HHS Public Access

Author manuscript

J Rural Health. Author manuscript; available in PMC 2021 July 01.

Published in final edited form as:

J Rural Health. 2020 September ; 36(4): 543–548. doi:10.1111/jrh.12455.

Stress and physical activity in rural cancer survivors: The moderating role of social support

Scherezade K. Mama, DrPH[1,2], **Nishat Bhuiyan, MS**[1], **Joshua Smyth, PhD**[3], **Kathryn H. Schmitz, PhD**[2,4]

[1]Department of Kinesiology, College of Health and Human Development, The Pennsylvania State University, University Park, Pennsylvania

[2]Penn State Cancer Institute, Hershey, Pennsylvania

[3]Department of Biobehavioral Health, College of Health and Human Development, The Pennsylvania State University, University Park, Pennsylvania

[4]Department of Public Health Sciences, College of Medicine, The Pennsylvania State University, Hershey, Pennsylvania

Abstract

Purpose: Social support (SS) has been shown to moderate the relationship between psychological distress and physical activity (PA) in adults, including those with no history of cancer and cancer survivors (CS). The purpose of this study was to explore the relationship between stress and leisure-time PA and test if SS is a moderator of this relationship in rural/nonmetro CS.

Methods: CS were recruited to Partnering to Prevent and Control Cancer (PPCC) and completed questionnaires assessing sociodemographics, leisure-time PA, perceived stress, and SS. Hierarchical multivariable linear regression was used to assess the moderating role of SS on the association between stress and PA.

Findings: Cancer survivors (N=219) were in their mid-60s (M age=64.3±12.5 years) and overweight/obese (M BMI=29.5±6.8 kg/m^2); over half were women (59.7%) and insufficiently active (59.4%); and 42.1% reported moderate-to-high perceived stress. Perceived stress was negatively correlated with PA (r=−.183, p=.044) and SS (r=−.470, p<.001), and SS was positively correlated with PA (r=.205, p=.025). However, SS did not moderate the association between stress and PA.

Conclusions: Rural CS reported higher stress and less PA than previously reported by urban CS, potentially contributing to rural cancer health disparities. Although previous studies have shown success in building SS to reduce stress and promote PA in CS, our results do not support the stress-buffering hypothesis in rural cancer survivors. Further research is needed to understand factors

Corresponding author: Scherezade K. Mama, DrPH, Department of Kinesiology, The Pennsylvania State University; 268J Recreation Building, University Park, PA 16802, USA; skmama@psu.edu; Phone: 814-863-5887; Fax: 814-863-1275.

Disclosures: The authors declare no potential conflicts of interest.

related to PA in rural CS and determine strategies to reduce psychological distress and promote healthy behaviors in an effort to improve cancer survivorship.

Keywords

Exercise; social environment; psychological stress; rural health; cancer survivors

Introduction

Cancer survivors residing in rural and nonmetropolitan, medically underserved areas experience higher cancer mortality and poorer survivorship outcomes post-treatment.[1] Although physical activity reduces the risk of cancer recurrence and comorbidities and improves physical and psychological well-being,[2] rural cancer survivors are less likely to meet physical activity recommendations than urban cancer survivors, contributing to cancer health disparities.[3,4]

Elevated psychosocial distress (e.g., fear of recurrence, anxiety, depression) is not uncommon among cancer survivors and contributes to physical inactivity and poor quality of life among rural cancer survivors.[3,5–8] Geographic isolation, inadequate transportation, and low access to health care and supportive oncology services and resources may contribute to rural-urban differences.[1,8,9]

Social support is a coping resource and has been associated with reduced psychosocial distress and greater well-being among cancer survivors.[10–12] The stress-buffering effect hypothesis suggests that social support (e.g., informational, emotional, tangible) may moderate the association between stress and poor health outcomes and behaviors, such as physical activity.[12] This hypothesis has been tested in a wide range of studies and populations.[10,13–15] However, no study of which we are aware has explored social support as a moderator of the association between stress and physical activity in rural cancer survivors.

Understanding the moderating role of social support on the association between stress and physical activity in rural cancer survivors may help differentiate those who would likely engage in and benefit from the peer or instructor support provided by group-based physical activity interventions and programs. Therefore, the purposes of this study were to explore the association between stress and physical activity and to test the moderating role of social support on this association in rural cancer survivors.

Methods

Design and participants

Partnering to Prevent and Control Cancer (PPCC) was a cross-sectional study guided by the social ecological model that aimed to understand multilevel factors related to physical activity and inactivity in rural cancer survivors. The PPCC study was reviewed and approved by the Institutional Review Board at The Pennsylvania State University, and all participants provided informed implied consent.

