THE ASSOCIATION OF HEALTH ANXIETY AND HEALTH CARE MANAGEMENT SKILLS TO HEALTH-RELATED QUALITY OF LIFE IN COLLEGE STUDENTS WITH A CHRONIC MEDICAL CONDITION

By

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IN COLLEGE STUDENTS WITH A CHRONIC MEDICAL CONDITION

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Abstract: Adolescents and young adults (AYAs) with a chronic medical condition (CMC) are often tasked with increasing independent management of their health care as they transition from pediatric to adult medical care (i.e., transition readiness). The Health Care Transition Model highlights the need to understand individual predictors for greater transition readiness and subsequent health-related quality of life (HRQoL). Based on the Yerkes-Dodson theory, it is known that optimal levels of anxiety are motivating for behavior performance. However, the role of *health* anxiety in the development of transition readiness among AYAs with a CMC is unclear. I hypothesized that moderate/optimal levels of health anxiety would be quadratically associated with greater transition readiness and HRQoL outcomes. Ninety-eight AYA college students (87.6% female, 79.1% white, 76.5% underclassmen, 19.54 ± 1.26 years old) completed online surveys of demographic information, health anxiety, transition readiness, and mental and physical HRQoL. Multiple linear regression results demonstrated linear, not quadratic, relationships between health anxiety and mental, $b = -.435$, $t(92) = -4.82$, $p < .001$, and physical HRQoL, $b = -.504$, $t(93) = -6.10$, $p < .001$. Multiple linear regression results indicated no associations between transition readiness and mental and physical HRQoL, and health anxiety and transition readiness. Two exploratory moderation analyses examining interactions between health anxiety and transition readiness on mental and physical HRQoL demonstrated a significant interaction effect for physical HRQoL. Across three quartiles of health anxiety, those in the lowest quartile demonstrated that greater transition readiness was associated with greater physical HRQoL, $b = 3.49$, 95% CI [.721, 6.260]. These findings are partially consistent with previous research indicating that greater health anxiety is associated with worse HRQoL outcomes; however, result do not support existing findings for associations between transition readiness and HRQoL. Results from the present study extend our understanding of the role of health anxiety in health care transition and associated HRQoL outcomes. In clinical settings, examining health anxiety in AYAs transitioning from pediatric to adult care and providing necessary support may bolster long-term HRQoL outcomes.

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CHAPTER 1

INTRODUCTION

Overview

It is widely known that optimal levels of anxiety motivate behavioral engagement (Yerkes & Dodson, 1908). However, it is unclear whether the same principle applies to health anxiety and behavioral engagement in the health care system. The present study aims to examine the role of health anxiety in motivating the development of independent health care management skills (i.e., transition readiness) among adolescents and young adults (AYAs) with a chronic medical condition (CMC).

Medical advancements have significantly improved the detection, treatment, and management of pediatric CMCs (Compas et al., 2012; Pai & Schwartz, 2011; Pinzon & Harvey, 2006), such that these youth are living into adolescence and young adulthood and planning for their future, including seeking college education (Maslow et al., 2011). As of 2019, 25.3% of college students reported being diagnosed or treated for a CMC within the last 12 months (ACHA, 2019). Despite medical advancements, AYAs with a CMC are at increased risk for hospitalizations and are estimated to have a ten-fold higher chance of mortality than those without a CMC (Rachas et al., 2018). Therefore, understanding how to best support this population has implications for both short- and long-term quality of life.

AYAs transitioning from high school to college are required to navigate both academic and environmental changes, including increased independence, personal responsibilities, academic workload, and peer and romantic relationship challenges (Brougham, Zail, Mendoza,

& Miller, 2009; Compas, Wagner, Slavin, & Vannatta, 1986; Dusselier, Dunn, Wang, Shelley, & Whalen, 2005; Eddington, Mullins, Fedele, Ryan, & Junghans, 2010). These challenges also include poorer sleep habits and diet, as well as increased rates of risky health behaviors (e.g., alcohol abuse), often resulting in negative psychological and health outcomes (Hudd et al., 2000; Kandiah et al., 2006; Lund et al., 2010). For AYAs with a CMC, these poorer outcomes are enhanced such that the presence of both college- and illness-related stressors put them at risk for poorer physical and mental health-related quality of life (HRQoL). Perhaps due to this additional stress and lower HRQoL, college student AYAs with a CMC demonstrate poorer psychosocial adjustment outcomes compared to their healthy peers (Herts et al., 2014; Sharkey et al., 2018). Additionally, college student AYAs with a CMC are at increased risk for psychosocial difficulties throughout adulthood (Ferro et al., 2015; Hampel et al., 2005; Herts et al., 2014; Mokkink et al., 2008; Pinquart & Shen, 2011). Given the various risks for college student AYAs with CMCs, it is essential to identify factors that can bolster positive psychosocial and HRQoL outcomes.

One hypothesized factor influencing these poor outcomes is the increased responsibility AYAs with a CMC must assume to manage their own health care, including connecting with local providers for routine visits, medication management, and illness monitoring. *Transition readiness* refers to an area of research and clinical intervention that aims to address the increased risk for reduced HRQoL and adjustment challenges in AYAs with a CMC via the development of these health care management skills (Reed-Knight et al., 2014; Sansom-Daly et al., 2012). Research examining the nature of these skills has found that stronger transition readiness has been associated with increased HRQoL in college student AYAs with a CMC (Sharkey et al., 2017; Traino et al., 2019; Uzark et al., 2015, 2019). From this literature, Betz and colleagues

(2014) developed the health care transition (HCT) model as a theoretical framework to better understand the broader context in which transition readiness relates to HRQoL. The HCT model (Figure 1) encompasses overlapping and interacting factors across several biopsychosocial domains that impact AYAs' ability to transition from pediatric to adult care. These include the environment domain, health care system domain, family/social support domain, individual domain, integration into adult health care services, and adult competencies (i.e., health care decision making). Within this model, there are also individual factors, such as demographic characteristics, personality, and self-advocacy, that either enhance or detract from AYAs' development of health care transition skills. Given that transition readiness is an important factor for quality of life outcomes in AYAs, it is essential to identify additional predictors of successful transition from pediatric to adult health care services.

The research on predictors of transition readiness outcomes in the AYA CMC population is growing, examining both inter- and intra-individual modifiable predictors. Predictors that have been examined include self-efficacy (Baum, 2014; Huang et al., 2014; Treadwell et al., 2015), hardiness (Hystad et al., 2009), conscientiousness (Bogg & Roberts, 2004; Raynor & Levine, 2009), grit (Sharkey et al., 2017; Traino et al., 2019), self-advocacy skills (Tsai Owens, 2018), age (Gumidyala et al., 2018), ecological factors such as race, zip code, median income (Javalkar et al., 2016), parental support (Tsai Owens, 2018), patient perceptions (Haarbauer-Krupa et al., 2019), and the patient-provider relationship (Gumidyala et al., 2018). These various inter- and intra-individual predictors have each demonstrated significant associations with AYAs' transition readiness in managing their own CMC care. Importantly, identifying factors that impact AYAs' transition readiness may better inform intervention development to effectively bolster successful health care transition and independent health care management.

Health anxiety (HA) is an additional intra-individual predictor that has yet to be studied and has the potential to help us understand how AYAs interact with the health care system. HA is defined as the negative interpretation of and fears about the meaning of both ordinary and unusual bodily sensations (Hadjistavropoulos et al., 2012; Salkovskis & Warwick, 2001). The Cognitive Developmental Model of Health Anxiety (Figure 2) describes the etiology of HA as an individual's inherent vulnerability to anxiety that, through illness-related experiences, impacts the way they interpret health threats and bodily sensations (Williams, 2004). Studies have largely found higher rates of HA among individuals with CMCs compared to peers without CMCs (Alberts et al., 2011; Hadjistavropoulos et al., 2012; Jeffers et al., 2015; Kehler & Hadjistavropoulos, 2009; Kirby & Yardley, 2009; Rode et al., 2006; Sunderland et al., 2013). Increased physical sensations secondary to a CMC may predispose individuals to over- or mis-attribute sensations as a threat (Hadjistavropoulos et al., 2012). One study demonstrates that HA accounts for a significant proportion of the variation in patients' report of somatic symptoms, beyond anxiety sensitivity and discomfort intolerance (Fergus, Limbers, Griggs, & Kelley, 2018). However, to date, research on HA has largely focused on adults and clinical hypochondriasis populations and only a few studies have examined the role of HA in AYAs, with even less research on HA among AYAs with a CMC. Among research examining HA in AYAs with and without a CMC, increased HA has been associated with increased anxiety sensitivity and intolerance of uncertainty (Gerolimatos & Edelstein, 2012), increased non-medical use of prescription drugs (Jeffers et al., 2015), worse psychosocial functioning, and greater health care utilization (Reigada et al., 2011).

