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Examining General versus Condition-Specific Health Related Quality of Life across Weight Categories in an Adolescent Sample

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Abstract

This study examined Health Related Quality of Life (HRQoL) across weight categories in adolescents using both a general and a condition-specific measure sensitive to fatigue symptoms. Participants ($N = 918$) completed the Pediatric Quality of Life (PedsQL) Inventory and PedsQL Multidimensional Fatigue Scale measures. Actual height and weight were used to calculate body mass index-for-age and-sex percentiles and assign weight categories. No interaction effects between total HRQoL and weight category and gender were found; however, main effects were found for both weight category and gender. Future research should examine the impact of using different measures to assess HRQoL outcomes across weight categories.

Keywords

Adolescents; Health Related Quality of Life; Overweight; Obese

Introduction

Pediatric overweight and obesity are an epidemic in the United States (U.S.) and worldwide, which is concerning because of research documenting that overweight and obesity tend to worsen through childhood and continue throughout adult life (Kuhl, Rausch, Varni, & Stark, 2012). For U.S. adolescents ages twelve to nineteen, the prevalence of overweight and obesity is 34.5% with 20.5% being obese (Ogden, Carroll, Kit, & Flegal, 2014). Research

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has shown that the rates of overweight and obesity are even higher in ethnic minority groups (Ogden, Carroll, Kit, & Flegal, 2012) and rural populations (Lutifyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007) including Appalachia [Centers for Disease Control and Prevention (CDC), 2009]. The rates of overweight and obesity in the adolescent population have remained high over the last decade, and overweight and obese groups are presenting with more and more body fat and central waist obesity (Wang, 2011). Physical (e.g., glucose intolerance, fatigue) and psychosocial health (e.g., lower self-esteem, poorer quality of life) consequences coupled with associated healthcare costs (Dietz, 1998; Griffiths, Parsons, & Hill, 2010; Harriger & Thompson, 2012; Varni, Limbers, Bryant, & Wilson, 2010; Wolf & Colditz, 1998) direct attention to the need to better understand factors related to overweight and obesity in an effort to develop effective prevention and intervention programs.

One important psychosocial health concern recognized by the World Health Organization as an important dimension of health affected by chronic illness like overweight/obesity is health related quality of life (HRQoL), although the effects vary among chronic conditions and may depend on severity (Tsiros, Olds, Buckley, Grimshaw, Brennan, Walkley, Hills, Howe, & Coates, 2009). This concern has also been embraced as a national health goal and target for improvement in *Healthy People 2020* (CDC, 2014; U.S. Department of Health and Human Services (USDHHS), 2010). HRQoL is a concept that encompasses the assessment of well-being in various aspects of life including physical and emotional functioning, mental status, and social well-being (Riazi, Shakoor, Dundas, Eiser, & McKenzie, 2010; Swallen, Reither, Haas, & Meier, 2005).

Pediatric Overweight/Obesity and HRQoL

Increasingly, pediatric obesity research has included a focus on HRQoL. Overall, the cross-sectional literature suggests that overweight or obese children and adolescents report significantly lower HRQoL than their healthy weight peers (Tsiros, et al, 2009). However, the results from different studies examining these variables differ slightly on which of the specific dimensions of HRQoL are associated with overweight/obesity. This variability in results could potentially be attributed to variances in measures of HRQoL (Griffiths, et al, 2010).

Total or overall HRQoL is consistently lower among overweight/obese adolescents compared to healthy weight peers (Griffiths, et al, 2010; Tsiros, et al, 2009; Ul-Haq, Mackay, Fenwick, & Pell, 2013). In fact, only one cross sectional study to date fails to support that overweight and obese adolescents report lower overall or total HRQoL (Khodaverdi F., Alhani, Kazemnejad, & Khodaverdi Z., 2011). Decreased physical HRQoL has been the dimension of HRQoL most consistently and strongly associated with overweight or obesity throughout cross sectional studies (Griffiths, et al., 2010; Tsiros, et al., 2009). Although the associations between obesity and psychosocial HRQoL are less supported and investigated at this time than the findings for physical HRQoL, evidence shows that social and emotional aspects of HRQoL are diminished in obese adolescents (Ul-Haq, et al., 2013). Recent reviews suggest studies report lower social HRQoL in obese adolescents to some degree, with the majority reporting significantly lower scores (Griffiths,