Rural cancer survivors were identified using the Center for Rural Pennsylvania's definition of rural, which is based on population density (defined as the total population of an area divided by the total number of square land miles of that area).[16] Cancer survivors identified as residing in a rural area in central Pennsylvania were recruited to the study through an academic-community partnership and via mailings to state and hospital-based cancer registries, e-flyers and newsletters, and announcements at cancer support groups, churches, and community health events. Recruitment occurred between May 2017 and December 2018. Eligible participants were ≥18 years of age, had received a cancer diagnosis, lived primarily within a 28-county area in central Pennsylvania, and were able to read and complete questionnaires in English.

Procedures and measures

Participants were mailed a consent note and questionnaires assessing sociodemographics and cancer history, weekly leisure-time physical activity, perceived stress, interpersonal support (appraisal, belonging, tangible, and total support), and social support for exercise from family and friends. Participants who returned the completed questionnaire provided implied consent to participate and were enrolled in the study.

Sociodemographic information included the following: self-reported age, race, ethnicity, education, income, employment and marital status, and height and weight. Participants also reported on cancer diagnosis, treatment status, and time since treatment.

Weekly leisure-time physical activity was assessed using the Godin Leisure-Time Exercise Questionnaire (Godin LTEQ).[17] The LTEQ includes four items to assess the frequency of strenuous, moderate, and mild leisure-time exercise during a typical week, and has been validated for use in cancer survivors.[18] The frequency of each type of exercise was used to compute a weekly leisure-time activity score, and participants with a weekly leisure-time activity score ≥24.0 were classified as sufficiently active. Continuous weekly leisure-time activity scores were used in analyses.

The ten-item Perceived Stress Scale (PSS-10) was used to measure the degree to which participants appraise situations in their life as stressful.[12] Scores range from 0 to 40, and higher scores indicate greater perceived stress. The PSS-10 has been found valid and reliable for use in diverse populations and cancer survivors,[19–21] and Cronbach's alpha was 0.82 in this study sample.

Perceived social support was measured using the 12-item Interpersonal Support Evaluation List (ISEL-12),[22] and social support for physical activity was measured using the Social Support and Exercise (SSE) survey.[23] The ISEL-12 measures overall social support (scores range from 0–36) and three dimensions of social support, appraisal, belonging, and tangible support (scores range from 0–12), and the SSE measures family and peer support for physical activity (scores range from 0 to 50). Higher scores indicate greater perceived social support for all scales.

Statistical analysis

Pearson correlations were used to explore associations between stress, social support, and physical activity, and multivariable linear regression models were used to estimate the effect of stress on physical activity, adjusting for age, BMI, income and marital status. Interaction terms were added to test whether each type of social support moderated the association between stress and physical activity. Six models were used to explore each type of social support separately (appraisal, belonging, tangible, and total interpersonal support, social support for exercise from family, and social support for exercise from friends), and a significant interaction term indicated a potential moderating effect of social support on physical activity. Analyses were performed using SPSS 25.0 (IBM Statistics, Armonk, NY), and significance was inferred at $p \leq .008$ to correct for multiple testing.

Results

Cancer survivors (N=219) were, on average, in their mid-60s and classified as overweight. Over half were women (60.7%), completed college (50.5%), and reported an annual household income ≥$40,000 (80.5%). Breast (30.6%) and prostate (27.4%) were the most common cancers reported, and most (90.4%) participants were at least 12 weeks but less than 5 years post-treatment. Over half (57.8%) of cancer survivors were classified as inactive or insufficiently active. Additional participant characteristics and means (and SD) for stress, social support, and physical activity are shown in Table 1.

Perceived stress was negatively correlated with physical activity (r=−.176, p=.011) and appraisal, belong, tangible, and total interpersonal support (rs=−.411-.171, ps<.013) but not social support for exercise from family and friends. Linear regression showed that higher stress was significantly associated with lower weekly leisure-time physical activity (B=−0.6, SE=0.2, p=.011). However, this association was no longer statistically significant after adjusting for age, BMI, income, and marital status (B=−0.5, SE=0.3, p=.053).

Multivariable linear regression models including interaction terms showed main effects of social support for exercise from family and friends on leisure-time physical activity. However, there was no evidence that any of the social support variables moderated the association between stress and physical activity. Unadjusted multivariable linear regression models are shown in Table 2, and models adjusted for age, BMI, income, and marital status are shown in Table 3.