One maintaining behavior for HA is the utilization of health care services as a reassurance-seeking behavior. It has been shown that adults higher on HA utilize more health

care services than those lower on HA (Sunderland et al., 2013). Alternatively, individuals higher on HA may avoid seeking health care services in order to reduce their anxiety in the short-term (Schwind et al., 2015). Subsequently, HA is often associated with increased financial burden on the health care system, either via those who access health care to relieve anxiety (i.e., reassurance-seeking) or those who do not promptly seek medical attention and let their disease go unaddressed and progress in severity (i.e., avoidance). Despite increased health care utilization, clinical and subclinical HA has been associated with decreased HRQoL (Bleichhardt & Hiller, 2007; Häuser et al., 2004; Hayter et al., 2016; Murphy et al., 2017), such that individuals with higher rates of self-reported HA report poorer HRQoL. These results assume a linear relationship between HA and HRQoL, such that increased health anxiety is associated with worse HRQoL. However, Yerkes-Dodson Law (1908) demonstrates that an optimal level of arousal is associated with better performance, whereas low and high ends of arousal are associated with lower performance. Using this model (Figure 3), individuals with subclinical HA might be optimally motivated to use health care services and therefore demonstrate more positive HRQoL outcomes than individuals with low or high levels of HA. Given the positive association between transition readiness and HRQoL, it remains unclear whether individuals with subclinical levels of HA can adaptively cope by utilizing transition skills to access health care services and improve their HRQoL.

Current Study

In sum, it is known that HA is associated with increased health care utilization, HA is associated with HRQoL, and transition readiness is associated with HRQoL. However, it is unclear whether a certain level of HA motivates use of the health care system (i.e., transition readiness) to improve HRQoL in AYAs with CMCs. The overarching goal of the present study is

to replicate and extend previous findings of the positive relationship between transition readiness and HRQoL. Specifically, the three primary aims of the current study are as follows: (1) to replicate the relationship between transition readiness and mental and physical HRQoL among AYAs with CMCs demonstrated in Sharkey et al. (2017) using a separate sample, (2) to examine the linearity of the relationship between HA and mental and physical HRQoL among AYAs with CMCs, (3) to examine the relationship between HA and transition readiness among AYAs with CMCs. For aim 1, we expect a significant positive association between transition readiness and HRQoL. For aim 2, we expect a negative quadratic relationship between HA and mental and physical HRQoL, respectively, such that low and high levels of HA are associated with lower HRQoL compared to mild-moderate levels of HA. For aim 3, we expect a negative quadratic relationship between HA and transition readiness, such that low and high levels of HA are associated with lower transition readiness compared to mild-moderate levels of HA. There is also an exploratory aim 4 to examine a path analysis for the impact of transition readiness on mental and physical HRQoL as moderated by HA among AYAs with CMCs. We expect HA to significantly moderate the relationship between transition readiness and mental and physical HRQoL.

CHAPTER 2

METHOD

Participants and Procedures

Participants included 98 college students with a self-reported CMC at a large Midwestern university. Participants completed consent forms and measures as part of a larger online study of college student health. Participants completed measures of demographic characteristics, health anxiety, transition readiness, and mental and physical health-related quality of life. For compensation, the participants received class credit after completion of the study as part of a course requirement. Inclusion criteria limited analyses to AYAs between 18 and 23 years-of-age who completed the surveys in an appropriate amount of time (less than 15 minutes). Participants who indicated a psychiatric diagnosis as their only CMC were excluded from analyses. Analyses were restricted to those with complete data on the included measures. The study was approved by the university Institutional Review Board with procedures adhering to the American Psychological Association's ethical guidelines. See Table 1 for descriptive information.

Materials

Demographic form. Demographic information was collected via self-report, including age, sex, race/ethnicity, native language, level of education, first generation college student status, parent/caregiver marital status, annual combined caregiver income, level of maternal education, CMC status and diagnosis, illness severity, and illness controllability. Education level

was dichotomized to underclassmen (freshmen and sophomores) and upperclassmen (juniors and seniors) for analyses.

Short Health Anxiety Inventory. The Short Health Anxiety Inventory (SHAI; Salkovskis, Rimes, Warwick, & Clark, 2002) is a 14-item self-report questionnaire measuring symptoms of HA, regardless of CMC status. Each item is composed of four statements assessing health-related worry and awareness of bodily sensations or changes over the past six months. An example item includes statements ranging from "*I do not worry about my health.*" to "*I spend most of my time worrying about my health.*" There are four additional items (for a total of 18 items) that assess perceived negative consequences of having an illness. Example items include such statements as "*If I had a serious illness I would still be able to enjoy things in my life quite a lot.*" to "*If I had a serious illness I would be completely unable to enjoy life at all.*" Since these four additional items assume absence of a medical condition, they may inappropriately assess HA for those who endorse a CMC (LeBouthillier et al., 2015). Therefore, these items were only administered to college students who did not self-report a CMC and were not included in the present study. The first 14 items were summed for a total score, with higher scores indicating greater health anxiety. In previous research, the SHAI has demonstrated good validity and reliability (Salkovskis et al., 2002). In the present study, internal consistency was excellent for AYAs with a CMC (α = .90).

Transition Readiness Assessment Questionnaire. The Transition Readiness Assessment Questionnaire (TRAQ; Sawicki et al., 2011) is a 20-item self-report questionnaire that measures skills to manage one's CMC and associated readiness to transition from pediatric to adult health care providers. The items are composed of questions assessing various non-illness specific skills for managing a CMC, such as managing medications, talking with providers, and

keeping appointments, with the assumption that these skills relate to one's ability to successfully transition to adult health care. An example item is "*Do you take medications correctly and on your own*?" Participants endorse their current ability or skill level for each item on a Likert scale (1 = *No, I do not know how* to 5 = *Yes, I always do this when I need to*). Items are averaged for a total score, with higher scores indicating greater health care management skills. The TRAQ has demonstrated good validity and reliability in past studies (Espeleta et al., 2019; Sharkey et al., 2017; Traino et al., 2019; Wood et al., 2014), and was good in the present study (α = .88).

RAND 36-Item Short Form Survey. The RAND 36-Item Short Form Survey (SF-36; Hays, Sherbourne, & Mazel, 1993) is a 36-item self-report questionnaire measuring physical and emotional HRQoL, and status of overall general health. An example item is "*How much time, during the past four weeks, did you feel worn out?*" The SF-36 yeilds 8 domains obtained with 1998 scoring norms (Laucis et al., 2015): physical functioning, role limitation owing to physical health, role limitation owing to emotional problems, energy/fatigue (vitality), emotional well-being, social functioning, pain, and general health. Of note, 7 items were collected according to version 2 of the measure (Ware, 2000) for which a 2-point Likert scale in the SF-36 was updated to a 5-point Likert scale. These 7 items were scored using SF36v2 2009 norm-based scoring software (Scoggins & Patrick, 2009) to generate two of the subscale scores (i.e., role limitations due to physical health and role limitations due to emotional health) for those participants. The domains were then combined into mental health composite (MHC) and physical health composite (PHC) scores (Laucis et al., 2015). Higher scores on the SF-36 indicate better HRQoL. Good validity and internal consistency of the SF-36 has been demonstrated in previous studies (Espeleta et al., 2019; McHorney et al., 1993; Sharkey et al., 2017; Traino et al., 2019).

In the present study, overall reliability was excellent (α = .90), good for the PHC (α = .81) score, and excellent for the MHC (α = .91) score.