et al., 2010; Tsiros, et al., 2009). Additionally, emotional or psychological functioning is impaired in obese adolescents in several cross sectional studies; however the level of significance varies between self- and parent-proxy measures, so overall the scores have not been considered significantly lower than scores for healthy weight youth (Griffiths, et al., 2010; Tsiros, et al., 2009). A limited number of studies to date find no association between overweight/obese youth (as compared to healthy weight) and social or emotional HRQoL (i.e., Khodaverdi F., et al., 2011; Swallen, et al., 2005; Tsiros, et al., 2009). Inverse associations are now becoming consistent across many other quality of life dimensions, such as physical functioning/mobility and pain, mental health, emotional role, social/interpersonal functioning, and overall health as self-reported by adolescents on a variety of measures including: the SF-36 Medical Outcomes Study Short Form Health Survey, Version 2.0), the EQ-5D (European Quality of Life- 5 Dimensions), and the IQQOL-Adolescents (Italian Questionnaire on Quality of Life in Adolescents; Griffiths, et al., 2010; Kolotkin, Norquist, Crosby, Suryawanshi, Teixeira, Heymsfield, Erondy, & Nguyen, 2009; Riazi, et al., 2010; Tsiros, et al., 2009; Ul-Haq, et al., 2013).

Some studies have begun to examine demographic variables associated with HRQoL including gender. Although limited in number, these studies show that females tend to report lower HRQoL than males, particularly in the physical functioning subdomain (Tsiros, et al., 2009; Keating, Moodie, & Swinburn, 2011), with only one study to date showing that males report lower HRQoL than females (Wake, Salmon, Waters, Wright, & Hesketh, 2002). The prevalence of overweight/obesity in adolescents has not been found to significantly differ in regard to gender. Specifically, 35.1% of male adolescents are overweight/obese and 33.8% of female adolescents are overweight/obese (Ogden, et al., 2014). Additional research examining the role of gender as related to HRQoL and weight status may provide greater understanding of current research and enhance development of future research.

Generic and Condition-Specific HRQoL Measures

Past research examining the relationship between weight status and HRQoL has used a variety of measures for assessing HRQoL. Questionnaires differ in scope from generic to condition-specific. The most widely used generic measure for adolescents is the Pediatric Quality of Life Inventory, Version 4.0 (PedsQL), which measures total HRQoL and subdimensions including physical and psychosocial HRQoL, the latter of which includes assessment of HRQoL related to social, school, and emotional functioning (Varni, Seid, & Kurtin, 2001). Several other generic instruments can be found in the literature such as the UK version 4 of the PedsQL for children and adolescents, the Youth Generic Quality of Life Scale (YQOL-S) for assessing adolescent HRQoL, the SF-36 (Medical Outcomes Study Short Form Health Survey, Version 2.0), the Visual Analog Scale, the General Well-Being Scale, the General Health Rating Index, the Sickness Impact Profile, and EQ-5D (European Quality of Life- 5 Dimensions) for assessing older adolescent and adult HRQoL (Kolotkin, et al., 2009; Maciejewski, Patrick, & Williamson, 2005; Patrick, Skalicky, Edwards, Kuniyuki, Morales, Leng, & Kirschenbaum, 2011; Riazi, et al., 2010).

Several studies have also used condition-specific HRQoL measures intended to assess qualities most likely to be affected by specific conditions. Studies focused on this topic cite

instruments such as the Impact of Weight on Quality of Life-Kids and the PedsQL Multidimensional Fatigue Scale (examining General Fatigue, Sleep/Rest Fatigue, and Cognitive Fatigue domains) for children and adolescents (Kolotkin, Zeller, Modi, Samsa, Quinlan, Yanovski, Bell, Maahs, Serna, & Roehrig, 2006; Maciejewski, Patrick, & Williamson, 2005; Varni, et al., 2010). Other measures specifically for adolescents include Sizing Them Up and the Youth Quality of Life- Weight Specific (YQOL-W) (Modi & Zeller, 2008; Patrick, et al., 2011). Finally, the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) or the Impact of Weight on Quality of Life-Adolescents (IWQOL-Adolescents) are measures used for older adolescents and adults (Griffiths, et al., 2010; Kolotkin, et al, 2009). Research has found that these condition-specific measures are reportedly more likely to identify increases in HRQoL as a result of weight loss than generic measures (Maciejewski, et al., 2005; Matza, et al., 2004). The sensitivity of the measure utilized is an important consideration when interpreting HRQoL outcomes. Few of these condition-specific measures have been used alongside a generic measure to compare results within the same population although researchers have called for this type of research (Kolotkin, et al., 2009; Maciejewski, et al., 2005).

