

Barriers to employment for young adult central nervous system tumor survivors: The role of career readiness and core self-evaluations

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Abstract.

BACKGROUND: Although the majority of childhood cancer survivors make successful transitions to adulthood, research suggests that a significant group experiences ongoing medical concerns, such as psychological distress, that significantly impact the achievement of crucial social roles including employment.

OBJECTIVE: The purpose of this study was to examine the relationship between career decision making, core self-evaluations, and perceived internal and external barriers to employment in a sample of young adult central nervous system tumor survivors.

METHOD: A sample of 110 young adult survivors of pediatric central nervous system tumors was surveyed. Mediation analysis with structural equation modeling was used to correlate a number of different measures (Career Decision Making [CTM], Perceived Employment Barriers [PEB], and Core-Self Evaluations [CSE]).

RESULTS: The presence of both significant direct and indirect effects of career decision making on perceived employment barriers implied that there was a partial mediating effect of core self-evaluations on the association between career readiness and employment barriers.

CONCLUSION: Career decision-making is a robust construct that can be applied to young adult central nervous system tumor survivors in effort to gain more insight into the vocational psychological factors that impact career development and employment in this group. Core self-evaluations was found to be a mediator between career decision making and perceived career barriers.

Keywords: Core self-evaluations, career readiness, young adult, central nervous system cancer, vocational rehabilitation

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1. Introduction

Although the majority of childhood cancer survivors make successful transitions to adulthood, research suggests that a significant group experiences ongoing medical concerns, such as psychological distress, that significantly impact the achievement of crucial social roles including employment (Michel et al., 2010; Zeltzer et al., 2009). Employment has been linked to increased quality of life and has significant implications for independence, self-esteem, and family and social relationships. A number of large cohort studies have identified unemployment as an important issue impacting young adult cancer survivors. Data from the Childhood Cancer Survivor Study indicated that survivors with poor physical health were eight times more likely to be unemployed when compared to healthy survivors, and health related concerns were frequently reported as a barrier to employment (Kirchhoff et al., 2011; Kirchhoff et al., 2010). The risk for unemployment increases in relation to chronic medical conditions with 73.5% of the survivors in the cohort reporting at least one chronic medical condition 30 years post cancer diagnosis (Oeffinger et al., 2006), and these reported conditions present important implications for employment, financial security, and independence. The impact of physical health on employment has also been demonstrated in the St. Jude Lifetime Cohort Study with physically healthy survivors reporting better emotional functioning, which correlated with more fully developed vocational identity and career readiness (Strauser et al., 2014). This suggests that the long-term physical effects associated with cancer treatment have significant implications for the vocational success of childhood cancer survivors.

Childhood cancer survivors who were treated for central nervous system (CNS) tumors are consistently identified as having psychological distress, poor functional outcomes and decreased quality of life (Meyer & Kieran, 2002; Recklitis et al., 2010). The invasive nature of the treatment, including toxic and radiation therapies directed to the brain, significantly impact physical functioning, overall health, learning, socialization, and psychological well-being (Henrichs & Schmale, 1993). Outcome studies have consistently found that young adult CNS survivors are more likely to experience depression, social withdrawal, and deficits in social competency when compared to non-CNS survivors (Carey et al., 2001; Fossen et al., 1998; Glaser et al., 1997; Mulhern et al., 1993; Ness

et al., 2005; Vannatta et al., 1998). Survivors of pediatric brain tumors have been found to be at high risk for not attaining developmental milestones associated with peer relationships and employment (Gurney et al., 2009; Maurice-Stam et al., 2007). Results of a study conducted with 1,101 adult survivors of pediatric brain tumors found that 26% were unemployed, 74% were unmarried, and 28% had incomes of less than \$20,000 per year (de Boer et al., 2006).

