.e., physical and mental health) in older colorectal cancer survivors. In this study, meeting the recommended physical activity guidelines (i.e., 150 minutes of moderate-intensity aerobic activity a week or 75 minutes per week of vigorous aerobic activity) was not related to mental health. However, participation in social leisure activities, such as visit with friends or family and attendance at church activities, were significantly associated with mental health in older colorectal cancer survivors. That is, older cancer survivors who participated in leisure activities in a social setting were more likely to be physically active, which in turn led to better mental health. Taken together, the aforementioned findings demonstrate that physical activity may serve as an effective therapeutic strategy to improve mental health among individuals with cancer.

Summary

Considering the literature reviewed, social support, especially emotional support, serves as an important contributor to improving mental health among individuals with cancer. Specifically, a consistent finding in the literature is that individuals with cancer who perceived social support from family, friends, and significant others tended to report better mental health (e.g., lower scores on depression, anxiety, stress, social and emotional loneliness, hopelessness). In addition to the effect of social support on mental health, it seemed obvious that social support can improve LTPA participation among people with cancer. That is, social support from family and friends has the potential to increase levels of LTPA participation in a cancer population. Finally, in the reviewed

literature, it was found that LTPA helped improve mental health among individuals with cancer. Cancer patients and survivors who participate in LTPA regularly tended to score higher on mental health. Given the aforementioned findings, it will be important for health professionals to expose cancer patients and survivors to social opportunities, which in turn, could promote physical activity and improve mental health among individuals with cancer.

By connecting existing findings, the present study expected that social support would have a direct positive effect on LTPA and mental health among individuals with cancer. It was also expected that LTPA mediates the relationship between social support and mental health. Barber (2013) suggested that "social support in the form of companionship (peer support), motivation, or health promotion influences or facilitates PA [physical activity] through modeling of healthy behaviors, providing encouragement, reducing stress, or improving health" (p. 486). Chang, Wray, and Lin (2014) empirically tested the relationship between social support, LTPA, and psychological well-being. In that study, older adults who perceived higher levels of social support tended to report greater participation in LTPA, which in turn led to better psychological well-being. This study provided important insights into the mediating effect of LTPA on the relationship between social support and mental health, although the analyzed data was limited to older adults. In addition, Spector, Battaglini, Alsobrooks, Owen, & Groff (2012) assessed the impact of community-based wellness workshops designed to promote physical activity and emotional management techniques on health-related quality of life in breast cancer survivors. They found that following the workshops, the majority of program participants increased their daily physical activity participation. Moreover, improvements in mental

health, pain, sleep, energy, and being worried were found. Although those results were not statistically significant, these findings suggest that encouraging positive emotions and stress reduction and promoting physical activity can be important strategies to improve the health of individuals with cancer. Hence, this study aimed to examine the relationship between social support, LTPA, and mental health among individuals with cancer.

III. METHODS

Data Source

This study used the 2017 Health Information National Trends Survey (HINTS), a nationally represented survey of non-institutionalized adults in the United States. The HINTS includes a wide range of health information, such as cancer prevalence, health status, and health-related behaviors, as well as public use of health-related information. The 2017 HINTS conducted random-digit dialing telephone surveys to provide a nationally represented sample of U.S. households. The 2017 HINTS has a sample of 3,285. For the purpose of this study, this study extracted 504 respondents who had been diagnosed with any types of 22 cancers listed in the survey questionnaire.

Measures

Independent and mediating variables. As independent variables, this study included three different types of support: emotional, informational, and tangible support. Emotional support was measured through the following question, "Is there anyone you can count on to provide you with emotional support when you need it - such as talking over problems or helping you make difficult decisions?," with dichotomous response options of (1) yes and (0) no. Informational support was measured through the following question, "Do you have friends or family members that you talk to about your health?," with dichotomous response options of (1) yes and (0) no. Tangible support will be measured through the following question, "If you needed help with your daily chores, is there someone who can help you?," with dichotomous response options of (1) yes and (0) no. Leisure time physical activity was assessed by asking respondents to indicate the number of days and the duration of the moderate-intensity physical activities that they

undertake in a typical week, such as sports, recreation activities, or exercise. Moderate-intensity physical activity was considered as 4.0 MET (i.e., the metabolic equivalent of task), and thus continuous scores for LTPA were calculated as follows.

