

ASSOCIATION OF CANCER WORRY AND PHYSICAL ACTIVITY BEHAVIORS IN ADULTS WITHOUT CANCER

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Abstract: Background: Cancer worry has been conceptualized as a potential motivator to engage in cancer preventative behaviors like cancer screening, genetic testing, or smoking cessation. It is currently unknown if these findings extend to the domain of physical activity, as physical activity has been associated with decreased cancer risk. Objective: To examine if the association between cancer worry and other health behaviors will extend to physical activity in a sample of adults not diagnosed with cancer. Methods: Data are drawn from the NCI's 2017 Health Information National Trends Survey (HINTS) Iteration 5 Cycle 1 (N = 2,706) dataset, a nationally representative survey of adults in the United States. A Kruskal-Wallis-H test was conducted to determine whether physical activity duration (i.e., daily minutes) differed between cancer worry levels with a post hoc Dunn's multiple comparison test to compare the differences between mean ranks. Results: A Kruskal-Wallis-H test showed statistically significant differences in PA duration (i.e., daily minutes) between groups that differed in their level of cancer worry. PA in minutes on a typical day was significantly lower in those who reported not at all, moderate, and extreme worry about developing cancer compared to those who reported slightly and somewhat worried. Conclusion: Contrary to our expectations, our results suggest that higher cancer worry levels are paradoxically associated with less PA. This study's results are significant in that they add to the breadth of literature linking cancer worry to health behaviors and may be used to inform future health promotion interventions.

Keywords: *Cancer Worry, Physical Activity, Cancer Prevention, Public Health*

INTRODUCTION

Over 25% of Americans worry to some degree about being diagnosed with cancer, with nearly 10% of the population experiencing extreme worry (Ferrer et al., 2013; Persoskie et al., 2014; Vrinten et al., 2015). Worry is a cognitive activity that focuses attention on a perceived threat and acts as a facilitator of problem-solving and self-protective behavior to a perceived threat (Davey et al., 1996). Cancer worry is an adverse emotional response to perceived susceptibility to a positive cancer diagnosis (Hay et al., 2006). There is growing evidence that cancer worry may influence intentions to engage in health-promoting behaviors to prevent cancer. Research has shown that people without cancer who spend time thinking about the disease to some extent, may explore useful information to decrease or eradicate feelings of worry (Hay et al., 2006). For example, cancer worry is significantly related to cancer-preventive practices, such as obtaining a cancer screening (Moser et al., 2007; Quaife et al., 2019; Vrinten et al., 2015;) and genetic testing (Lumish et al.,

2017; Palmero et al., 2020), smoking cessation (Janssen et al., 2014; Yong et al., 2014), and surgical procedures like mastectomy to prevent cancer (Hay et al., 2005).

Despite the current literature reporting the influence of cancer worry on positive cancer-protective health behaviors, few studies have explicitly investigated the association between cancer worry and its impact on health-promoting behaviors like physical activity (PA) in a nationally representative sample. A study examining worry, in general, found that individuals who worry more often spend less time being physically active than individuals who worry less often (Clancy et al., 2020). Two studies limited to women showed some evidence that increased cancer worry was associated with increased physical activity levels (Brunet et al., 2014; Bernat et al., 2015). However, a recent review in this area found mixed and limited evidence for an association between worry of cancer recurrence and physical activity in samples of individuals who have previously undergone cancer treatment (Durazo & Cameron, 2019). There-

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fore, we seek to clarify the relationship between cancer worry and physical activity and determine if the association between cancer worry and physical activity found in women generalizes to a nationally representative sample.

Additionally, engaging in PA plays an essential role in numerous physiological systems (Brown et al., 2012), ultimately reducing cancer risk. Many studies have shown that high levels of physical activity in adults is associated with lower risk of breast cancer (Eliassen et al., 2010; Kossman et al., 2011; Pizot et al., 2016), bladder cancer (Keimling et al., 2014), kidney cancer (Behrens & Leitzmann, 2013), colon cancer (Liu et al., 2016), and several other cancers (Moore et al., 2016; Psaltopoulou et al., 2016). Given that cancer worry may positively influence cancer-preventive health behaviors, and the limited literature investigating its contributive role in PA behaviors, it is essential to address this gap. Thus, the objective of this secondary data analysis was to examine if the association between cancer worry and other health behaviors would extend to physical activity in a nationally representative sample of adults.