Despite the difficulties noted above, pursuing one's career development and obtaining employment has been identified as an important aspect of cancer survivorship for young adults (Short et al., 2005). Identity, self-esteem, self-worth, and self-concept have all been linked to obtaining and maintaining employment. Research has consistently found that obtaining employment is an important aspect of facilitating and maintaining social relationships that provide the foundation for psychosocial support, overall health promotion, and increased levels of community integration (Hoffman, 2005; Main et al., 2005; Turner & Turner, 2004). Conversely, struggling with the career development process and experiencing unemployment has been linked to decreased levels of overall cancer adjustment, increased levels of social isolation, poor general health outcomes, and decreased quality of life and general welfare for both the individual and the family (Hewitt et al., 2003; Syse et al., 2008; Verbeek & Spelten, 2007).

Given the importance of career development and employment in the survivorship experience, recent research has attempted to address the factors that impact career development and employment in young adult CNS survivors. The Illinois Work and Well-being Model (IW²M; Strauser et al., 2013; Strauser et al., 2015) is a conceptual framework that is being used to guide career development research for young adult CNS survivors and is comprised of three major domains (Contextual, Career/Employment Development, and Participation) that have reciprocal relationships that inform outcomes and potential interventions.

Recently, a study was conducted using the IW²M to identify *internal* and *external* factors that impact the career development and employment of young adult CNS survivors acting as either facilitators or barriers in establishing the necessary congruence between the *Contextual* and *Career* Domains of the IW²M (Strauser, Chan, et al., 2019). *Internal* factors address how the individual perceives his or her physical, cognitive, emotional and social functioning. Research in the area of career development

and employment have consistently identified these areas of functioning as critical to educational and employment outcomes (Strauser, 2013). Importantly, recent research with young adult CNS survivors has found that the individual's perceptions of functioning in these areas are highly related to one's willingness to engage in the necessary activities critical in identifying (awareness), acquiring and maintaining involvement with appropriate education and employment activities and outcomes (Strauser, Chan, et al., 2019). *External* factors address environmental factors such as employer and family attitudes regarding employment and the perceived access and availability of appropriate career, educational and financial benefits. Research has consistently found that external factors are influential in the educational, career and employment outcomes of individuals with disabilities, including cancer survivors (Strauser, 2013; Strauser, Chan, et al., 2019).

1.1. Theoretical background

In addition to internal and external barriers, research has found that career development is a cognitively and affectively mediated process that can be negatively impacted by cancer, especially CNS cancer (Peterson et al., 1991; Strauser, Iwagana, et al., 2019). As a result, developing an understanding of how vocational psychological constructs related to cognition and affect relate to internal and external career development barriers in young adult CNS survivors is crucial. Two constructs that have received considerable attention in the vocational and career psychology literature are career readiness and core self-evaluations (CSE). Both of these constructs have been consistently found to be robust factors that impact the career development process and have been found to be effective points of career and vocational interventions.

Career readiness, grounded in Cognitive Information Processing Theory, is a cognitively mediated construct that addresses an individual's ability to effectively manage the factors related to making effective career decisions (Peterson et al., 1991). Career readiness is conceptualized as the *capability* of an individual to make appropriate career and employment choices, taking into account the *complexity* of an individual's contextual factors (family, SES, gender) that influence an individual's career development and employment. Specifically, *capability* refers to the cognitive and affective proficiency of the individual to engage in effective career and

employment problem solving and decision making. *Complexity* refers to the contextual factors originating in the family, society, employing organizations, or the broader economy that make it more difficult to process the information necessary to solve career and employment problems and make effective and productive decisions (Sampson et al., 2004; Saunders et al., 2000). Research across chronic health conditions has consistently found that higher levels of career readiness are related to making better career and employment decisions and lower levels of psychological distress (Strauser, 2013).