[Total MET-minutes/week = MET level (4) x minutes of activity per day x days per week]

Dependent variable. Mental health was measured by four questions regarding *little interest or pleasure, hopelessness, nervousness, and worrying*. Specifically, respondents were asked to indicate how often those problems have bothered them over the past two weeks. By adding up the values of four mental health indicators, this study combined four variables of mental health into one continuous variable. The items were assessed on a 4-point Likert-type scale (1 = Nearly every day, 2 = More than half the days, 3 = Several days, and 4 = Not at all). The items were then averaged. Therefore, respondents with higher scores indicated those who have been bothered by those problems less frequently and thus have better mental health.

Control variables. This study included age, education, and household income as individual-level control variables. Educational attainment included five categories: Less than High School, High School Graduate, Some College, Bachelor's Degree, and Post-Baccalaureate Degree. Annual household income included nine categories ranging from "\$0 - \$9,999" to "\$200,000 or more." As evidenced in previous research, these demographic factors have found to be related to LTPA and mental health in the general population and among cancer patients (Dorak & Karpuzoglu, 2012; Keegan et al., 2015; Zeng et al., 2015).

Data Analysis

All analyses were conducted using SPSS version 24.0. Descriptive statistics were used to identify participant characteristics with regard to demographics and study constructs. Cronbach's alpha coefficients with SPSS were used to measure internal consistency for the measure of mental health. Pearson correlation coefficients were used as the bi-variate analysis procedure for examining the relationship between continuous independent and mediating variables and the dependent variable. Using maximum likelihood parameter estimation with AMOS, path analysis was conducted to measure model fit and to determine the significance and relative strength of different types of social support and LTPA levels in predicting mental health. In this analysis, age, education, and household income were controlled because of those potential effects on mental health. In addition to model testing, this study also tested the mediating role of LTPA in the relationship between social support and mental health among individuals with cancer. To test mediation, this study referred to Baron and Kenny's (1986) four steps for testing mediation: (1) the independent variable must significantly affect the dependent variable (*path c*), (2) the independent variables must significantly affect the mediator (*path a*), (3) the mediator must significantly affect the dependent variable (*path b*) and (4) when paths a and b are controlled for, the effect of the independent variables on the dependent variable (*path c'*) must be less than in the first equation ($path\ c < path\ c'$, partial mediation) or be insignificant (full mediation). For path(s) that meet the first three conditions, a mediation test was conducted using bootstrapping procedures in order to examine the significance of this mediating effect. Finally, standardized beta coefficients from regression equations between three types of support, LTPA, and mental health were

presented in Table 4 and Figure 3.

IV. RESULTS

Descriptive analysis. Descriptive statistics were used to identify cancer patients' characteristics with regard to age, gender, race/ethnicity, education, income, perceived emotional social support, LTPA, and mental health (Table 1). The mean age of the participants was 67 years, and the sample was comprised of 288 females (61.3%), and 182 males (38.7%). Most of the participants were non-Hispanic White (67.5%). The most common educational level was "some college" (29.2%), followed by "high school graduate" (23.2%), and "a bachelor's degree" (21.2%). The largest household income group was "\$50,000 to \$74,999" (18.8%), followed by "\$100,000 to \$199,999" (16.9%), and "\$20,000 to \$34,999" (16.1%). The mean emotional social support (Table 2) was 0.88 on a dichotomous scale (0 = no and 1 = yes), which indicated that, on average, people with cancer receive emotional support from others when they need it. The mean LTPA was about 740 MET-minutes per week with a median of 320 MET-minutes per week (Table 2), which showed that the data for the LTPA were positively skewed. The average mental health score, assessed by the frequency of four mental problems (i.e., little interest or pleasure, hopelessness, nervousness, and worrying) was 3.47 on the scale. This score indicated that, on average, the respondents reported good mental health statuses (Table 2).

