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ORIGINAL ARTICLE

Relationship of perceived everyday cognitive function and work engagement in breast cancer survivors

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Abstract

Introduction Breast cancer survivors (BCS) who represent approximately 3.5 million survivors in the USA frequently report ongoing cognitive dysfunction that may impact work outcomes. However, little is known about how perceived everyday cognitive function may affect work engagement (a measure of work efficacy and work well-being) in BCS who have completed treatment.

Objectives The purpose of this study was to examine the relationship between perceived everyday cognitive function and work engagement in BCS.

Methods A convenience sample of 68 employed BCS seen at a Midwest NCI-Cancer Center who were at least 1-year post-treatment, completed a cross-sectional questionnaire assessing demographic and medical characteristics, and perceived everyday cognitive function (Everyday Cognition Scale) and work engagement (Utrecht Work Engagement Scale). Descriptive statistics, Pearson's *r*, and separate regression models controlling for age and education were used to analyze the data.

Results BCS who were on average 52 (SD = 8.6) years old, 5 (SD = 3.8) years post-treatment, and primarily employed full-time (79%) participated. A subset of BCS (12%) identified poorer everyday cognitive function after BC diagnosis and treatment. Everyday cognition, including subscales vigor and dedication, were correlated with work engagement ($p<0.01$), controlling for age and education.

Conclusions Findings indicate the important role of perceived everyday cognitive function in work engagement well into survivorship. Reducing cognitive dysfunction may be an important area for future intervention research to support BCS who return to work.

Implications to practice Healthcare providers need to assess and address perceived cognitive dysfunction to promote work-related outcomes in BCS well into survivorship.

Keywords Breast cancer survivors · Everyday cognitive function · Work ability · Work productivity · Work engagement

Introduction

Breast cancer survivors make up the largest population in the cancer survivor community with over 3.5 million in the USA alone [1]. Advances in the diagnosis and treatment of breast cancer have led to improvements in survival [2], yet, often a substantial portion of these survivors are left with a myriad of symptoms, including cognitive dysfunction [3]. In fact, up to 75% of breast cancer survivors report concerns with their everyday cognitive functioning [4]. These cognitive concerns, in turn, have been noted to impact work-related outcomes in breast cancer survivors [5–8].

For many reasons, work is an important indicator of health in breast cancer survivors. Work has been described by cancer survivors as giving meaning and purpose to life [9, 10] and is often denoted as a sign of full recovery from cancer and its treatment [11]. In fact, research has indicated that up to 89% of breast cancer survivors return to work by 24 months [12]. The ability to return to work after breast cancer diagnosis and treatment has been associated with individual economic and financial benefits [9, 13], as well as enhanced overall quality of life [14]. However, when compared to non-cancer survivors, breast cancer survivors who return to work have been noted to have increased absenteeism [5, 9], poorer work ability, and less productivity [7, 15, 16]. Moreover, breast cancer

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survivors often experience greater job loss than the general population [12, 13], and those with ongoing lingering symptoms such as cognitive dysfunction may be at greater risk [15]. Therefore, more research is needed to understand the unique needs of breast cancer survivors with persistent, perceived cognitive concerns or dysfunction and its relationship with sustained and engaged employment.

One concept that many have identified that is critical to understanding longevity and sustainability in employment is to understand one's work engagement [17, 18]. Work engagement has been defined as "a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption" [19, p. 74]. Vigor is characterized by "high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties" [19, p. 74]. Dedication refers to "being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge" [19, p. 74] . Absorption is characterized by "being fully concentrated and positively engrossed in one's work" [19, p. 75]. Work engagement has been shown to be a critical indicator of work well-being, work efficacy, and productivity and has been shown to be negatively related to "burnout" [19, 20]. Work engagement may be a critical factor to explore regarding work efficacy and sustainability, especially for breast cancer survivors with unique cognitive concerns/dysfunction. Therefore, the purpose of this study was to examine the relationship between perceived everyday cognitive function and work engagement in breast cancer survivors.