Core self-evaluations (CSE) are a higher order construct addressing the individual's primary perception and bottom-line evaluation of oneself, of others, and of the world (Judge et al., 1998). CSE perceptions are considered to be subconscious, to reside deep within the individual, and to provide a foundation for situation specific appraisals (e.g., the evaluation of one's work and one's colleagues) related to job performance and satisfaction (Bono & Judge, 2003). CSE is comprised of the following four widely studied psychological constructs that independently have been related to positive psychological outcomes, including work, by over 50,000 independent studies: *Self-Esteem*, *Generalized Self-Efficacy*, *Locus of Control*, and *Emotional Stability* (neuroticism) (Judge & Bono, 2001). *Self-esteem* can be conceptualized as the approval of oneself and the degree to which the individual perceives oneself as "capable, significant, successful, and worthy" (Coopersmith, 1967, pp. 4-5). *Generalized self-efficacy* is one's perception of his or her capabilities to perform at a global level across a variety of contexts. *Locus of control* is the individual's perception regarding one's ability to control one's environment. Finally, *emotional well-being* is conceptualized as low levels of neuroticism (Bono & Judge, 2003). According to CSE theory these four constructs collectively act as a higher order factor to impact career and employment outcomes including, but not limited to, job satisfaction and performance (Jiang & Jiang, 2015; Jiang et al., 2017).

Given the paucity of research regarding the psychological factors that impact the career development of young adult CNS survivors, it is important to conduct theoretically-driven research that examines how career readiness and core self-evaluation impact the career and employment development process, especially as it relates to the perceptions of internal and external barriers. Based on prior research with individuals with chronic health conditions, it is

hypothesized that increased levels of career readiness and CSE are related to decreased levels of perceived internal and external barriers (Strauser et al., 2013; Strauser et al., 2011). In addition, given the nature of career readiness, it is hypothesized that career readiness has a direct effect on perceived barriers, and that CSE acts as a mediator between these two constructs. Therefore, the purpose of the present study was to examine the relationships among career readiness, CSE, and perceived internal and external barriers to employment in a group of young adult CNS survivors. Given the theoretical and hypothesized relationships among the constructs, we were interested in examining the potential mediating role of CSE on the relationship between career readiness and perceived barriers to employment. The following research question guided our study:

1. Does CSE mediate the relationship between career readiness and perceived internal and external barriers to employment in a group of young adult CNS survivors?

2. Method

2.1. Participants

The participants consisted of 110 young adult survivors of pediatric CNS tumors aged between 18 and 30 years old ($M = 23.05$, $SD = 3.36$) (See Table 1). The age at diagnosis of the participants was between 0 and 22 years old ($M = 9.59$, $SD = 5.10$). Fifty-eight (52.7%) participants were women and a majority of participants identified themselves as Caucasian (90%). Others identified themselves as Hispanic (3.6%), Asian or other Pacific Islander (3.6%), and African American (2.7%). Regarding educational attainment, 20.9% had a high school diploma, 4.5% had training after high school other than college, 42.7% had some college, 26.4% had a college degree, and 5.5% had a postgraduate degree. In terms of employment status, 34.5% of participants were working full time, 23.6% were working part time, 11.8% were unemployed or currently looking for work, 20.9% were unemployed and currently not looking for work, and 6.4% were disabled and unable to work. Of the 110 participants, 40% underwent surgery only; 28.2% surgery, radiation and chemotherapy; 14.5% surgery and radiation; 7.3% surgery and chemotherapy; 2.7% radiation and chemotherapy; 2.7% only radiation; 1.8% only chemotherapy; 1.8% surgery, radiation, chemotherapy and stem cell

Table 1

Demographic characteristics of the participants ($N = 110$)	
Variable	n (%)
Gender	
Male	52 (47.3%)
Female	58 (52.7%)
Race/ethnicity	
Caucasian	99 (90.0%)
Hispanic	4 (3.6%)
Asian or Pacific Islander	4 (3.6%)
African American	3 (2.7%)
Education level	
Completed high school	23 (20.9%)
Training after high school, other than college	5 (4.5%)
Some college	47 (42.7%)
College graduate	29 (26.4%)
Postgraduate	6 (5.5%)
Employment	
Working full time	38 (34.5%)
Working part time	26 (23.6%)
Unemployed looking for work	13 (11.8%)
Unemployed not looking for work	23 (20.9%)
Disabled and unable to work	7 (6.4%)
Other	3 (2.7%)
Treatment	
Surgery	44 (40%)
Surgery, radiation and chemotherapy	31 (28.2%)
Surgery and radiation	16 (14.5%)
Surgery and chemotherapy	8 (7.3%)
Radiation	3 (2.7%)
Radiation and chemo	3 (2.7%)
Chemotherapy	2 (1.8%)
Surgery, radiation, chemo and stem cell transplant	2 (1.8%)
No treatment	1 (0.9%)