Correlation analysis. Pearson correlation coefficients were used as the bi-variate analysis procedure by which to examine the relationship between the constructs. The results indicated that emotional support ($r = .32, p < .001$), informational support ($r = .29, p < .001$), tangible support ($r = .28, p < .001$), and LTPA ($r = .22, p < .001$) were positively associated with mental health (Table 3). While emotional support was

associated with LTPA ($r = .10, p < .001$), informational support ($r = .02, p > .05$) and tangible support ($r = .06, p > .05$) were not related to LTPA. The Pearson's bivariate correlations, ranging from .02 and .57 (i.e., $< .08$), suggested that

Table 1. Demographic characteristics of individuals with cancer

<i>Gender</i>	<i>N</i>	<i>Valid %</i>
Female	288	61.3
Male	182	38.7
<i>Age (years)</i>	<i>M</i>	<i>SD</i>
	67	12
<i>Annual household income</i>	<i>N</i>	<i>Valid %</i>
\$0 - \$9,999	33	6.5
\$10,000 or 14,999	30	6.0
\$15,000 - \$19,999	31	6.2
\$20,000 - \$34,999	81	16.1
\$35,000 - \$49,999	55	10.9
\$50,000 - 74,999	95	18.8
\$75,000 - \$99,999	59	11.7
\$100,000 - \$199,999	85	16.9
\$200,000 or more	33	6.5
<i>Race/ethnicity</i>	<i>N</i>	<i>Valid %</i>
White	340	67.5
Black	51	10.1
Hispanic	36	7.1
Asian	5	1.0
Other	17	3.4

no multi-collinearity existed. In addition to the correlation test, the variance inflation factor (VIF) was examined in order to assess the degree of collinearity. In general, a value of 10 has been considered the maximum value for the VIF. In this study, the values of the VIF ranged between 1.01 and 1.65, indicating that no multi-collinearity existed in the data.

Path analysis. The hypothesized model provided an acceptable fit to the data ($\chi^2(df=2) = 5.72, p=0.057$; RMSEA = 0.065; SRMR = 0.016; CFI = 0.994). Specifically,

the results indicated that emotional support ($b = .15, p < .05$), informational support ($b = .13, p < .05$), tangible support ($b = .12, p < .05$), and LTPA ($b = .13, p < .001$) were significant predictors of mental health among people with cancer.

Table 2. Means and standard deviations for study constructs

Variable	Individuals with cancer ($N = 504$)			Cronbach's alpha
	<i>M</i>	<i>SD</i>	<i>Loadings</i>	
<i>Emotional Support</i>				-
Is there anyone you can count on to provide you with emotional support when you need it - such as talking over problems or helping you make difficult decisions?	.88	.33	-	
<i>Informational Support</i>				-
Do you have friends or family members that you talk to about your health?	.92	.28	-	
<i>Tangible Support</i>				-
If you needed help with your daily chores, is there someone who can help you?	.78	.41	-	
<i>Mental Health</i>	3.47	.70	-	.87
Little interest or pleasure in doing things	3.37	.95	.83	
Feeling down, depressed, or hopeless	3.53	.79	.90	
Feeling nervous, anxious, or on edge	3.45	.83	.85	
Not being able to stop or control worrying	3.51	.79	.81	
<i>Leisure Time Physical Activity</i> (MET-minutes per week)	744.68	1429.17	-	-

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3. Pearson correlations of independent variables and mental health

Variable	1.	2.	3.	4.	5.	6.
1. Emotional support	1					
2. Informational support	.57**	1				
3. Tangible support	.42**	.34**	1			
4. LTPA	.10*	.02	.06	1		
5. Mental health	.33**	.29**	.28**	.22**	1	

* $p < .05$. ** $p < .001$.

Therefore, Hypotheses #1 and #3 were supported. Emotional support was also associated with LTPA ($b = .12$, $p < .05$), whereas no significant effects were found between informational support and LTPA and between tangible support and LTPA. Therefore, Hypothesis #2 was partially supported. Across all of the study constructs, emotional social support had the strongest relationship to mental health ($b = .15$, $p < .05$), followed by LTPA ($b = .14$, $p < .05$). Overall, the model accounted for 26% of the variance in mental health.