A priori power analysis

An *a priori* power analysis using G*Power version 3 (Erdfelder et al., 1996) indicated that a total sample of 107 participants will be needed to have a 95% chance of detecting a medium effect at (f^2 = .15) at the 5% level (one-tailed) based on a fixed model linear regression analysis testing 2 predictors with 5 total predictors in the model. However, due to the COVID-19 pandemic, data were limited to those participants collected prior to stay-at-home orders (March 2020) given the potential impact of the pandemic guidelines on health anxiety and access to care. Specifically, 37 participants were excluded from this study. Thus, the final sample was 98 participants.

Data Analytic Plan

Preliminary analyses. All analyses were conducted using SPSS version 27. Prior to testing the aims of the study, a set of independent samples *t*-tests were conducted to evaluate relationships between study variables and sex, race/ethnicity, and level of education (underclassmen and upperclassmen). One-way analyses of covariance (ANCOVAs) were conducted to examine relationships between study variables and race/ethnicity and caregiver marital status. Pearson bivariate correlations of demographics and disease variables (e.g., age, illness severity, illness controllability) with primary study variables were evaluated. Any covariates with significant relationships with study variables were included in the subsequent analyses. Lastly, Pearson bivariate correlations among study variables were conducted to examine preliminary associations.

Aim 1. Two hierarchical regression analyses were conducted to examine the presence of a linear versus a quadratic relationship between transition readiness and mental or physical HRQoL, respectively, among AYAs with a CMC. Transition readiness was squared to create the quadratic term. First, a regression analysis was conducted including demographic covariates, the linear transition readiness term, the quadratic transition readiness term, with mental HRQoL as the outcome variable. Second, the regression analysis was repeated with physical HRQoL as the outcome and specific indicated demographic covariates included.

Aim 2. Two hierarchical analyses were conducted to examine the presence of a linear versus a quadratic relationship between HA and mental or physical HRQoL, respectively, among AYAs with a CMC. HA was squared to create the quadratic term. First, a regression analysis was conducted including demographic covariates, the linear HA term, the quadratic HA term, with mental HRQoL as the outcome variable. Next, a second regression analysis was conducted with physical HRQoL as the outcome and specific indicated demographic covariates included.

Aim 3. A hierarchical regression analysis was conducted to examine the presence of a linear versus a quadratic relationship between HA and transition readiness among AYAs with a CMC. A regression analysis was conducted including demographic covariates, the linear HA term, the quadratic HA term, with transition readiness as the outcome variable.

Exploratory Aim 4. To examine the strength and direction of the relationship between transition readiness and HRQoL (mental and physical) at different levels of HA (i.e., the moderator variable), including indicated demographic covariates, a moderation analysis was conducted in SPSS using Hayes's PROCESS macro version 3.5 (Hayes, 2017) with 5,000 bootstrap reasampling with replacement. Conditional effects were probed using quartiles of HA respondent data (i.e., Lower Quartile ≤ 9, Middle Quartile 10-18, Upper Quartile ≥ 25).

CHAPTER 3

RESULTS

Preliminary Analyses. All analyses were limited to those with complete data for study variables ($N = 98$). Preliminary analyses were conducted to examine demographic covariates related to outcome variables (i.e., SHAI, TRAQ, PHC, and MHC). Independent samples *t*-tests were conducted to examine the relationships between sex, level of education (i.e., underclassmen vs. upperclassmen), native English speaker status, and first generation college student status and study outcomes. Sex was significantly related to the SHAI, $t(96) = -2.60$, $p = .011$, PHC, $t(96) = 2.57$, $p = .012$, and MHC, $t(96) = 4.05$, $p < .001$. Female participants demonstrated more HA ($M = 18.35$, $SD = 8.02$) than male participants ($M = 12.08$, $SD = 5.92$), worse MHC ($M = 35.63$, $SD = 12.79$) compared to males ($M = 51.14$, $SD = 8.98$), and worse PHC ($M = 44.39$, $SD = 10.20$) compared to males ($M = 52.17$, $SD = 6.16$). Level of education was related to the TRAQ, $t(96) = -2.69$, $p = .008$, with lowerclassmen demonstrating lower TRAQ scores ($M = 4.03$, $SD = .66$) compared to upperclassmen ($M = 4.43$, $SD = .48$). There were no significant differences for native English speaker status and first generation college student status on study outcomes.

ANCOVAs were conducted to examine the relationships between race/ethnicity and caregiver marital status and outcome variables. There were no significant differences across race/ethnicity groups for study outcomes. Parent/caregiver marital status was significantly associated with MHC, $F(2,95) = 4.25$, $p = .017$. Follow-up dummy coding was conducted with 2-caregiver household as the reference group (i.e., coded 0). Two independent samples *t*-tests

were conducted to compare both the 1-caregiver household and Other (i.e., other caregiver(s) in the home) groups to the reference group on MHC. The 1-caregiver household group did not significantly differ from the reference group, $t(93) = .758$, $p = .450$. The Other group significantly differed from the reference group on MHC, $t(75) = 2.90$, $p = .005$, with the Other group demonstrating worse MHC ($M = 16.85$, $SD = 6.63$) compared to the reference group ($M = 38.73$, $SD = 12.93$).

Pearson bivariate correlations were conducted to examine the relationships between age, self-reported illness severity, self-reported illness controllability, annual family income and maternal level of education, and study outcome variables. Illness severity was significantly associated with SHAI, $r(96) = .298$, $p = .003$, TRAQ, $r(96) = -.203$, $p = .045$, PHC, $r(96) = -.434$, $p < .001$, and MHC, $r(96) = -.277$, $p = .006$. Illness controllability was significantly associated with SHAI, $r(96) = -.205$, $p = .043$, and PHC, $r(96) = .246$, $p = .015$. Age, family income, and level of maternal education did not signficantly relate to any study outcomes. All identified covariates were included in subsequent analyses.

Lastly, Pearson bivariate correlations among study variables indicated significant relationships between SHAI and PHC, $r(96) = -.616$, $p < .001$, and MHC, $r(96) = -.536$, $p < .001$, and PHC and MHC, $r(96) = .593$, $p < .001$. Of note, there were no significant relationships between TRAQ and SHAI, PHC, and MHC. Correlations are reported in Table 2.

Aim 1. Two hierarchical regression analyses were performed to determine the relative contribution of a quadratic TRAQ term to MHC and PHC, respectively, over and above demographic covariates and a linear TRAQ term. For MHC, demographic covariates (i.e., sex, education, caregiver marital status, illness severity) were entered into step 1, $R^2_{\text{Adjusted}} = .174$, $F(4, 93) = 6.09$, $p < .001$. The demographic factors accounted for 20.8% of the variability in

MHC. In step 2, the linear TRAQ term was added to the model, $R^2_{Adjusted} = .175$, $F(5, 92) = 5.11$, $p < .001$, which did not account for additional variability in MHC ($p = .284$). Lastly, the quadratic TRAQ term was added to the model, $R^2_{Adjusted} = .167$, $F(6, 91) = 4.24$, $p = .001$, which also failed to account for additional variability in MHC ($p = .760$). Hierarchical regression results are reported in Table 3.

For PHC, demographic covariates (i.e., sex, education, illness severity, illness controllability) were entered into step 1, $R^2_{Adjusted} = .233$, $F(4, 93) = 8.35$, $p < .001$. The demographic factors accounted for 26.4% of the variability in PHC. In step 2, the linear TRAQ term was added to the model, $R^2_{Adjusted} = .225$, $F(5, 92) = 6.64$, $p < .001$, but did not account for any variability in PHC ($p = .748$). Lastly, the quadratic TRAQ term was added to the model, $R^2_{Adjusted} = .220$, $F(6, 91) = 5.55$, $p < .001$, and also failed to account for any variability in PHC ($p = .558$). Hierarchical regression results are reported in Table 3.

Aim 2. Two hierarchical regression analyses were performed to determine the relative contribution of a quadratic SHAI term to MHC and PHC, respectively, over and above demographic covariates and a linear SHAI term. For MHC, demographic covariates (i.e., sex, combined caregiver marital status, illness severity, illness controllability) were entered into step 1, $R^2_{Adjusted} = .173$, $F(4, 93) = 6.07$, $p < .001$. The demographic factors accounted for 20.7% of the variability in MHC. In step 2, the linear SHAI term was added to the model, $R^2_{Adjusted} = .332$, $F(5, 92) = 10.65$, $p < .001$, accounting for an additional 16% of the variability in MHC, $F(1, 92) = 23.18$, $p < .001$, with greater SHAI predicting worse MHC, $b = -.435$, $t(92) = -4.82$, $p < .001$. Lastly, the quadratic SHAI term was added to the model, $R^2_{Adjusted} = .325$, $F(6, 91) = 8.78$, $p < .001$, but did not account for significant variability in MHC ($p = .881$). Hierarchical regression results are reported in Table 4.