transplant; and 0.9% received no treatment. Post-treatment symptoms experienced by participants included vision loss (24.5%), hearing loss (19.1%), seizures (10.9%), endocrine (28.2%), growth problems (14.5%), headaches (15.5%), chronic pain (5.5%), depression (22.7%), anxiety (44.5%), social problems (27.3%), learning problems (29.1%), stroke (0.9%), and diabetes (3.6%).

2.2. Procedures

After receiving approval from the affiliated institutional review boards, a potential list of eligible participants was identified from the databases used by the Dana Farber Cancer Institute's Pediatric Brain Tumor Outcomes Clinic where survivors of pediatric brain tumors receive long-term follow-up care. Clinic staff members were instructed to identify all survivors seen in the Outcomes Clinic who were at least 2 years post-diagnosis and 2 years off tumor directed therapy.

Prior to recruitment, medical records were reviewed, and individuals were excluded from the recruitment process if they were identified as having a significant cognitive impairment as evidenced by a diagnosis of Intellectual Disability on neuropsychological assessment. Medical teams in each respective clinic were contacted via email requesting them to review the potential list of participants and to obtain permission to contact patients. Those determined eligible for the study were diagnosed with a brain tumor prior to age 18, over the age of 18 at the time of the study, had no cancer therapy in the past 24 months, were active patients in the Pediatric Neuro-oncology Outcomes Clinic, and spoke English.

Upon developing a list of individuals who were identified as being eligible for the study, potential participants were recruited through an introductory letter that provided information about the proposed study. For participants who indicated that they were interested in participating, they were offered two options to complete the study packet that consisted of a demographic form and the survey instruments. First, participants could opt to receive the survey packet via United States mail and return the completed materials in a postage-paid envelope. Included in the survey materials was an opt-out card for potential participants who did not want to complete the survey or did not want to receive any future communication regarding the study. If participants did not return the survey within 3 weeks and no opt-out card has been received, a reminder mailing was sent out. No more than one reminder mailing was sent to participants for whom opt-out information was not received.

A second method of data collection was to recruit participants who were coming for their regularly scheduled appointments in the Outcomes Clinic at Dana-Farber Cancer Institute (DFCI). Participants who agreed to participate received the study packets while waiting for their appointment after eligibility requirements for the study were met. Informed consent was obtained from all individual participants included in the study.

2.3. Instruments

Perceived Career Barriers Scale (PCBS; Strauser, Chan, et al., 2019). The *Perceived Career Barriers Scale* identifies internal and external barriers to the career development and employment of young adult survivors of pediatric brain tumors. The PCBS consists of 12 items making up two subscales

(Internal and External Barriers). For each career barrier identified, an 11-point Likert Scale (0–10) with 0 being “not a barrier” and 10 being a “major barrier”. A midpoint label of “somewhat of a barrier” is also utilized. The Internal Barriers subscale consists of seven items with the central theme of the subscale reflecting perceptions of physical, social and emotional challenges. The internal consistency reliability coefficient as measured by Cronbach’s alpha for the Internal Barrier subscale is 0.88. The External Barriers subscale consists of five items with the central theme of the subscale reflecting perceptions of barriers related to external support from family and employers. The internal consistency reliability coefficient as measured by Cronbach’s alpha for the External Barrier subscale is 0.80.