Methods

This study was part of a larger two-phased, mixed method study to examine the impact of cognitive dysfunction on quality of life, including work-related outcomes in breast cancer survivors. In phase 1, a convenience sample of 16 breast cancer survivors were interviewed and completed work-related questionnaires and provided critical feedback on each instrument for the identification of appropriate work-related questionnaires for this study. The results, then, led to phase 2, which has focused on assessing cognitive dysfunction and its relationship to work-related outcomes, including work ability and work productivity (published previously) [15], as well as work engagement in breast cancer survivors. As identified in the literature and by our breast cancer survivors in phase 1, work engagement is a separate concept [21] that is important to the overall understanding of issues facing breast cancer survivors who return to work. BCS eligible for this study were over the age of 21, worked outside of the family home, and were at least 1-year post-adjuvant treatment (except for antihormonal therapy) for early stage breast cancer (stage I–III). BCS were excluded if they had brain metastasis or had a medical history of stroke, brain injury, brain surgery, or dementia, which could severely affect everyday cognitive functioning. Indiana University Purdue University Indianapolis institutional review board approved this study.

Sample and data collection

Consecutive BCS in a National Cancer Institute-affiliated cancer clinic in the Midwest were recruited by clinic staff who fully explained the study requirements and obtained informed consent from those that were eligible and interested in participating. Sample size was based on having a minimum of 10 subjects per outcome variable in the regression analyses [22, 23]. Upon consent, questionnaire packets were either given or mailed to each participant with a self-addressed stamped return envelope. Information regarding participants' demographic and characteristics, employment status (full-time or part-time), perceived everyday cognitive function, and work-related outcomes, including work engagement, were collected. BCS who completed and returned the questionnaires, which took approximately 50 min, were compensated with a $10 gift card. All study data were collected in 2017. Questionnaire data were de-identified and stored in a password-protected and HIPAA compliant database.

Instruments

Demographic and medical information An investigator-initiated instrument was designed to examine factors to describe the breast cancer sample. Information collected included age education, work status (full-time, part-time), stage of breast cancer upon diagnosis, time from diagnosis, and type of cancer treatment (chemotherapy, radiation, and use of tamoxifen and/or aromatase inhibitor).

Everyday cognition (ECog) The ECog scale, developed by Farias et al. [24], assesses cognitively mediated functional ability across six specific domains, including (1) everyday memory, (2) language, (3) visuospatial ability, (4) executive functioning - planning, (5) executive functioning - organization, and (6) executive functioning - divided attention, and one global total overall everyday function. This 39-item instrument asks the participant to rate how well they can currently perform everyday activities compared to before having a breast cancer diagnosis and cancer treatment. The ECog utilizes a Likert response scale ranging from 1 = "better or no change" to 4 = "consistently much worse," with 5 = "do not know" (which was not included in the scoring calculation). Scores were summed and the average was calculated by dividing by the number of items, with totals ultimately ranging from 1 to 4. Higher scores then represented an increase in difficulty of performing everyday cognitive activities. This measure has been shown to have sufficient psychometric

properties when compared to established measures of cognitive dysfunction and the sensitivity to detect mild cognitive impairment (MCI) from normal cognitive function and dementia [24]. ECog has also been moderately correlated with neuropsychological tests of episodic memory and executive function [25]. Cronbach's alpha for this study was 0.86.

Work engagement Work engagement was measured using the 17-item Utrecht Work Engagement Scale (UWES-17) [17] and includes three domains of work engagement, including vigor, dedication, and absorption. Participants are asked to rate if they have had this feeling and indicate how often you feel on a scale from 0 = "never" to 6 = "every day". The overall work engagement score is strongly correlated with work efficacy and has strong psychometric properties [17, 20, 21, 26, 27]. The Cronbach's alpha in this study was 0.93.

Data analysis

Demographic and medical characteristics of the sample were assessed with descriptive statistics. Pearson's r was used to examine bivariate correlations. Separate regression analyses were ran to assess the relationship of everyday cognitive function and its subscales on total work engagement and subscales, including vigor, absorption, and dedication, controlling for age and education. For each model, the amount of variance explained by the variables of interest on work-related outcomes was reported. The Statistical Package Social Sciences (SPSS v. 23, SPSS, Inc., Chicago, IL) was used for the analysis. Statistical significance was set at $p < 0.05$.