For PHC, demographic covariates (i.e., sex, illness severity, illness controllability) were entered into step 1, $R^2_{\text{Adjusted}} = .219$, $F(3, 94) = 10.08$ $p < .001$. The demographic factors accounted for 24.3% of the variability in PHC. In step 2, the linear SHAI term was added to the model, $R^2_{\text{Adjusted}} = .436$, $F(4, 93) = 19.77$, $p < .001$, accounting for an additional 21.6% of the variability in PHC, $F(1, 93) = 37.19$, $p < .001$, with greater SHAI predicting worse PHC, $b = -.504$, $t(93) = -6.10$, $p < .001$. Lastly, the quadratic SHAI term was added to the model, $R^2_{\text{Adjusted}} = .432$, $F(5, 92) = 19.77$, $p < .001$, but it did not account for additional variability in PHC ($p = .633$). Hierarchical regression results are reported in Table 4.

Aim 3. A hierarchical regression analysis was performed to determine the relative contribution of a quadratic health anxiety term to transition readiness over and above demographic covariates and a linear health anxiety term. Demographic covariates (i.e., sex, education, illness severity, illness controllability) were entered into step 1, $R^2_{\text{Adjusted}} = .075$, $F(4, 93) = 2.97$, $p = .024$. The demographic factors accounted for 11.3% of the variability in TRAQ. In step 2, the linear SHAI term was added to the model, $R^2_{\text{Adjusted}} = .076$, $F(5, 92) = 2.60$, $p = .030$, which did not account for additional variability in TRAQ ($p = .288$). Lastly, the overall model with the quadratic SHAI term added was not significant ($p = .054$), and did not account for additional variability in TRAQ ($p = .760$). Hierarchical regression results are reported in Table 5.

Exploratory Aim 4. Two hierarchical regression analyses with interaction effects were conducted to assess whether SHAI moderates the relationship between TRAQ and MHC and PHC, respectively, with demographic covariates included. For MHC, the overall model was significant, $R^2_{\text{Adjusted}} = .403$, $F(8, 89) = 7.50$, $p < .001$, with demographic covariates added (i.e., sex, education, caregiver marital status, illness severity, illness controllability). MHC was

significantly predicted by TRAQ, β = 7.01, 95% CI [.737, 13.273], but not SHAI, b = .28, 95% CI [-1.137, 1.691]. Further, the interaction term (TRAQ x SHAI) was not significant, b = -.25, 95% CI [-.589, .087].

For PHC, the overall model was significant, R^2_{Adjusted} = .532, $F(7, 90) = 14.61$, $p < .001$, with demographic covariates added (i.e., sex, education, illness severity, illness controllability). PHC was significantly predicted by TRAQ, b = 6.60, 95% CI [2.432, 10.771], but not SHAI, b = .78, 95% CI [-.165, 1.715]. Notably, the interaction term (TRAQ x SHAI) was significant, b = -.35, 95% CI [-.570, -.121], with its addition to the model explaining a significant additional portion of the variance in PHC, ΔR = .049, $F(1, 90) = 9.36$, p = .003. Greater TRAQ was associated with greater PHC, only at a low level of SHAI, b = 3.49, 95% CI [.721, 6.260]. The relationship between TRAQ and PHC was not significant among those with medium, b = .38, 95% CI [-2.093, 2.851], or high HA, b = -2.041, 95% CI [-5.287, 1.206]. Figure 4 displays the interaction effect.

CHAPTER IV

DISCUSSION

Although moderate levels of anxiety have been shown to optimally motivate behavioral engagement (Yerkes & Dodson, 1908), it is unknown whether the same principle applies to HA and engagement in the health care system. Given the importance of developing independent health care management skills for AYAs living with a CMC, the present study sought to examine the possible role of HA in developing transition readiness.

Primary study aims were to evaluate the linearity of the relationships between (1) transition readiness and mental and physical HRQoL, (2) HA and mental and physical HRQoL, and (3) HA and transition readiness. The current findings did not support a linear or quadratic relationship between transition readiness and HRQoL. Although this lack of association is not consistent with previous findings (Sharkey et al., 2017), a recent latent class analysis among AYAs with a CMC suggests that transition readiness may differentially relate to HRQoL based on health care utilization. Specifically, one group demonstrated worse HRQoL despite greater transition readiness (Traino et al., 2020). HA may, in part, explain this relationship such that those who report greater HA may continue to perceive their HRQoL as worse and more frequently seek medical services. Therefore, it may be that additional factors, such as HA, as well as differential heterogeneous profiles need to be considered when evaluating the relationship between transition readiness among AYAs across a range of CMC diagnoses and

treatment regimens. Additionally, it may be that restricting the sample size due to COVID-19 confounds reduced statistical power to detect significant relationships.

Addressing our second primary aim, the current findings did not support the quadratic relationship hypothesis between HA and HRQoL. However, results demonstrated significant linear associations between variables, with greater HA being associated with worse mental and physical HRQoL. Therefore, without considering additional influencing factors (e.g., transition readiness), it appears that lower HA is associated with better HRQoL. These findings are consistent with previous findings demonstrating that greater HA is associated with worse HRQoL (Bleichhardt & Hiller, 2007; Hayter et al., 2016). Because the current data are cross-sectional, the temporal nature of this relationship cannot be assessed, however previous research suggests that this relationship is bidirectional in nature. Specifically, reduced HRQoL secondary to a medical condition increases risk for HA (Hadjistavropoulos et al., 2012; Jeffers et al., 2015) and that greater HA may increase individuals' sensitivity to physiological sensations and lead to increased perceptions of diminished HRQoL (Williams, 2004). Further, it may be that readiness to independently manage one's own medical care partially explains this relationship.

Our third primary hypothesis was not supported, such that HA was not linearly or quadratically associated with transition readiness. Similar to the relationship between transition readiness and HRQoL, the lack of association may indicate heterogeneous profiles of subgroups within our sample (e.g., lower HA and lower transition readiness, lower HA and greater transition readiness, greater HA and lower transition readiness, greater HA and greater transition readiness). It may be that various coping styles related to HA (i.e., reassurance-seeking versus avoidant) are mechanisms that differentially explain how HA impacts transition readiness and vice versa (Jones et al., 2020). In this way, individuals who respond to anxiety with increased

reassurance-seeking behaviors may be more likely to independently engage with health care services and thereby develop necessary transition readiness skills. Whereas, individuals who are more avoidant may be less likely to respond to increased HA in a manner that bolsters their independent health care management. Alternatively, it may be that the restricted sample size reduced power to detect a relationship between these variables.

To examine any potential interaction effects between HA and transition readiness on HRQoL, exploratory moderation analyses were conducted. Findings supported that HA and transition readiness interact to impact physical, but not mental, HRQoL. In this way, individuals who report lower HA demonstrate a pattern of increased transition readiness associated with better physical HRQoL. However, the association between transition readiness and physical HRQoL was *not* significant for those at moderate to high levels of HA. Although these findings do not support the quadratic hypothesis, they do suggest that HA may serve as a barrier to any potentially benefitial effects of transition readiness on physical HRQoL. Therefore, individuals who demonstrate sufficient transition readiness may be either less likely to engage with services to improve HRQoL due to HA, or HA eliminates any HRQoL benefits of having engaged with medical care. Further, it may be that integrating HA coping styles into examining these relationships accounts for null moderate to high HA findings. Additionally, the lack of replication of this interaction effect for mental HRQoL may reflect an overlap of symptomatology between HA and mental HRQoL, or diminished power to detect significant effects.

Summary

Together, these findings highlight the importance of evaluating psychosocial barriers, such as HA, when assessing and promoting AYA transition readiness. Consistent with the HCT

Model (Figure 1; (Betz et al., 2014), the manner in which the individual interacts within larger societal and health care systems can greatly inform future research and intervention. Collective findings suggest that lower HA may allow for AYAs to maximize the development and use of transition readiness skills to bolster quality of life outcomes.