Bootstrapping test. To test mediation, this study first determined which path met Baron and Kenny's (1986) four steps. It was found that one hypothesized path where emotional support had a direct effect on mental health through its effect on LTPA met Baron and Kenny's criteria, whereas no direct effects were found between informational support and LTPA and tangible support and LTPA. Therefore, a mediation test was conducted using bootstrapping procedures in order to examine whether a significant indirect effect of LTPA existed on the relationship between emotional support and mental health. Unstandardized indirect effects were computed for each of the 500 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect

effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was .037, and the 95% confidence interval ranged from .001 to 0.98; thus, the indirect effect of LTPA on the relationship between emotional support and mental health was statistically significant ($p < .05$). This finding suggests that individuals with cancer who had higher levels of emotional support were more likely to report higher levels of LTPA, which, in turn, resulted in better mental health. Overall, Hypothesis #4 was partially supported.

Table 4. Direct effects in model of mental health among individuals with cancer

<i>Dependent Variable and Path</i>		β (SE)	<i>t</i> -value	R^2	Hypothesis
<i>Mental health</i>				.26	
Emotional support	→ Mental health	0.15(0.12)	2.82**	-	H1: Supported
Informational support	→ Mental health	0.13(0.13)	2.63**	-	H1: Supported
Tangible support	→ Mental health	0.12(0.08)	2.57*	-	H1: Supported
LTPA	→ Mental health	0.14(0.02)	3.36***	-	H3: Supported
<i>LTPA</i>				.08	
Emotional support	→ LTPA	0.12(0.25)	2.02*	-	H2: Supported
Informational support	→ LTPA	0.08(0.28)	-1.40	-	H2: Not supported
Tangible support	→ LTPA	0.04(0.17)	.82	-	H2: Not supported