Results

Women participating in this study were 29 to 68 years of age ($x = 52.1$, SD = 8.6). The majority were White (94%), well educated (65% some college), and married or living with a partner (83%). The majority of BCS were working full-time (79%) as they were well post-treatment, with the average 5 (SD = 3.8) years post-adjuvant treatment. These breast cancer survivors were originally diagnosed with early stage breast cancer including stage 0 = 9 (13%), stage I = 26 (39.4%), stage II = 24 (36.4%), and stage IIIa = 7 (10.6%). Almost all received surgery (99%) and completed chemotherapy (62%) and radiation treatment (65%). At the time of this study, approximately one-third were on anti-hormonal therapy, including either tamoxifen (35%) or an aromatase inhibitor (26%).

Table 1 displays the ECog total score and subscale scores of memory, language, visual spatial abilities, planning, organization, and divided attention including the sample mean, standard deviation, and potential and actual range of scale scores. Results ranged from no change to consistently worse. Memory and language had the highest overall means, indicating the most difficult. Eight of sixty-eight (12%) BCS reported "consistently a little worse" to "consistently much worse" on total global everyday cognitive function.

Table 1 displays the results of the Utrecht Work Engagement Scale total score and subscale scores of vigor, absorption, and dedication with their means, standard deviation, and potential and actual ranges. Twelve of 68 (18%) BCS rated total work engagement as low, with scores of "never" to "rarely" in relation to their overall work engagement.

To understand relationships between the main variables, Pearson's r and linear regression models were conducted. Pearson's r correlation analysis was conducted among all main variables to determine bivariate associations between ECog total score and subscale scores and total work engagement scale scores and subscale scores. Correlations among all variables were significant from $p < 0.05$ to $p < 0.000$. Separate linear regressions with the total everyday cognitive function (total ECog) on total work engagement as well as each subscale score, controlling for age and education, were ran. Table 2 displays the results of the regression analysis of the

Table 1 Mean, standard deviation, and actual and potential range of total everyday cognition and work engagement and their subscales ($n = 68$)

	Mean (SD)	Actual range	Potential range
Memory	2.06 (0.81)	1–4	1–4
Language	2.00 (0.83)	1–3.7	1–4
Visual spatial	1.29 (0.48)	1–3.6	1–4
Executive functioning - planning	1.48 (0.60)	1–3.8	1–4
Executive functioning - organization	1.67 (0.81)	1–4	1–4
Executive functioning - divided attention	1.94 (0.95)	1–4	1–4
Total everyday cognition	1.71 (0.64)	1–4	1–4
Work engagement - vigor	3.87 (1.07)	1.33–5.67	0–6
Work engagement - absorption	3.73 (1.01)	0.67–5.67	0–6
Work engagement - dedication	4.24 (1.23)	1.00–6.00	0–6
Total work engagement	3.97 (0.97)	1.00–5.71	0.6

Table 2 Regression analysis of relationships of age, education, and everyday cognitive function on work engagement and subscales of vigor, absorption, and dedication

	Vigor	Absorption	Dedication	Total work engagement
Age		.03*		.03*
Education	.15*	.15*	.03*	.10**
Everyday cognitive function	− .02**		− .01*	− .01**
F	11.08	4.24	4.67	5.12
R^2	.36	.18	.19	.26
Adjusted r^2	.32	.13	.15	.22

*$p < 0.05$ and **$p < 0.01$

relationships of age, education, and everyday cognitive function and total work engagement and subscale scores of vigor, absorption, and dedication. All models were statistically significant and explained 13 to 32% variance in work engagement.

Total work engagement

Age, education, and everyday cognitive function explained 22% of the variance of the total work engagement, with everyday cognitive function significantly related to total work engagement ($\beta = -0.01, p < 0.01$). These results indicated that higher scores (poorer) everyday cognitive function was negatively related to total work engagement.