Strengths

To our knowledge, the present study is the first to examine HA within the developmental context of health care transition in AYAs. Of note, the current sample is heterogeneous in terms of medical symptomatology and various subclinical levels of HA (i.e., no participant reported being formally diagnosed with Somatic Symptom Disorder or Illness Anxiety Disorder). Further, data were collected from participants outside of a medical clinic setting and capture a range of health care utilization, such that those who are not actively seeking medical care are included.

Limitations

The present study is not without limitations. As mentioned, sample size was reduced due to the potential for COVID-19 confounds. Therefore, analyses may be underpowered. Additionally, the study is cross-sectional in nature, therefore, temporal and causal conclusions cannot be drawn. Data were also collected from a college student convenience sample lacking in diversity and representation across racial/ethnic backgrounds, gender identities, socioeconomic statuses, etc. Therefore, conclusions centered around systems-based injustices often associated with these identities/statuses due to systemic racism and white supremacy cannot be drawn. For example, due to historical injustices, many marginalized communities may not trust the medical system, which may uniquely impact anxiety surrounding health and independent engagement in health care. Additionally, individuals with reduced access to care may experience HA secondary to this lack of access. Lastly, a wide range of medical conditions were captured within the

present sample, therefore conclusions related to aspects of HRQoL, transition readiness, and HA that are unique to particular diagnoses cannot be made.

Future Directions

Future longitudinal research should be conducted on a diverse, representative sample, including measures of underlying systemic factors (e.g., racism, medical mistrust) and may consider evaluating unique medical diagnostic populations separately. Additionally, future research should examine the mediating role of HA coping in AYAs' health care transition.

Clinical Implications

Overall, findings from the present study support the differential role of HA in independent health care engagement and transition for AYAs with a CMC. Therefore, clinicians should formally or informally assess anxiety surrounding health as a potential barrier to optimal health care transition and quality of life outcomes. Known cognitive-behavioral therapies for health anxiety may be indicated and effective for such patients (Cooper et al., 2017).

Conclusion

The present study aimed to examine the nature of the relationships between HA, transition readiness, and physical and mental HRQoL among a sample of AYAs with a CMC. Results indicated that transition readiness did not significantly relate to physical and mental HRQoL and HA. However, HA was significantly linearily associated with both physical and mental HRQoL. Further, HA moderated the relationship between transition readiness and physical, but not mental, HRQoL. Among those with low HA, greater transition readiness was associated with better physical HRQoL. The relationship between transition readiness and physical HRQoL was not significant at moderate to high HA groups. Taken together, these findings suggest that moderate to high HA may mitigate the development of transition readiness

and/or use of existing independent health care management skills for AYAs with a CMC. This study is the first to our knowledge to examine these factors among a sample of non-clinic-based HA AYAs. The study advances our understanding of health care transition and indicates areas for future research and health care transition program development.

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APPENDIX

EXTENDED LITERATURE REVIEW

The following chapter includes a review of the literature for the proposed study. The review of the literature first details the unique experiences and needs of college students with chronic medical conditions (CMCs). Second, a review of what is known about transition readiness and associated predictors and outcomes is described. Next, a review describes health anxiety (HA) and its variable presentation among those with and without a CMC. A following review acknowledges the impact of HA on the health care system. Then, a review highlights the impact of HA on quality of life outcomes. Lastly, the chapter concludes with a summary of the hypotheses and aims of the present study.

College Students with Chronic Medical Conditions

An increasing number of children with CMCs are surviving into adolescence and young adulthood and planning for the future, including continuing higher education. With more adolescents and young adults (AYAs) with CMCs entering college, it is essential to understand how they adjust to the stressors of college in conjunction with ongoing disease management. Across students with and without a CMC, the transition to college entails increased academic, social, and daily life responsibilities and expectations, with up to 75% of students reporting moderate stress (Pierceall & Keim, 2007). Such student life obligations and associated increased stress have been linked to worse mental health outcomes (Arigo & Cavanaugh, 2016; Brougham et al., 2009; Dusselier et al., 2005; Lee et al., 2014; Macgeorge et al., 2005; Yue & Fangli, 2018)

and more negative health behaviors and health outcomes (Dusselier et al., 2005; Pedersen et al., 2017). For all college students, regardless of CMC status, increased stressors negatively impact adjustment and subsequent mental and physical health outcomes. For AYAs with a CMC, the stress of college is further compounded by continuous management of their condition. Compared to their healthy peers, college students with CMCs are at increased risk for distress including depression and anxiety, loneliness, and reduced HRQoL (Herts et al., 2014; Mullins et al., 2017; Sharkey, et al., 2018).

Transition Readiness

One way to potentially bolster physical and mental health-related quality of life (HRQoL) outcomes is to improve transition readiness. *Transition readiness* is defined by health care management skills necessary to independently manage care during the transition from pediatric to adult health care services. Research and intervention on transition readiness aims to address the increased risk for reduced HRQoL in AYAs with CMCs (Reed-Knight et al., 2014; Sansom-Daly et al., 2012). In strengthening these transition readiness skills, AYAs with CMCs may be better able to independently manage their own health care needs and thusly improve their HRQoL outcomes.

The majority of studies have found increased transition readiness is associated with better HRQoL (Espeleta et al., 2019; Sharkey et al., 2017; Traino et al., 2019; Uzark et al., 2015, 2019). However, Van Staa and colleagues (2011) reported a weak relationship between transition readiness and HRQoL. Another study examined this relationship using a different measure (the STARx Questionnaire) than the present study, thus a lack of observed relationship may be due to measurement (Cohen et al., 2015). Additionally, a review of transition readiness interventions observed little to no improvement in HRQoL 4- to 12-months post-intervention (Campbell et al.,

2016). Nevertheless, this should continue to be examined longitudinally to confirm these findings. Overall, the majority of findings demonstrate a positive relationship between transition readiness and HRQoL; however, more cross-sectional and longitudinal research in this area is needed to determine the full nature of the relationship concurrently and across transition.

The health care transition (HCT) model (Betz et al., 2014) is a theoretical model that encompasses individual and socioecological factors that influence the development and impact of transition readiness. The HCT model identifies four underlying domains of HCT: individual, family/social support, environment (community resources and educational system), and health care system. Each of the domains is an opportunity for intervention to facilitate moving AYAs from pediatric to adult care services as well as dependent to independent health care decision-making. At the center of the model is the individual domain, which includes individual risk and resilience factors that impact how AYAs go on to develop transition readiness. To date, there are a handful of studies that have begun to systematically examine the role of individual risk and resilience factors in developing transition readiness. These studies have largely focused on resilience factors such as conscientiousness (Bogg & Roberts, 2004; Raynor & Levine, 2009), self-efficacy (Ah et al., 2004; Huang et al., 2014; Treadwell et al., 2015), hardiness (Hystad et al., 2009), and grit (Sharkey, et al., 2018; Sharkey et al., 2017; Traino et al., 2019).

Conscientiousness is a personality construct defined as striving for competence and achievement while being self-disciplined, orderly, reliable, and deliberate (John & Srivastava, 1999). In studies examining conscientiousness as it relates to health management behaviors, researchers have found that increased conscientiousness was associated with decreased risky health behaviors (e.g., drug use) and increased beneficial health behaviors (e.g., healthy diet and exercise) in AYAs both with and without CMCs (Bogg & Roberts, 2004; Raynor & Levine,

2009). Self-efficacy is another construct that has been linked to health management behaviors. Self-efficacy is defined as an individual's belief in their own capability to accomplish a goal (Bandura, 1977). Studies that have examined the role of self-efficacy in health behaviors have found that increased self-efficacy is associated with increased transition readiness as well as decreased risky health behaviors and increased beneficial health behaviors (Ah et al., 2004; Huang et al., 2014; Treadwell et al., 2015).