Discussion

We sought to explore the association between stress and physical activity in rural cancer survivors and to test the moderating role of social support on the association between stress and physical activity. Rural cancer survivors in this study reported high levels of stress and low physical activity. However, social support did not moderate the association between perceived stress and leisure-time physical activity in this sample. Thus, we found no evidence to support the stress-buffering effect hypothesis in this sample of older, rural cancer survivors.[12]

Previous studies have shown success in increasing social support to reduce stress and promote physical activity in young adult cancer survivors.[10] We expanded on previous studies and used two different measures of social support, one global measure assessing appraisal, belonging, tangible and total interpersonal support and a second measure specific to social support for exercise, to explore multiple dimensions of social support and its association with stress and physical activity among rural cancer survivors. Although the stress-buffering effect hypothesis is widely studied,[14,15] it has been tested less often among cancer survivors.[10,13] To our knowledge, this is the first study to extend findings to rural cancer survivors and suggests that rural cancer survivors experiencing elevated perceived stress require additional supportive resources, beyond social support, to improve health behaviors and cancer survivorship outcomes.

Individually supervised exercise programs are effective for reducing stress and promoting physical activity but are resource-intensive, particularly in underserved and hard-to-reach populations, such as rural cancer survivors.[24] Face-to-face, group-based physical activity interventions require fewer resources and are effective for increasing physical activity in cancer survivors.[25] Future research is needed to understand whether rural cancer survivors have environmental and personal needs related to treatment and survivorship care, such as lack of access to health services or financial strain, that must be addressed prior to interpersonal support needs.[8]

Findings add to the evidence that an ecologic approach is needed to understand and change physical activity behavior in rural cancer survivors. Strengths of this study include the use of multiple measures of social support; study limitations include the cross-sectional study design, limiting causal inferences, and the use of self-reported measures of stress and physical activity. Additionally, less than 5% of our sample reported residence in a more isolated rural area, limiting our ability to explore differences in stress, social support and physical activity in cancer survivors residing in isolated rural areas versus small towns. Additional research is needed to explore differences by degree of rurality and to understand multilevel factors related to physical activity to inform strategies to reduce psychosocial distress and promote healthy behaviors in rural cancer survivors to improve cancer survivorship, reduce health disparities and promote health equity.

Acknowledgements:

The authors thank the cancer survivors who participated in the Partnering to Prevent and Control Cancer (PPCC) study and the numerous community partners who assisted with recruitment.

Funding sources: This study is funded, in part, under a grant with the Pennsylvania Department of Health using Tobacco CURE Funds (TRK08-Mama-PSU-2016F; PI: Mama). The Department specifically disclaims responsibility for any analyses, interpretations or conclusions. Scherezade Mama is supported by a career development award from the National Cancer Institute (K07 CA222335, PI: Mama).

References

1. Blake KD, Moss JL, Gaysynsky A, Srinivasan S, Croyle RT. Making the Case for Investment in Rural Cancer Control: An Analysis of Rural Cancer Incidence, Mortality, and Funding Trends. Cancer Epidemiol Biomarkers Prev. 2017;26(7):992–997. [PubMed: 28600296]

2. Cormie P, Zopf EM, Zhang X, Schmitz KH. The Impact of Exercise on Cancer Mortality, Recurrence, and Treatment-Related Adverse Effects. Epidemiol Rev. 2017;39(1):71–92. [PubMed: 28453622]

3. Weaver KE, Palmer N, Lu L, Case LD, Geiger AM. Rural-urban differences in health behaviors and implications for health status among US cancer survivors. Cancer Causes Control. 2013;24(8):1481–1490. [PubMed: 23677333]

4. Mama SK, Bhuiyan N, Foo W, et al. Rural-urban differences in meeting physical activity recommendations and health status in cancer survivors in central Pennsylvania. Support Care Cancer. 2020.

5. Carmack CL, Basen-Engquist K, Gritz ER. Survivors at higher risk for adverse late outcomes due to psychosocial and behavioral risk factors. Cancer Epidemiol Biomarkers Prev. 2011;20(10):2068–2077. [PubMed: 21980014]

6. Denlinger CS, Ligibel JA, Are M, et al. NCCN Guidelines Insights: Survivorship, Version 1.2016. J Natl Compr Canc Netw. 2016;14(6):715–724. [PubMed: 27283164]

7. Weaver KE, Forsythe LP, Reeve BB, et al. Mental and physical health-related quality of life among U.S. cancer survivors: population estimates from the 2010 National Health Interview Survey. Cancer Epidemiol Biomarkers Prev. 2012;21(11):2108–2117. [PubMed: 23112268]