Vigor

Education and everyday cognitive function explained 32% of the variance in vigor, with everyday cognitive function significantly related to vigor ($\beta = -0.02$, $p < 0.01$). These results indicated that higher scores or poorer everyday cognitive function was negatively related to vigor.

Absorption

Everyday cognitive function was not significantly related to absorption. Age and education were significantly related to absorption, explaining 13% of the variance in absorption, with older BCS with more education reporting higher levels of absorption.

Dedication

Education and everyday cognitive function explained 15% of the variance of vigor in work engagement, with everyday cognitive function significantly related to vigor ($\beta = -0.01$, $p < 0.05$), indicating that higher scores or poorer everyday cognitive function was negatively related to dedication.

Discussion

The purpose of this study was to examine the everyday cognitive function and its relationship with work engagement in breast cancer survivors. A substantial number of breast cancer survivors rated everyday cognitive function worse after treatment. In this study, 12% of the breast cancer survivors identified that they had consistently ("a little" to "much") worse cognitive performance since their diagnosis and treatment for breast cancer. This finding is consistent with other studies that have identified cognitive concerns/dysfunction in long-term breast cancer survivors [4], some even up to 20 years post-treatment [28]. Cognitive concerns/dysfunction after breast cancer diagnosis and treatment has also been documented on neuropsychological exam [29]. Multiple meta-analyses of quantitative studies of cancer survivors, including breast cancer survivors, have documented that cognitive concerns can be both severe and a life-changing symptom [29–35]. A meta-analysis of 27 studies of breast cancer survivors (over 1562 subjects) found small to moderate decrements in performance in memory, processing speed, attention, working memory, and executive function in both cross-sectional and longitudinal studies [29]. In addition, breast cancer survivors have reported that perceived cognitive concerns are most disruptive and bothersome after treatment, when other cancer treatment-related symptoms have subsided, and they face returning to work [36–39]. Thus, research to understand the contribution of everyday cognitive functioning on work-related outcomes is paramount.

Total work engagement varied, but 18% of the BCS identified low engagement, rating that they "never" to "rarely" expressed engagement in their work. In the broader literature, work engagement has been shown to be related to positive work-related outcomes [19, 40]. To our knowledge, this is the first study to examine work engagement in breast cancer survivors who have returned to work. Returning to work is a significant milestone for breast cancer survivors [11]; yet very little research has been conducted to fully understand factors associated with positive work-related outcomes. Research to date has focused mainly on achieving return to work [5], and while important, more studies are needed to explain factors

that influence work efficacy and work well-being and ultimately sustained employment which has significant financial implications for breast cancer survivors and their families.

Everyday cognitive functioning was an important factor associated with total work engagement. Bivariate correlations of total everyday cognitive function and subscale scores of memory, language, visual spatial abilities, executive function - planning, executive functioning - organization, and executive function - divided attention were significantly related to total work engagement and subscales. In addition, linear regression models were significant and identified total everyday cognitive function, age and education explained 22% of total work engagement, while education and everyday cognitive function explained vigor (32% of the variance) and dedication (15% of the variance) in breast cancer survivors. Although, these factors do not fully explain the variance in work engagement, these initial findings suggest that everyday cognitive function may play a role in overall work engagement, vigor, and dedication. After all, the instrument measuring everyday cognitive function may be tapping into the breast cancer survivors' ability and overall confidence (self-efficacy) to complete specific cognitive tasks.

Similarly, the Utrecht Work Engagement Scale assesses work engagement, including an individual's vigor or overall "mental resilience" to overcome obstacles or difficulties at work, as well as their dedication, which relates to the individual's ability to positively and enthusiastically address "challenging work" in which higher levels of everyday cognitive functioning would be essential. In addition, previous research has also identified that total work engagement is best predicted by personal resources, such as their overall self-confidence and self-efficacy to complete tasks [21], suggesting that those breast cancer survivors who report higher everyday cognitive function may also experience greater work engagement.