Career Thoughts Inventory (CTI; Sampson et al., 1996). Sampson et al. developed the CTI, which defines career thoughts as outcomes of one’s thinking about assumptions, attitudes, behaviors, beliefs, feelings, plans, and strategies related to career problem solving and decision-making. The CTI consists of 48 items and includes three subscales: (a) the Decision-Making Confusion subscale (CTI-DMC), which consists of 14 items that measure the extent to which one’s emotions or lack of decision-making skills interfere with one’s ability to make a career decision; (b) the Commitment Anxiety subscale (CTI-CA), which consists of 10 items that examine the impact anxiety has on one’s ability to commit to a career decision; and (c) the External Conflict subscale (CTI-EC), which consists of 5 items that examine how well one uses input from others and one’s self-perception in decision making (Sampson et al., 1996). According to the Cognitive Information Processing Model, the subscales of the CTI can be grouped together to profile *Capability* and *Complexity*. Complexity is comprised of the total of the items of CTI-CA and CTI-DMC. Capability consists of the items making up the subscale of CTI-EC. The CTI total score is made up of all 48 items in the CTI scale. Sampson et al. (1996) reported the following ranges of internal consistency reliability coefficients (Cronbach’s alphas) for the CTI measures: 0.93–0.97 for the CTI total, 0.90–0.94 for CTI-DMC, 0.79–0.91 for CTI-CA, and 0.74–0.81 for CTI-EC. In the present study, internal consistency reliability coefficients were 0.97 for CTI total score, 0.96 for CTI-DMC, 0.91 for CTI-CA, and 0.79 for CTI-EC.

Core Self-Evaluations Scale (CSES; Judge et al., 2003). The CSES was developed by Judge, Erez,

Bono, and Thoresen (2003) to assess core self-evaluations (CSE). It is a stable personality trait encompassing self-esteem, generalized self-efficacy, emotional stability, and locus of control. The CSES comprises 12 items (e.g., "I am confident I get the success I deserve in life") rated on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores range from 12 to 70, with higher scores indicative of greater levels of CSE. According to Judge et al. (2003), the CSES is a unidimensional measure consistent with CSE theory, and correlated significantly with measures of job satisfaction, job performance, and life satisfaction. The internal consistency reliability coefficient for this sample was found to be 0.93.

2.4. *Statistical analysis*

Mediation analysis with structural equation modeling (SEM) technique was used to examine core self-evaluations as a mediator for the relationship between career decision-making and perceived employment barriers. This approach allowed us to simultaneously estimate the direct effect of the latent variable Career Decision-Making (CDM) on the PEB as well as the indirect effect through CSE. In addition, this approach has the advantage of permitting multiple indicators of a latent variable to be used. Specifically, it allowed us to consider the different dimensions of CDM and PEB. CDM was modeled by a latent structure comprised of three domains (Total, Capability and Complexity) which are all derived from the CTI (Sampson et al., 1996). For the single factor PEB, two measures were Internal Barriers (IBI) and External Barriers (EBI) (Strauser, Chan, et al., 2019). The association between these study variables was examined simultaneously in one SEM model. Model fit was examined using various absolute fit indices and incremental fit indices were conducted and the factor loadings and path coefficients were estimated. Mplus (Muthén & Muthén, 2017) was used to fit these models.

The overall model fit was examined using various absolute fit indices and incremental fit indices. Absolute fit indices included normed chi-square, root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR). Normed chi-square is defined as the ratio of chi-square and the degree of freedom in the model. Ullman (2001) recommended 2 or less than 2 for normed chi-square for adequate model fit. RMSEA is a parsimony-adjusted index which is based on the non-centrality parameter.

The RMSEA estimates the lack of fit in a model compared to a saturated model and the threshold value for a good model fit is 0.06 (Hu & Bentler, 1999). SRMR is the square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model. Values SRMR as high as 0.08 are deemed acceptable (Hu & Bentler, 1999). We also considered two incremental fit indices: Tucker-Lewis index (TLI), comparative fit index (CFI). Values of these indices over 0.95 represent an excellent model fit (Hu & Bentler, 1999), indicating that the fit increases by 95% from the null model in which all the measured variables are unrelated.