8. Paskett ED. Breast Cancer Among Special Populations: Disparities in Care Across the Cancer Control Continuum. Adv Exp Med Biol. 2015;862:39–52. [PubMed: 26059928]

9. Ormel HL, van der Schoot GGF, Sluiter WJ, Jalving M, Gietema JA, Walenkamp AME. Predictors of adherence to exercise interventions during and after cancer treatment: A systematic review. Psychooncology. 2018;27(3):713–724. [PubMed: 29247584]

10. Brunet J, Love C, Ramphal R, Sabiston CM. Stress and physical activity in young adults treated for cancer: the moderating role of social support. Support Care Cancer. 2014;22(3):689–695. [PubMed: 24203086]

11. McDonough MH, Sabiston CM, Wrosch C. Predicting changes in posttraumatic growth and subjective well-being among breast cancer survivors: the role of social support and stress. Psychooncology. 2014;23(1):114–120. [PubMed: 23983131]

12. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychol Bull. 1985;98(2):310–357. [PubMed: 3901065]

13. Carpenter KM, Fowler JM, Maxwell GL, Andersen BL. Direct and buffering effects of social support among gynecologic cancer survivors. Ann Behav Med. 2010;39(1):79–90. [PubMed: 20151235]

14. Gellert P, Hausler A, Suhr R, et al. Testing the stress-buffering hypothesis of social support in couples coping with early-stage dementia. PLoS One. 2018;13(1):e0189849. [PubMed: 29300741]

15. Mezuk B, Diez Roux AV, Seeman T. Evaluating the buffering vs. direct effects hypotheses of emotional social support on inflammatory markers: the multi-ethnic study of atherosclerosis. Brain Behav Immun. 2010;24(8):1294–1300. [PubMed: 20600815]

16. The Center for Rural Pennsylvania. Rural Urban Definitions. 2014; http://www.rural.palegislature.us/demographics_rural_urban.html. Accessed November 27, 2017.

17. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. Can J Appl Sport Sci. 1985;10(3):141–146. [PubMed: 4053261]

18. Amireault S, Godin G, Lacombe J, Sabiston CM. Validation of the Godin-Shephard Leisure-Time Physical Activity Questionnaire classification coding system using accelerometer assessment among breast cancer survivors. J Cancer Surviv. 2015;9(3):532–540. [PubMed: 25666749]

19. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983;24(4):385–396. [PubMed: 6668417]

20. Cuevas BT, Hughes DC, Parma DL, et al. Motivation, exercise, and stress in breast cancer survivors. Support Care Cancer. 2014;22(4):911–917. [PubMed: 24249424]

21. Lee EH. Review of the psychometric evidence of the perceived stress scale. Asian Nurs Res (Korean Soc Nurs Sci). 2012;6(4):121–127. [PubMed: 25031113]

22. Cohen S, Mermelstein R, Kamarck T, Hoberman H. Measuring the functional components of social support. In: Sarason IG, Sarason BR, eds. Social support: Theory, research and application. The Hague, The Netherlands: Martinus Nijhoff; 1985:73–94.

23. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. Prev Med. 1987;16(6):825–836. [PubMed: 3432232]

24. Marcus BH, Williams DM, Dubbert PM, et al. Physical activity intervention studies: what we know and what we need to know: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity); Council on Cardiovascular Disease in the Young; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research. Circulation. 2006;114(24):2739–2752. [PubMed: 17145995]

25. Leach HJ, Mama SK, Harden SM. Group-based exercise interventions for increasing physical activity in cancer survivors: a systematic review of face-to-face randomized and non-randomized trials. Support Care Cancer. 2019.

Table 1.

Participant characteristics and mean (*SD*) stress, social support, and physical activity (*N*=219)