Everyday cognitive function, however, did not predict all of the variance in total work engagement. In fact, everyday cognitive function was not significantly related to the subscale score of absorption in the regression model, when controlling for age and education. Absorption, which has been characterized as being engrossed with one's work to almost the point of being obsessed [17], may have not related as well with breast cancer survivors. Breast cancer survivors have reported that they often experience post-traumatic growth and go through a reordering of life priorities post-treatment and, thus, may not relate to this aspect of work engagement as much as compared with the general population [41]. In addition, research indicates that work engagement is not only related to personal resources but is also related to the work itself. Job resources such as autonomy, coaching, professional development, and performance feedback have also been found to be important factors related to work engagement and should be considered in future research to fully understand work engagement in breast cancer survivors [21].

Strengths and limitations

The strength of this study was that it moved beyond the existing research on work-related outcomes in breast cancer survivors, which to date has been predominately focused on achieving return to work versus the survivor's experience at work. Work engagement is a high priority for businesses. Currently, work engagement is being explored by most organizations, to not only promote work productivity but also improve organizational culture [18]. Workers with higher levels of work engagement are more committed and productive and often create and/or positively redesign their roles for optimal outcomes [18]. Since work is such an important indicator of survival for breast cancer survivors, interventional research is needed to enhance work engagement in cancer survivors. A systematic review of interventional studies found that most studies were limited by focusing solely on return to work and failed to identify definitive recommendations to promote other positive work-related outcomes [42]. This study provides initial evidence that work engagement may be an important work-related outcome for breast cancer survivors. Alternatively, there were a number of limitations of this study and include the use of a cross-sectional design, reliance on only perceived everyday cognitive function to measure cognitive dysfunction versus objective measures of cognitive dysfunction, and the focus on long-term survivors versus prospectively following newly diagnosed breast cancer survivors over the cancer care trajectory.

Clinical implications and future research

Despite study limitations, our findings have implications for clinicians and identify opportunities for future research. Clinicians should screen for cognitive dysfunction throughout the cancer care trajectory, as this symptom has debilitating consequences and may place survivors at greater risk for poor work-related outcomes. The National Comprehensive Cancer Network (NCCN) Guidelines® have identified assessment, evaluation, and management recommendations for addressing cognitive dysfunction, and nurses should use them as a guide in supporting breast cancer survivors [43]. The NCCN Guidelines® specifically identifies assessing and optimizing treatment for known correlated symptoms amenable to approved treatment such as depression, emotional distress, pain, and sleep disturbance. Recommendations also include practical solutions to enhance recall (organizational strategies) and reduce stress (enhancing coping strategies) [44]. Although further research is needed, emphasis on non-pharmacological interventions to improve cognitive impairment has gained support including cognitive rehabilitation [45], cognitive training [45–47], physical activity/exercise [48, 49], and mindfulness-based stress reduction [50, 51]. Addressing cognitive dysfunction, in turn, may be associated

with not only improvements in everyday cognitive functioning but also in supporting positive work-related outcomes, including work engagement.

Future studies should also address previous study limitations. Research studies are needed that employ prospective, longitudinal designs that will examine factors associated with work-related outcomes in breast cancer patients from diagnosis through treatment and into survivorship. Interventional studies are needed that are multi-faceted assessing both personal resources and job resources to promote work engagement and, ultimately, sustained employment post breast cancer diagnosis and treatment.

Conclusion

A substantial subset of breast cancer survivors reported worse everyday cognitive functioning post diagnosis and cancer treatment. Everyday cognitive functioning was also significantly related to work engagement in breast cancer survivors. Work engagement, which has been associated with work well-being, work efficacy, and productivity, is an important indicator to examine in breast cancer survivors who return to work. Breast cancer survivors, who make up the largest population of cancer survivors and predominately are of working age, have identified work as an important factor in recovery and return to normalcy and, therefore, should be a priority area for future research.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval The questionnaire and methodology for this study was approved by the Institutional Review Board at Indiana University (IRB#: 1109006684).

Consent to participate Informed consent was obtained from all individual participants included in the study.

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