METHOD

Design

This was a secondary data analysis of an existing publicly available dataset from the National Cancer Institute's 2017 Health Information National Trends Survey (HINTS). HINTS is a nationally representative survey of adults (age ≥ 18) designed to collect data on the need to access, use, and understand health-related information (Finney Rutten et al., 2020). The HINTS-5 study was reviewed and approved by the Westat Institutional Review Board (IRB). The study was exempted from IRB review by the NIH Office of Human Subjects.

Participants

This study's data came from HINTS-5 (Cycle 1) survey responses collected from January 2017 to May 2017 through a mailed questionnaire. A two-stage sampling design consisted of (1) stratification from residential addresses and (2) from sampled households. Locations with high minority subpopulations were oversampled. For this study, data only include respondents ($N = 2,756$) who self-reported that they have not been

Table 1. Sample demographic characteristics (N = 2,706).

	<i>M (SD)</i>	<i>N</i>	<i>%</i>
Age	52.2 (19.7)		
Gender			
Male		1100	40.7
Female		1606	59.3
Race/ethnicity			
White, non-Hispanic		1933	75.2
Non-White		637	24.8
Education Level			
High school or less		680	25.3
Some college		793	29.5
Bachelor's degree or more		1213	45.2
Household Income			
Less than \$20,000		464	18.6
\$20,000 to < \$35,000		347	13.9
\$35,000 to < \$50,000		335	13.3
\$50,000 to < \$75,000		447	17.9
\$75,000 or more		908	36.3

* Indicates significant differences between sex ($p < 0.05$).

diagnosed with having cancer by answering to the item "Have you ever been diagnosed as having cancer?" From this group, 50 (1.8%) survey respondents were excluded because of missing data on one or more of the other variables in the current study. Based on these inclusion/exclusion criteria, the study's subsample was N = 2,706 survey respondents.

Measures

To assess cancer worry, respondents were asked: "How worried are you about getting cancer?" This item was assessed on a 5-point Likert scale, with responses including: 1 = not at all, 2 = slightly, 3 = somewhat, 4 = moderately, and 5 = extremely. To measure physical activity durations, respondents were asked to report how long they are typically doing physical activity or exercise of at least moderate intensity in minutes. Participants' self-reported demographic characteristics including race/ethnicity, gender, age, education level, and household income.

Statistical Analysis

All statistical analyses were conducted using R program 4.0.3 software with the fisheries stock assessment (FSA; Ogle, 2016) and dplyr (Wickham et al., 2015) packages. Descriptive statistics (means, standard deviations, frequencies, and percentages) were calculated for all variables. We conducted a Kruskal-Wallis-H test to determine whether physical activity duration (i.e., daily minutes) was different for cancer worry levels. A post hoc Dunn's (1964) multiple comparison test compared the differences (mean ranks) between more than two groups. The non-parametric test was used because the study variables were not normally distributed.

RESULTS

Participants (N = 2,706) were 52 years old on average in Cycle 1 (Table 1). The majority of participants were female (59%) and White (75%) race/ethnicity. With respect to education level, 25.3% had a high school education or less, 29.5% attended some college, and 45.2% had a bachelor's degree or more.

A Kruskal-Wallis H test was conducted to determine if there were differences in physical activity (PA) duration (i.e., minutes) between groups that differed in their level of cancer worry: not at all, slightly, somewhat, moderately, and extremely worried. Results showed that minutes of PA on a typical day was associated with levels of cancer worry, $\chi^2_{(4)} = 13.401$, $p < .01$ (Table 2). More specifically, on a typical day, PA in minutes was statistically lower in those not at all, moderately, and extremely worried about developing cancer than among those who were somewhat and slightly worried about developing cancer. Posthoc pairwise comparisons were conducted using a Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Results indicated a statistically significant difference in PA

in minutes between somewhat and moderately worried, and not at all and somewhat worried, $p < .05$. There was no statistically significant difference between other worry groups.