Variable (Scale)	Mean (*SD*)
Age (years)	64.5 (12.2)
Body mass index ([BMI] kg/m^2)	29.6 (6.9)
Female, *N*(%)	133 (60.7)
Education, *N*(%)	
< Bachelor degree	108 (49.5)
4-year bachelor degree	56 (25.7)
> Bachelor degree	54 (24.8)
Annual income, *N*(%)	
< $40,000	40 (19.4)
$40,000–79,999	66 (32.0)
≥ $80,000	100 (48.5)
Employed, *N*(%)	79 (37.3)
Married or living with a partner, *N*(%)	175 (80.3)
Cancer type, *N*(%)	
Breast	67 (30.6)
Colorectal	29 (13.2)
Gynecological	48 (21.9)
Lung	20 (9.1)
Prostate	60 (27.4)
Time since diagnosis (years)	5.1 (6.4)
Time since treatment, *N*(%)	
Currently receiving or planning to receive treatment	21 (9.7)
At least 12 weeks	196 (92.5)
More than 5 years	19 (9.2)
Weekly leisure-time physical activity score	24.9 (21.7)
Perceived stress (Scale: 0–40)	12.6 (6.8)
Interpersonal support	
Appraisal (Scale: 0–12)	9.5 (2.8)
Belonging (Scale: 0–12)	8.5 (2.7)
Tangible (Scale: 0–12)	6.5 (1.6)
Total (Scale: 0–36)	24.5 (5.0)
Social support for exercise	
Family participation (Scale: 0–50)	18.4 (8.3)
Friend participation (Scale: 0–50)	15.5 (7.8)

Table 2.

Unadjusted regression models exploring moderating effects of interpersonal support and social support for exercise on association between perceived stress and leisure-time physical activity in rural/nonmetro cancer survivors

Model[a]	Independent variables	*B*	*SE*	*p*	95% CI
1	Perceived stress	−0.469	0.251	.063	−0.964, 0.026
	Appraisal interpersonal support	−0.248	0.606	.682	−1.444, 0.947
	Stress*Appraisal support	0.114	0.071	.112	−0.027, 0.255
2	Perceived stress	−0.381	0.235	.107	−0.846, 0.083
	Belonging interpersonal support	1.178	0.581	.044	0.033, 2.323
	Stress*Belonging support	0.051	0.081	.530	−0.109, 0.210
3	Perceived stress	−0.523	0.226	.022	−0.968, −0.077
	Tangible interpersonal support	−1.548	0.983	.117	−3.486, 0.390
	Stress*Tangible support	0.071	0.120	.553	−0.165, 0.307
4	Perceived stress	−0.454	0.241	.061	−0.930, 0.022
	Total interpersonal support	0.142	0.324	.662	−0.496, 0.780
	Stress*Total support	0.057	0.043	.192	−0.029, 0.143
5	Perceived stress	−0.538	0.217	.014	−0.967, −0.109
	Social support for exercise from family	**0.782**	**0.176**	**.000**	**0.435, 1.129**
	Stress*Family support	−0.001	0.028	.962	−0.056, 0.054
6	Perceived stress	−0.499	0.215	.021	−0.923, −0.075
	Social support for exercise from friends	**0.779**	**0.187**	**.000**	**0.410, 1.149**
	Stress*Friend support	0.003	0.027	.912	−0.051, 0.057

Note: Bold font indicates a statistically significant association ($p \leq .008$).

Table 3.

Adjusted regression models exploring moderating effects of interpersonal support and social support for exercise on association between perceived stress and leisure-time physical activity in rural/nonmetro cancer survivors

Model[a]	Independent variables	*B*	*SE*	*p*	95% CI
1	Perceived stress	−0.561	0.278	.045	−1.109, −0.013
	Appraisal interpersonal support	−0.897	0.630	.156	−2.140, 0.346
	Stress*Appraisal support	0.079	0.076	.301	−0.071, 0.228
2	Perceived stress	−0.408	0.270	.132	−0.940, 0.125
	Belonging interpersonal support	0.520	0.637	.416	−0.738, 1.777
	Stress*Belonging support	0.003	0.087	.972	−0.168, 0.175
3	Perceived stress	−0.416	0.259	.110	−0.927, 0.095
	Tangible interpersonal support	−1.709	1.006	.091	−3.693, 0.276
	Stress*Tangible support	0.043	0.131	.742	−0.215, 0.301
4	Perceived stress	−0.551	0.271	.043	−1.086, −0.017
	Total interpersonal support	−0.315	0.354	.375	−1.013, 0.383
	Stress*Total support	0.022	0.048	.647	−0.073, 0.177
5	Perceived stress	−0.512	0.250	.042	−1.005, −0.019
	Social support for exercise from family	**0.688**	**0.194**	**.001**	**0.305, 1.071**
	Stress*Family support	−0.012	0.030	.687	−0.071, 0.047
6	Perceived stress	−0.460	0.247	.064	−0.948, 0.027
	Social support for exercise from friends	**0.604**	**0.201**	**.003**	**0.207, 1.000**
	Stress*Friend support	−0.008	0.028	.781	−0.064, 0.048

[a]All models included leisure-time physical activity as the dependent variable and were adjusted for age, BMI, income, and marital status.

Note: Bold font indicates a statistically significant association ($p \leq .008$).