Hardiness is a personality construct involving the ability to be interested in and engage with the world, while seeing challenges as opportunities for growth and maintaining belief in one's autonomy (Bartone, 2000). Hardiness has been implicated in positive health management behaviors. Hystad and colleagues (2009) found that at high levels of academic stress, students scoring high on hardiness reported fewer health complaints compared to students low on hardiness. Such results suggest that hardiness is an individual personality construct that may help reduce academic stress and associated negative health effects. Another series of studies examined grit in AYAs with and without CMCs (Sharkey et al., 2018; Sharkey et al., 2017; Traino et al., 2019). Grit is an intrapersonal construct involving an individual's ability to persist through barriers in commitment to achieving long-term goals (Duckworth et al., 2007). In these studies, increased grit was associated with decreased depressive and anxious symptoms, increased emotional well-being, increased transition readiness, and greater mental and physical HRQoL (Sharkey, et al., 2018; Sharkey et al., 2017; Traino et al., 2019). Overall, research examining individual resilience factors has found that they play a significant role in increased health care management skills, positive health behaviors, and health outcomes as well as in reduced risky health behaviors. However, the role of intraindividual risk factors in transition readiness and associated health outcomes has not been thoroughly examined.

Health Anxiety

One intraindividual factor that has the potential to better inform how AYAs interact with the health care system, as well as how the health care system (i.e., health care providers) responds to AYAs is health anxiety. Currently, there is no known literature examining the role of health anxiety in the development of transition readiness and associated health outcomes. *Health anxiety* (HA) is defined as the negative interpretations of and fears about the meaning of both ordinary and unusual bodily sensations (Hadjistavropoulos et al., 2011; Salkovskis & Warwick, 2001). To better understand the etiology of HA, Williams (2004) proposed a Cognitive Developmental Model of Health Anxiety (Figure 2). Of note, Williams's model describes the etiology of HA as an individual's inherent vulnerability to anxiety that, through illness-related experiences, impacts the way they interpret health threats and bodily sensations.

One study found that 19.8% of patients aged 16 to 75 years report to various specialty clinics with self-reported clinically significant HA (Tyrer et al., 2011). Another study reported that 15.7% of adolescents experience significant health-related fears and beliefs (Sirri et al., 2015). When examining differences of HA among individuals with and without CMCs, studies have found higher levels of HA in CMC groups (Alberts et al., 2011; Hadjistavropoulos et al., 2012; Jeffers et al., 2015; Kehler & Hadjistavropoulos, 2009; Kirby & Yardley, 2009; Rode et al., 2006). These results are consistent with Williams's model (2004), such that individuals with CMCs experience more physical sensations and symptoms that they are likely to over- or mis-attribute and develop HA (Fergus, Kelley, & Griggs, 2019; Hadjistavropoulos et al., 2012). Sunderland and colleagues (2013) found that compared to relatively healthy participants, those with at least one physical illness were 4.67 times more likely to meet diagnostic criteria for a current HA disorder.

However, no known research has systematically examined HA in an AYA CMC population. One study examining illness-specific concerns in adolescents (12 to 17 years) diagnosed with IBD found similar concerns among adolescents compared to adults with IBD (Maunder et al., 1999; Reigada et al., 2011). However, more studies examining HA in AYAs need to be conducted to determine potential individualized differences across development and illness groups.

Health Anxiety & Health Care Utilization

Within the larger health care and societal systems, individuals with HA are higher users of health care services as a reassurance- or safety-seeking behavior to reduce anxiety (e.g., Barsky, Ettner, Horsky, & Bates, 2001; Conroy, Smyth, Siriwardena, & Fernandes, 1999; Creed, 2011; Fergus, Bardeen, Gratz, Fulton, & Tull, 2015; Weiss, Rief, & Kleinstäuber, 2017). One such study found that somatization associated with HA demonstrated significant retrospective and prospective health care utilization among adult patients attending a primary care clinic (Barsky, Ettner, Horsky, & Bates, 2001). A study from Conroy and colleagues (1999) found that not only is HA associated with increased health care utilization, but also increased expectancy for medical care. Additionally, one study found that HA significantly predicted greater emergency department visits above and beyond demographic factors, substance use, and physical health status (Fergus, Bardeen, Gratz, Fulton, & Tull, 2015). Another study demonstrated that adult patients presenting to primary care facilities with clinical HA had more medical visits, and that this increased health care utilization translated to higher inpatient and outpatient costs (Barsky, Orav, & Bates, 2005).

For individuals with a comorbid CMC, these reassurance-seeking behaviors may be augmented by the presence of increased physiological sensations arising from a CMC, and thus

result in increased health care service utilization. Bernal and colleagues (2000) reported that children with CMCs who also endorsed affective symptoms (e.g., anxiety) utilize greater medical services than those who do not endorse affective symptoms. Therefore, AYAs with a CMC and elevated HA may also demonstrate increased health care utilization. In addition to an overall increased burden on the health care system, HA can negatively impact the medical provider-patient relationship with medical visits being frustrating and unsatisfactory for both parties (Conradt et al., 2006).

Though HA is associated with increased health care utilization as a reassurance-seeking behavior to cope with anxiety, such negative individual health outcomes suggest that individuals with HA may not follow medical recommendations. However, research examining medical compliance and health behaviors in HA found that patients with HA (without a major medical illness, e.g., cancer) were just as compliant with medical recommendations as healthy controls (Schwind et al., 2015). Therefore, it remains unclear why HA and its associated health care utilization does not translate to improved health outcomes.

Overall, findings demonstrate increased health care utilization among individuals with HA. However, these findings largely focus on samples with clinically diagnosable levels of HA and somatization. It has been proposed that subclinical HA might be adaptive in that it motivates individuals to seek clinically appropriate care when it is indicated (Asmundson et al., 2010). These subclinical benefits have been proposed among older adults; however, it is not known whether HA might motivate AYAs to develop the necessary transition readiness in order to receive appropriate clinical care to improve their quality of life.

Health Anxiety & Quality of Life Outcomes

In addition to increased health care utilization, HA can negatively impact the individual. Studies have demonstrated that HA is associated with reduced HRQoL, increased psychological distress, and increased risky health behaviors. One study found that individuals with higher HA reported decreased quality of life (Bleichhardt & Hiller, 2007). Another study found that HA was significantly associated with worse mental and physical HRQoL (Häuser et al., 2004). Among individuals with multiple sclerosis, those with high HA reported lower HRQoL when compared to those with lower HA (Hayter et al., 2016). Murphy and colleagues (2017) found a significant relationship between HA and HRQoL, and that the relationship was mediated by perceived somatic symptoms.

Sirri and colleagues (2015) found that among adolescents, HA was associated with decreased wellbeing, and increased psychological distress and unhealthy behaviors, including smoking, drug use, physical inactivity, and truncated sleep. When examining young adults, those who reported increased non-medical use of prescription drugs also reported significantly higher HA (Jeffers et al., 2015). One study suggested that severe HA has also been shown to inhibit social interaction due to the concern of disease spread and negative cognitive biases about others' health status (Axelsson et al., 2015). In specific disease populations such as inflammatory bowel disease (IBD), it has been demonstrated that illness-specific anxiety was related to greater social isolation (Reigada et al., 2011).

HA is overall associated with lower HRQoL and other risky health-related behaviors. However, given that the majority of the literature examines clinically significant HA, the inclusion of a range of subclinical HA might demonstrate a nonlinear relationship between the two variables. The Yerkes-Dodson Law (1908) shows strong evidence for a U-shaped quadratic

relationship between anxiety and performance (Figure 3). Relatedly, HA may demonstrate a similar quadratic relationship such that a mild, subclinical level of HA is associated with better HRQoL.

Summary

Transition readiness is a set of health care self-management skills that are necessary for positive HRQoL outcomes among AYAs with CMCs. Using the HCT model, HA is an individual factor that not only is associated with an individual's HRQoL, but also their larger utilization of health care services. It remains unclear whether subclinical HA can serve as an individual motivator for AYAs to develop transition readiness and utilize health care services. To synchronize these bodies of literature, the present study aims to (1) replicate the relationship between transition readiness and HRQoL among AYAs with CMCs, (2) test the linearity of the relationship between HA and mental and physical HRQoL among AYAs with CMCs, (3) examine the relationship between HA and transition readiness among AYAs with CMCs. Additional exploratory aims of the study examine: (4) a path analysis for the impact of transition readiness on mental and physical HRQoL as moderated by HA, and (5) differences in HA between AYAs with and without CMCs.