* $p < .05$; ** $p < .01$ and *** $p < .001$

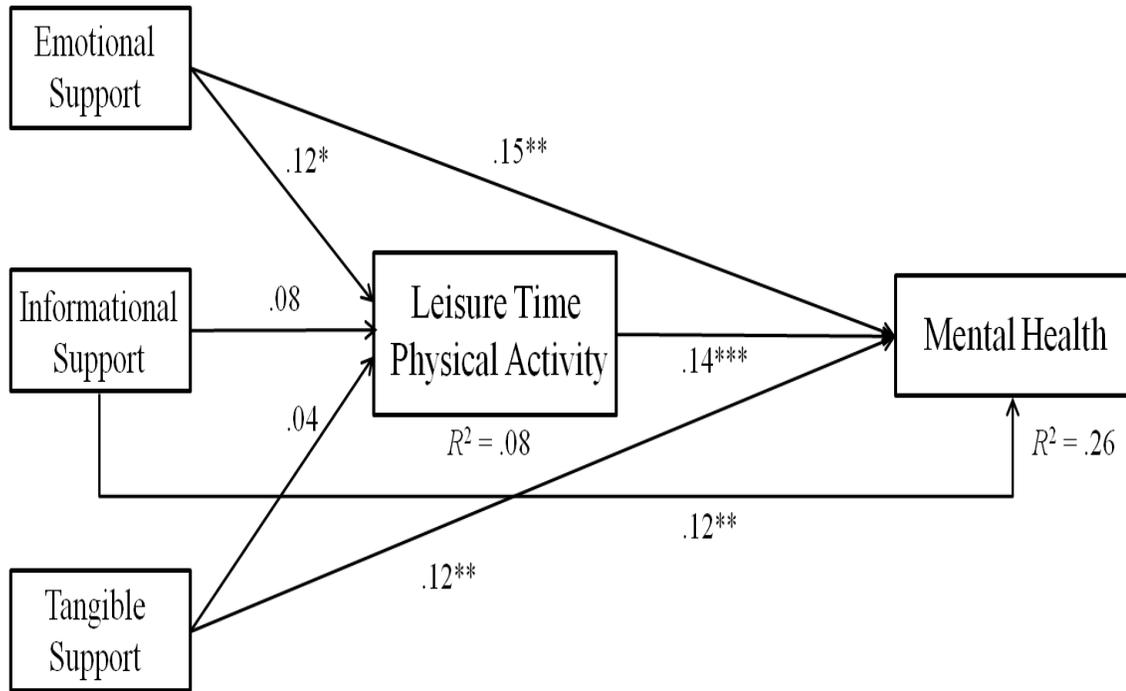


Figure 3. Final path model of mental health among individuals with cancer

V. DISCUSSION

Direct Pathways to Mental Health

The study results indicated that emotional, informational, and tangible support were significantly associated with mental health. Prior studies have suggested that any type of social support can reduce negative psychological problems and symptoms among individuals with cancer (Eom et al., 2013; Roland et al., 2013). Consistent with the findings from the aforementioned studies, this study revealed that all three types of support were beneficial to mental health among individuals with cancer. In particular, emotional support was found to be the strongest predictor of mental health, followed by LTPA, informational support, and tangible support. This result expands our body of knowledge that emotional support is particularly important for mental health among people with cancer (Helgeson & Cohen, 1996; Kershaw et al., 2004; Pasek et al., 2016; Schroevers et al., 2013). For example, Schroevers et al. (2013) compared cancer patients with a comparison group of individuals without cancer with regard to the effect of emotional support on depressive symptoms. They found a significant relationship between problem-focused emotional support (e.g., reassuring, comforting) and depressive symptoms among cancer patients, not among individuals without cancer. Previous studies have suggested that individuals with cancer used emotional support as coping resources and coping strategies (e.g., Kershaw et al., 2004; Pasek et al., 2016). These studies suggested that cancer patients with high emotional support had reduced social stress and sought social support coping strategies. Based on these findings, the current study suggests that receiving/perceiving emotional support can help individuals with cancer feel connected with others and allows them to exchange various forms of emotions and

challenges that result in positive mental health.

In addition to the contribution of emotional support on mental health, informational support was also found to be a significant predictor of mental health among persons with cancer. This is, people with cancer who had friends or family members who they could talk to about health tended to report better mental health. This finding was partially consistent with Mardanian-Dehkordi et al.'s (2018) study that found that cancer patients who had levels of informational support from family, friends, and relatives tended to score lower on cancer-related fatigue, including in physical, emotional, and cognitive dimensions. Moreover, in this study, emotional support from family members, relatives, and health personnel was found to be the most demanded type of support. Given this information, it may be important for health professions not only to provide cancer patients with information, advice, and feedback, but also to help them establish social support networks that could contribute to feelings that they are loved or cared about.

As expected, tangible support had a positive impact on mental health, suggesting that individuals with cancer who had someone who could help with their daily chores were more likely to report better mental health. This finding was consistent with prior work by Merluzzi, Philip, Yang, and Heitzmann (2016) who found that instrumental/tangible support played a significant moderating role in the relationship between physical debilitation and psychological distress among cancer patients in treatment (i.e., people with cancer). For cancer survivors, however, there was a stronger moderating effect of emotional support on that relationship. That is to say, instrumental support, such as helping with one's daily chores, was shown to be more critical for

patients in the treatment phase when the side-effects of cancer treatment and physical symptoms may be more disruptive than in the survivor phase. Based upon their findings, the authors suggested that different types of support may affect psychological distress differently between patients in treatment and cancer survivors; thus, it is imperative to provide cancer patients and survivors with the most beneficial form of support by matching the needs and desires of the person. Moreover, given that limited evidence exists to show the health benefits of the positive contribution of instrumental support to the health of cancer patients, further research concerned with examining the relationship will be needed.