We first fitted the initial hypothesized model to the data and evaluated the model fit. If the model fit the data adequately, we estimated the path coefficients. Any path with non-significant path coefficients was removed from the model and the modified model was examined. We estimated and tested both the direct effect of career decision making (CDM) and the mediating effect (the path via core self-evaluations [CSE]) on perceived employment barriers (PEB). Inference on indirect effect was tested using a bootstrap estimation approach with 5000 samples (Shrout & Bolger, 2002). Bias corrected bootstrap standard errors and confidence intervals of the direct and indirect effects were calculated.

3. Results

3.1. *Mediation analysis*

Model fit: The initial model fit the data well. All path coefficients showed significance except the correlation between capability and internal barriers. This path was therefore removed and the final best-fitting causal model is depicted in Fig. 1. Results revealed an exceptionally well-fitting model to our data as indicated by the following goodness-of-fit indices: $\chi^2/df = 1.40$, RMSEA = 0.04, CFI = 0.99, TLI = 0.99, SRMR = 0.01. This supported the adequacy of the model for subsequent tests of structural paths and mediation.

Career Decision Making (CDM): Results indicated that CDM predicted three lower order variables: Total score, Capability and Complexity scores. Two construct scale scores, Decision Making Confusion (DMC) and Commitment Anxiety (CA), were significantly loaded on the Capability domain. All items were positively loaded, and the factor loadings were significant (see Fig. 1).

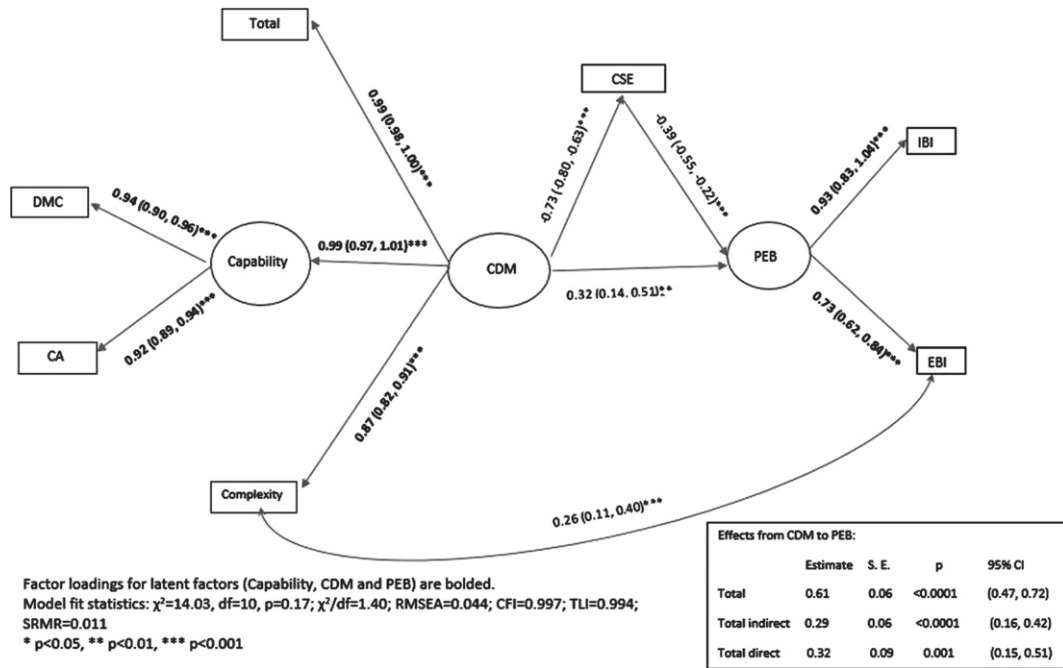


Fig. 1. Modified conceptual model. Note: CDM = Career decision making, DMC = Decision-making confusion, CA = Commitment anxiety, CSE = Core self-evaluations, PEB = Perceived employment barriers, IBI = Internal barriers, EBI = External barriers.

Perceived Employment Barriers (PEB): One latent variable, PEB, explained the relationship between two measured variables (IBI, EBI). Both factor loadings were significant (see Fig. 1).