DISCUSSION

The purpose of this study was to examine the relationship between cancer worry and physical activity durations in adults. A Kruskal-Wallis-H test was used to determine whether physical activity durations (i.e., daily minutes) differed by cancer worry levels. Contrary to our expectations, our results suggest that no worry, moderate, and extreme cancer worry levels are linked to less PA, whereas slightly or somewhat cancer worry levels are linked to greater PA.

Lower PA behaviors among no worry and elevated worry individuals observed in this study are consistent with limited research indicating that worry levels about getting cancer can lead to more significant avoidance and lower health-promoting behaviors. For example, very low or no worry levels may induce inactivity in health-promoting behaviors (Consedine et al., 2004a). In contrast, elevated levels of cancer worry strongly predict doctor avoidance (Persoskie et al., 2014), interrupt healthy decision-making (Miles et al., 2008), and can be a barrier for other health behaviors including smoking-cessation intentions (Klein et al., 2009) and cancer screening (Andersen et al., 2003; Consedine et al., 2004a). Evidence also shows that elevated worry levels contribute to low fruit and vegetable intake, less physical activities (Ferrer et al., 2013), longer durations of sitting, and less walking among adults (Clancy et al., 2020). However, our findings are inconsistent with some previous literature indicating that elevated worry could act as an adaptive function by motivating preventive care behaviors. For example, elevated cancer worry significantly predicted the desire to adhere to physical activity guidelines in college women (Bernat et al., 2015). Additionally, elevated levels of worry for developing lung cancer was positively related to greater intentions to quit smoking (Janssen et al., 2014; Yong et al., 2014), while developing breast cancer was positively related to routine mammography (Consedine et al., 2004b) and colorectal cancer was positively related to routine sigmoidoscopy and colonoscopy screening (Moser et al., 2007).

Study strengths and limitations

The current study has both strengths and limitations. Strengths include reporting results from a large, diverse, and nationally representative sample of adults. Limitations include the use of only one cycle of the HINTS study, and the cross-sectional and observational nature of the data, making it difficult to infer causation. Another limitation is the reliability and validity of single-item cancer worry and PA duration measures, which also have lower sensitivity than alternative measures and were all based on self-reports that are subject to response bias. Lastly, it is unclear

Table 2: Kruskal Wallis-H test results of mean PA in minutes according to cancer worry.

Worry Levels	N	Mean PA Minutes	SD	df	χ^2	p
Not at all	542	20.0	16.7			
Slightly	852	21.6	17.6			
Somewhat	836	22.7	18.5	4	13.708	.008
Moderately	332	19.3	15.6			
Extremely	144	20.8	18.6			

why cancer worry is associated with PA behaviors and why elevated levels are linked to lower PA durations. This may be related to negative arousal and amplification of threat appraisals, as described by Aspinwall and Taylor (1997), which may shut down proactive coping efforts. Additional research is essential, specifically longitudinal research, to better understand these associations. Despite these limitations, using a large nationally representative sample may exceed the limitations as the results support generalizability.

CONCLUSION

The current study showed some support for previous literature suggesting that cancer worry is associated with health-promoting behaviors. Results indicated that while a certain level of cancer worry can decrease physical activity among adults, other levels of worry may increase it. Thus, these findings may inform psychosocial and health promotion interventions and future research. Further research is necessary to assess the causal nature of the association between cancer worry and physical activities and whether this association is observed in other health-promoting behaviors like nutrition intake. Additionally, future research may elucidate underlying psychological factors behind this relationship.

Financial Support

The first author was supported by a William F. and Margaret W. Scandling Scholar Award from the Warner School of Education and Human Development at the University of Rochester.

Competing interests
None declared.

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