A significant relationship was also found between LTPA and mental health. Leisure scholars have suggested that participation in leisure activities helps individuals with disabilities and illnesses cope with psychological distress and improve their psychological and emotional well-being (Harris, Cronkite, & Moos, 2006; Hutchinson, Bland, & Kleiber, 2008; Iwasaki & Bartlett, 2006; Iwasaki & Mannell, 2000). The finding of this study also corroborated previous cancer research that found that participation in LTPA can reduce mental illnesses among people with cancer (Conroy et al., 2017; Kang et al., 2017; Rogers et al., 2011; Thraen-Borowski et al., 2013; Zopf et al., 2016). Some studies have indicated that, as a result of participation in LTPA, individuals with cancer had reduced feelings of anxiety and depression and improved self-esteem and self-worth (Brunet et al., 2014; Culos-Reed et al., 2010; Fitzpatrick, 2018). Thus, the current study confirmed that LTPA can be a contributing factor in promoting mental health among individuals with cancer. Moreover, while previous research has focused more on the impact of exercise programs on mental health among cancer patients, this

study provides insight into the role of LTPA in shaping mental health among individuals with cancer.

Direct Pathways to Leisure Time Physical Activity

The results of this study support previous findings that have shown that social support plays an important role in encouraging LTPA participation among individuals with cancer (Coleman et al., 2014; Cummins et al., 2017; Paxton et al., 2010; Phillips et al., 2013; Sherman et al., 2010). In particular, this study revealed that only emotional support was a significant predictor of LTPA among individuals with cancer. This finding is in line with Strine, Chapman, Balluz, and Mokdad (2008) who found that people who always/usually received social or emotional support were more likely to be physically active than those individuals who sometimes or rarely/never received support. Although this study did not focus on people with cancer, the authors analyzed national survey data from the Behavioral Risk Factors Surveillance System and provided insight into the significant role of social and emotional support in shaping health behavior adherence. By interviewing cancer survivors, Cummins et al. (2017) revealed that support from family and friends served as an encouragement to engage in physical activity. Considering that there have been few studies focused on this relationship, it may be difficult to draw conclusions about the effect of emotional support on LTPA among people with cancer. Nonetheless, it seems clear from the above discussion that support from significant others, such as attachment, reassurance, and encouragement, can serve as a motivational factor in increasing LTPA participation.

While all three types of support had direct effects on mental health, no direct effects were found between informational support and LTPA and between tangible

support and LPTA. These findings counter prior studies that found that social support increased LTPA involvement (Kershaw et al., 2004; Mardanian-Dehkordi et al., 2018; Paxton et al., 2010; Phillips et al., 2013; Sherman et al., 2010). As for the non-significant relationship between informational support and LTPA, the most likely explanation is that one question used for measuring informational support(i.e., "Do you have friends or family members that you talk to about your health?") addressed only health-related information and not information about physical activity or exercise. Perhaps one's view on health was not enough to directly relate to LTPA participation, but was enough to link to mental health. This may have resulted in the significant relationship between informational support and mental health, not between informational support and LTPA.

As for the non-significant relationship between tangible support and LTPA, one possible explanation may be that one tangible support question (i.e., "If you needed help with your daily chores, is there someone who can help you?") was not enough to relate to LTPA behavior. Perhaps individuals' perceptions of tangible support (i.e., helping with one's daily chores) may reduce psychological burdens caused by cancer and thus, improve mental health among people with cancer (Merluzzi et al., 2016). However, it does not seem to be evident that such perceptions of tangible support directly encouraged them to participate in LTPA. Given these findings, there may be a need to use additional informational and tangible support questions more relevant to LTPA behaviors in future studies. Furthermore, considering that there are relatively few studies that have examined how different types of support relate to LTPA among people with cancer, the relationship deserves further investigation.

Indirect Pathways to Mental Health

The results of the bootstrapping test indicated that a significant mediating effect existed for LTPA on the relationship between emotional support and mental health. That is, individuals with cancer who had higher levels of emotional support were more likely to report higher levels of LTPA, which, in turn, led to better mental health. Chang and colleagues (2014) proposed LTPA as the mediating role in the relationship between social support and mental health among older adults. Specifically, they found that higher levels of social support led to greater LTPA participation, which, in turn, resulted in better psychological well-being among older adults. This finding is aligned with the results of our study, which indicated that individuals with cancer who perceived emotional support tended to engage in LTPA and, thus, reported better mental health. In addition, the findings of this study corroborate Spector et al. (2012) who found that community-based wellness programs designed to promote physical activity and improve emotional management techniques were effective in increasing LTPA levels and mental health in breast cancer survivors. Collectively, the present study confirmed the mediating effect of LTPA in the link between emotional support and mental health among individuals with cancer. That is, this study suggested that promoting LTPA through encouraging positive emotions can be an effective strategy by which to improve mental health among people with cancer.