Mediating effect: Direct effect of CDM on PEB and mediating effect of CSE on the association between CDM and PEB were examined. Results indicated that the standardized path coefficients for the path from CDM to CSE, then from CSE to PEB were all significant. CDM predicted CSE positively, $\beta = -0.73$, $SE = 0.04$, $95\% CI = (-0.80, -0.63)$. CSE also negatively predicted PEB, $\beta = -0.39$, $SE = 0.09$, $95\% CI = (-0.55, -0.22)$. In addition, there was strong evidence of a direct pathway from CDM to PEB once the CSE was accounted for ($\beta = 0.32$, $SE = 0.09$, $95\% CI = (0.14, 0.51)$). By using a bootstrap estimation approach with 5000 samples, a significant indirect pathway (from CDM to PEB through CSE) was found, $\beta = 0.29$, $SE = 0.06$, $95\% CI = (0.16, 0.42)$. The presence of both significant direct and indirect effects of CDM on PEB implied that there was a partial mediating effect of CSE on the association between CDM and PEB. Combining direct and indirect effect, the total effect of CDM on PEB is positively significant with $\beta = 0.61$, $SE = 0.06$, $95\% CI = (0.47, 0.72)$.

4. Discussion

The primary purpose of this study was to examine the potential mediating effect of core self-evaluations on the relationship between career readiness and perceived internal and external barriers to employment in a group of young adult CNS brain tumor cancer survivors. Overall study results provided additional theoretical support for the vocational psychology construct of career readiness as a robust construct that can be applied to young adult CNS cancer survivors in an effort to gain more insight into the personality and psychological factors that impact career development and employment in this group. The major findings of this study were that career readiness and CSE had a significant direct effect on perceived career barriers and that there was a significant indirect effect with CSE acting as a mediator between career readiness and perceived career barriers. Importantly, results of the study provided initial support that both career readiness and CSE had a positive effect on both internal and external barriers, suggesting that strengthening career readiness and CSE may be particularly important given that they address both internal and external barriers to employment. Specific findings regarding career readiness, CSE, and the

mediating effect of CSE on the relationship between career readiness and perceived barriers are discussed in the following paragraphs.

Although not the primary purpose of this study, the results provided additional support regarding the theoretical structure of career readiness as a personal factor that has meaningful implications for career and employment development for young adult CNS cancer survivors. Specifically, the structure and composition of capability and complexity were confirmed providing further evidence that these components can be identified as encompassing career readiness and that these theoretically derived subscales have predictive value on important aspects of vocational behavior, career development, and employment outcomes for individuals with chronic health conditions such as CNS cancer. Prior research has found that young adult CNS cancer survivors reported significantly lower levels of career readiness when compared to non-CNS survivors, which contribute to poor career and employment outcomes (Strauser et al., 2013). Research has also provided support that increasing career readiness could be an effective strategy to improve vocational outcomes and merits the attention of practitioners who provide career and employment educational services to those with chronic health conditions including young adult CNS cancer survivors (Strauser, 2013).

Another interesting and important finding in this study is that the *complexity* component of career readiness was found to have a significant relationship with external barriers. This is theoretically consistent and has been found in prior research suggesting that an individual's perception of her or his environment (i.e. parents, school, family) impacts how the individual perceives her or his own ability to manage environmental factors impacting the career and employment process (Strauser et al., 2014). This finding is consistent with prior research in the career development and rehabilitation literature that has found that higher levels of career readiness and CSE are associated with improved vocational and career outcomes (Bono & Judge, 2003; Strauser, 2013). This study finding also lends additional support that addressing vocational psychological constructs as part of career and employment educational programs targeting young adult CNS survivors would be important. Career readiness and CSE may be particularly relevant in addressing perceived career barriers given that study results suggest that these two factors impact both perceived internal and external factors. Study results would also suggest that it might be beneficial

for career education programs to address how external environmental factors, such as family, impact the perception of barriers to employment and potentially career outcomes.