IRB APPROVAL LETTER

Oklahoma State University Institutional Review Board

Date:	08/02/2019
Application Number:	AS-19-89
Proposal Title:	An Examination of the Psychosocial Impact of Chronic Illness on College Students
Principal Investigator:	Larry Mullins, Ph.D
Co-Investigator(s):	
Faculty Adviser:	
Project Coordinator:	Katie Traino
Research Assistant(s):	
Processed as:	Exempt
Exempt Category:	

Status Recommended by Reviewer(s): Approved

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in 45CFR46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,
Oklahoma State University IRB

LIST OF TABLES

Table 1. Sample Characteristics (N = 98)

	N (%) or $M \pm SD$
Demographics	
Age	19.54 ± 1.26
Sex	
Female	86 (87.6)
Race/Ethnicity	
White/Caucasian	77 (78.6)
Black/African American	1 (1.0)
Hispanic	3 (3.1)
Asian	1 (1.0)
Native American	12 (12.2)
Multi-Racial	3 (3.1)
Not Specified	1 (1.0)
Education	
Underclassmen	75 (76.5)
Upperclassmen	23 (23.5)
Native Language	
English	96 (98.0)
First Generation College Student	16 (16.3)
Caregiver Marital Status	
2-Caregiver Household	74 (75.5)
1-Caregiver Household	21 (21.4)
Other caregiver(s) in the home	3 (3.1)
Maternal Education	
Less than a college degree	27 (27.6)
College degree (Associate's or Bachelor's degree) and above	71 (72.4)
Combined Caregiver Annual Income*	
$0-49,999	18 (18.6)
$50,000-99,999	42 (43.3)
$100,000+	37 (38.1)
Disease**	
Asthma	40 (40.8)
Allergies	30 (30.6)
Irritable Bowel Syndrome	10 (10.2)
Inflammatory Bowel Disease	7 (7.1)
Type I Diabetes	6 (6.1)
Other***	19 (19.4)
Number of medical conditions	
One medical condition	44 (44.9)
More than one condition	54 (55.1)
Illness Perceptions	
Illness Severity	4.31 ± 2.25
Illness Controllability	3.97 ± 1.73

Study Outcomes	
Physical Health-Related Quality of Life (SF-36 PHC)†	45.34 ± 10.10
Mental Health-Related Quality of Life (SF-36 MHC)†	37.53 ± 13.36
Transition Readiness (TRAQ)	4.12 ± .65
Health Anxiety (SHAI)	17.58 ± 8.04

*Missing *n*=1.
**Participants can list multiple medical conditions. Percentages indicate % of total participants that report the respective diagnosis.
***Other (e.g., Celiac disease, epilepsy, fibromyalgia)
†Scores reported are T-scores.

Table 2. Correlations between study outcomes.

	Health Anxiety (SHAI)	Mental Health-Related Quality of Life (MHC)	Physical Health-Related Quality of Life (PHC)
SHAI	---	---	---
MHC	-.536***	---	---
PHC	-.616***	.593***	---
TRAQ	.041	.144	.077

*$p < .05$, **$p < .01$, ***$p < .001$

Table 3. Hierarchical Regression Analysis for Relationship Between Transition Readiness and Mental and Physical Health-Related Quality of Life

			At entry into model	Final model
Variable	$R^2_{Adjusted}$	ΔR^2	β	β
Mental health composite score ($N = 98$)				
Step 1 – Demographics	.174***	.208***		
Sex			-.344***	-.337**
Education			-.035	-.067
Caregiver marital status			.078	.082
Illness severity			-.251*	-.238*
Step 2 – Transition readiness (linear)	.175***	.010	.106	-.060
Step 3 – Transition readiness (quadratic)	.167***	.001	---	.168
Physical health composite score ($N = 98$)				
Step 1 – Demographics	.233***	.264***		
Sex			-.169	-.168
Education			-.146	-.147
Illness severity			-.387***	-.371***
Illness controllability			.125	.123
Step 2 – Transition readiness (linear)	.225***	.001	.031	.339
Step 3 – Transition readiness (quadratic)	.220***	.003	---	-.313

*$p < .05$, ** $p < .01$, *** $p < .001$
Note: Standardized beta values are reported.

Table 4. Hierarchical Regression Analysis for Relationship Between Health Anxiety and Mental and Physical Health-Related Quality of Life

			At entry into model	Final model
Variable	$R^2_{Adjusted}$	ΔR^2	β	β
Mental health composite score ($N = 98$)				
Step 1 – Demographics	.173***	.207***		
Sex			-.346***	-.258**
Caregiver marital status			.081	.047
Illness severity			-.245*	-.132*
Illness controllability			.023	-.030
Step 2 – Health anxiety (linear)	.332***	.160***	-.435***	-.390
Step 3 – Health anxiety (quadratic)	.325***	.000	---	-.046
Physical health composite score ($N = 98$)				
Step 1 – Demographics	.219***	.243***		
Sex			-.189*	-.086
Illness Severity			-.381***	-.258**
Illness Controllability			.122	.062
Step 2 – Health anxiety (linear)	.436***	.216***	-.504***	-.373
Step 3 – Health anxiety (quadratic)	.432***	.001	---	-.136

*$p < .05$, ** $p < .01$, *** $p < .001$
Note: Standardized beta values are reported.

Table 5. Hierarchical Regression Analysis for Relationship Between Health Anxiety and Transition Readiness

			At entry into model	Final model
Variable	$R^2_{Adjusted}$	ΔR^2	β	β
Transition readiness ($N = 98$)				
Step 1 – Demographics	.075*	.113*		
Sex			-.063	-.084
Education			.268**	.263*
Illness severity			-.197	-.224*
Illness controllability			-.043	-.027
Step 2 – Health anxiety (linear)	.076*	.011	.113	.006
Step 3 – Health anxiety (quadratic)	.067	.001	---	.111

*$p < .05$, ** $p < .01$, *** $p < .001$
Note: Standardized beta values are reported.

LIST OF FIGURES

Figure 1. *Health care transition research consortium health care transition model* (Betz et al., 2014).