Study Limitations

Several limitations exist in this study. First, given the cross-sectional nature of the current data, no causal inferences can be drawn from our findings. Inversely, another possibility exists that participation in LTPA may increase perceived emotional support.

Future investigation is needed to examine these casual relationships. Second, the HINTS data only provided self-reported information on LTPA. Therefore, this study acknowledges that several biases (e.g., recall bias, over reporting) could be present. Third, most of the individuals with cancer who participated in the study were non-Hispanic Whites (67.5%) and female (61.3%). Given this, the results of this study may not be generalizable across ethnic groups and gender. Future research could use a sample that includes more ethnically-diverse and male cancer patients. Further, it would be interesting if future studies examine whether ethnicity and gender differences exist regarding social support, LTPA, and mental health in the cancer population.

Implications and Conclusion

The results from this study suggests that healthcare professionals, including recreational therapists who work with individuals with cancer, need to implement a variety of emotional support groups for individuals with cancer. The creation of online emotional support groups may be beneficial for individuals with cancer to connect with others. By sharing their experiences with online support groups, such as web-based communication forums, cancer patients and survivors can create unique bonding experiences and build supportive relationships with others (Nobis et al., 2015). In addition to online support groups, some studies have provided evidence that web-based interventions can increase LTPA levels through tailored feedback (Kim, Hwang, & Chen, 2018). Web-based tailored feedback from health professionals has been found to be an effective way by which to receive social and emotional support and professional advice on physical activity and health (Franco, Gallardo, & Urtubey, 2018; Nobis et al., 2015).

For recreation therapists, implementing peer support groups may be beneficial for individuals with cancer to receive and/or perceive emotional support. Ussher, Kirsten, Butow, and Sandoval (2006) suggested that cancer peer support groups where individuals share the same problem can create unique bonding experiences and build supportive relationships with others, such as through a sense of community, unconditional acceptance, and information sharing. Such supportive and cohesive networks can help people with cancer express their emotion and thus, improve mental health among people with cancer. In addition, family counseling programs where family members can be aware of patients' needs and desires and how to provide emotional support, seem to be important resources for maintaining or improving mental health among individuals with cancer.

Previous studies have emphasized the importance of physicians' communication behaviors and techniques on their cancer patients' health outcomes (Arora, 2003; Maguire, 1999). Moreover, some studies have stressed the importance of the patient-spouse relationship in improving cancer patients' adjustment or mental health (Christensen, 1983; Jamison, Wellisch, & Pasnan, 1978). Given this, communication counseling programs where family members and health care providers can be aware of patients' needs and how to provide emotional support seem to be particularly important for maintaining or improving health among individuals with cancer (Arora, Finney Rutten, Gustafson, Moser, & Hawkins, 2007).

Prior research has suggested that community-based physical activity interventions that help develop social support networks among neighbors are cost-effective strategies for improving both physical activity and health (Heath et al., 2012; Lombard, Lombard,

& Winett, 1995; Roux et al., 2008). Specifically, by participating in community-based programs and activities, individuals with cancer can connect with and establish social support networks in the community. Such connections can help them receive emotional support. That is, having an opportunity to exercise with other participants can provide rich opportunities for people with cancer to have peer support, which will, in turn, result in LTPA participation and better mental health.

In conclusion, this study examined how emotional, informational, and tangible support related to LTPA participation and mental health among individuals with cancer. The results of the current study indicated that three types of support and LTPA played a significant role in shaping mental health among people with cancer. In addition, this study confirmed that emotional support had a direct effect on mental health through its effect on LTPA. That is, emotional support was identified as a significant contributor to both LTPA participation and mental health. The findings from this study will help inform policy-makers and health professionals about how to develop more effective interventions to promote health behaviors and improve mental health among individuals with cancer.

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