An important finding from this study is that the results provide initial support for the theoretical underpinnings of the IW²M, which proposes a reciprocal bi-directional relationship between within-domain factors. This study addressed factors residing within the Contextual Domain and found that the Personal Factors of career readiness and CSE impact both functioning (Internal) and environmental (External) factors. The impact of personal factors is important because it suggests that targeting educational programming directed at improving career readiness and CSE could have significant within domain impact, which ultimately should lead to increased levels of performance in the Career Domain. This is important because addressing personal factors such as career readiness and CSE is more consistent with psychosocial interventions typically employed as part of the psychosocial cancer treatment process. In addition, it is practical to assume that personal factors may be more amenable to change through educational interventions than an individual's level of functioning or environmental factors that impact individuals as part of the broader environment.

4.1. Implications for rehabilitation counseling practice

Survivors of pediatric brain tumors can be seen as an emerging population within the field of rehabilitation. As young adult CNS cancer survivors continue to work through lasting physical and emotional difficulties in survivorship, there is a need to facilitate career development activities and secure gainful employment. The results of this study provide potentially important implications for both psychosocial programming for young adult CNS tumor survivors and vocational rehabilitation counselors. Regarding psychosocial programming for young adult CNS tumor survivors, these programs typically address important issues such as managing depression, decreased cognitive functioning, family stress, and issues related to sexuality and fertility. However, issues related to career development and employment are typically not addressed, and if they are, programming usually involves basic information related to employment and the job search. Findings from this study provide additional support that the scope of psychosocial

programming for young adults needs to be expanded to include issues related to career development and employment. Career development is a complex biopsychosocial process that has significant implications for overall psychosocial well-being and quality of life. As a result, there is a need to develop programming that addresses the career development from a biopsychosocial perspective and vocational rehabilitation is well-positioned to provide such services.

Expanding psychosocial programming to include a biopsychosocial career perspective will require the integration of services providers who have the skills and abilities needed to meet these demands. Vocational rehabilitation counselors are uniquely trained to meet these demands and have the capacity to implement comprehensive vocational and career programming as part of a psychosocial treatment program. Currently, psychosocial programs are typically staffed by licensed social workers who do not have the capacity or desire to address these issues, but openly welcome professionals who have the knowledge and skills greatly needed to address vocational issues. Integrating vocational rehabilitation into young adult cancer treatment programming is an opportunity to expand the areas of practice and overall relevance of vocational rehabilitation counseling.

4.2. *Limitations*

There are several limitations that attenuate the generalizability of these study findings. First, this study utilized a sample of young adult CNS cancer survivors who reside in the Northeast part of the United States. As a result, it would be important to replicate this study with young adults who reside outside of the Northeast as factors related to career development and employment may differ based on geographic proximity. In addition, future research regarding the career development of young adult cancer survivors of other cancer types is warranted. Second, all of the data collected in this study were self-report and therefore may be subject to social desirability bias (Livneh & Antonak, 2005). Third, this study was cross-sectional, limiting the ability to analyze causation or prediction of actual career, educational and employment outcomes. Finally, the cross-sectional approaches to mediation may lead to biased estimations of longitudinal parameters of both partial and complete mediation (Maxwell & Cole, 2007). Future studies may need to use other mediation models (e.g., longitudinal designs) beyond cross-sectional models.

5. Conclusion

The primary goal of this study was to examine if CSE mediated the relationship between career readiness and perceived barriers to employment. Overall, study findings provided support that both career readiness and CSE impact both internal and external perceived career barriers in a group of young adult CNS cancer survivors. Findings from this study provide additional support for the incorporation of vocational psychological constructs as part of psychosocial career education interventions that focus on education, career, and employment of young adult CNS cancer survivors. Finally, additional research further addressing the impact of career readiness and CSE on perceived barriers and overall employment outcomes in young adult CNS cancer survivors is needed.

Acknowledgments

None to report.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Approval was obtained from the University of Illinois at Urbana-Champaign (#13080).

Informed consent

Prior to enrollment, participants were informed that their participation was voluntary and were free to withdraw at any time without losing access to services or care. Participants who agreed to participate received the study packets while waiting for their appointment after eligibility requirements for the study were met. Informed consent was obtained from all individual participants included in the study.

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Conflict of interest

The authors declare that they have no conflict of interest.

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