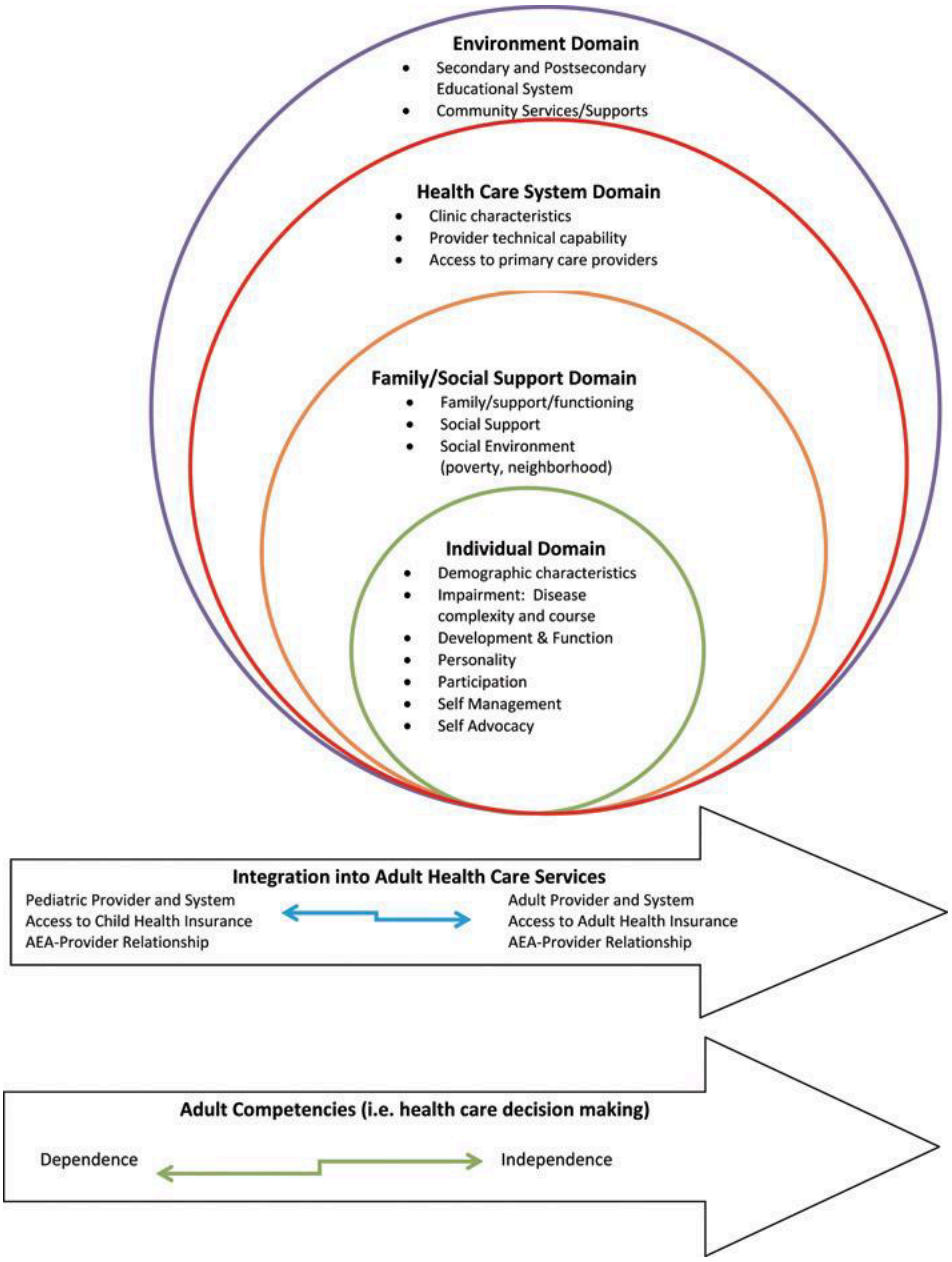


Figure 2. *Proposed cognitive developmental model of the etiology and maintenance of health anxiety and hypochondriasis* (Williams, 2004).

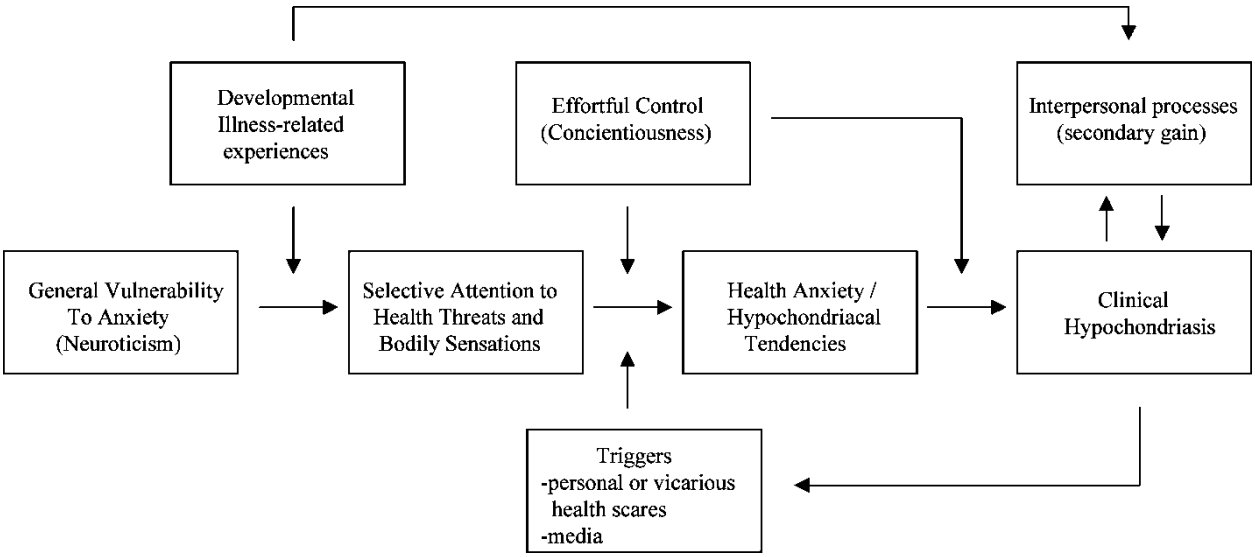


Figure 3. *Yerkes-Dodson Law* (Yerkes & Dodson, 1908).

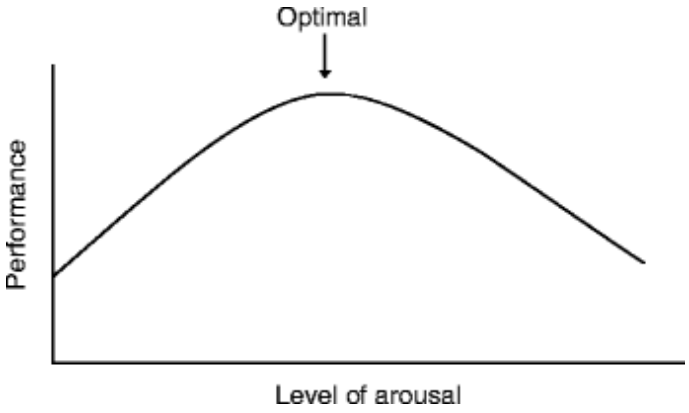
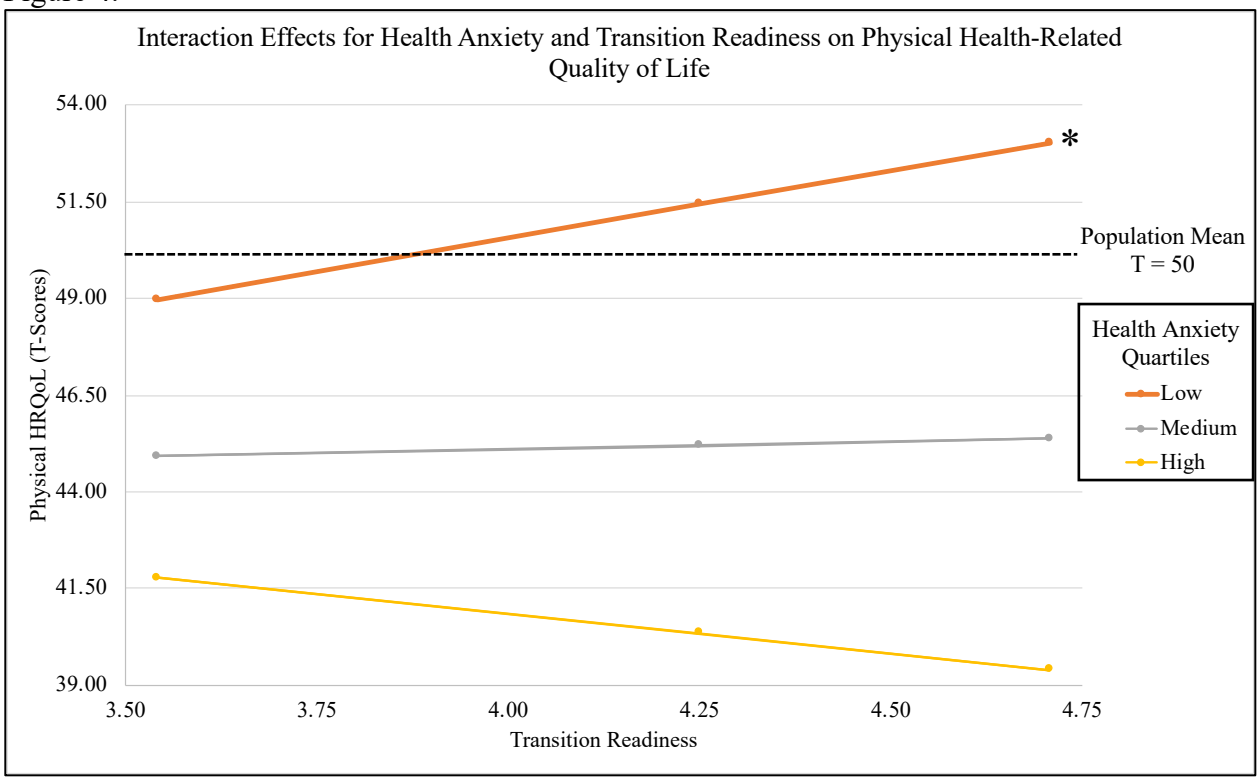


Figure 4.



*Significant simple slope, $p = .014$.

VITA

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