Despite the number of available assessment instruments, little literature has compared differences in HRQoL based on the measure used. In fact, as alluded to previously, few studies to date have used both generic and condition-specific measures within the same population. One exception is a study by Varni and colleagues (2010) examining the reliability, feasibility, and validity of the Pediatric Quality of Life Inventory Multidimensional Fatigue Scale along with the Generic Pediatric Quality of Life Inventory (PedsQL). The findings showed that children with obesity reported significantly lower condition-specific (i.e., assessed via the Multidimensional Fatigue Scale, which focuses on pain and fatigue) HRQoL than healthy weight children. However, the study did not directly compare differences in participants' HRQoL across weight categories as a function of the measure utilized (i.e., both the generic and condition-specific measures). Another study by Patrick and colleagues (2011) followed adolescents (ages eleven to nineteen) through a four week weight loss camp and demonstrated that the Youth Quality of Life-Weight Specific (YQOL-W) was more sensitive to differences in quality of life associated with weight loss than the generic Youth Quality of Life scale (YQOL-S). Although the sensitivity differences were only slight, when controlling for other variables, including gender, age, and weight at baseline, the weight-specific measure scores remained significantly associated with weight loss and the generic scores did not. Although this study is supportive of the idea that condition-specific measures are especially sensitive to weight-related issues of HRQoL, this study used one specific measure and was conducted on overweight and obese participants at a weight loss camp.

Research Aims

HRQoL has been identified as an important domain of psychosocial health as well as a target for overweight and obesity initiatives (CDC, 2014; USHHS, 2010). Findings to date on the relationship between pediatric obesity and HRQoL are sometimes mixed. Studies frequently differ in methodology, including types of HRQoL measures used, thus potentially accounting for some of the mixed findings across studies. This study was a first step to

better understand differences associated with using the generic Pediatric Quality of Life Inventory versus the PedsQL condition-specific measure of HRQoL across weight categories in a community sample of adolescents.

The primary aim of this investigation was to examine differences in HRQoL across weight categories in a school-based sample of adolescents in east Tennessee. Specifically, the researchers assessed the sensitivity of a general [Pediatric Quality of Life Inventory Version 4.0 (PedsQL)] versus condition-specific (PedsQL Multidimensional Fatigue Scale) HRQoL measure in differentiating HRQoL across weight categories. Few studies to date have utilized both generic and condition-specific HRQoL measures within the same sample, which is essential to interpreting findings and health outcomes. The two selected measures possess strong psychometric properties, were developed by the same research team, allow for efficient data collection, and followed similar calculation and interpretation methods. This allowed for greater ease of administration and comparison of total HRQoL across measures. Based on the limited research to date, the researchers hypothesized that overweight and obese youth (compared to healthy weight adolescents) would report significantly lower total HRQoL and that this difference would be even more pronounced using the condition-specific as compared to the generic HRQoL measure (i.e., the condition-specific measure would be more sensitive).

The secondary study aim was to explore the influence of gender on weight status and HRQoL. Literature to date has mixed findings on the relationship between HRQoL and gender; however, the trend is that females report lower HRQoL than male peers (Tsiros et al., 2009). Further, a study by Kolotkin and colleagues (2002) found that HRQoL was lower in adult women than men, controlling for BMI. Differences in HRQoL across weight categories may also be more pronounced in female adolescents compared to male adolescents due to the additional pressures of Western culture and media on young women to maintain a thin physique (Benowitz-Fredricks, Garcia, Massey, Vasagar, & Borzekowski, 2012). The researchers hypothesized that female adolescents would report lower total HRQoL than their male classmates. Additionally, the researchers hypothesized that gender would act as a moderator between HRQoL and weight status, with more pronounced differences in HRQoL scores across weight categories for females.

Methods

Participants

Participants in the current study were part of a larger school-based obesity prevention study, *Team Up for Healthy Living*, which assessed the effectiveness of an 8-session peer-delivered curriculum in *Lifetime Wellness* courses of participating high schools (Crenshaw, Mozen, Dalton, & Slawson, 2014; Dalton, Wang, Southerland, Schetzina, & Slawson, 2014; Mozen, Dalton, McKeehan, & Slawson, 2014; Slawson, Dalton, Wang, Southerland, Schetzina, Littleton, Stoots, Mozen, Lowe, Relyea, McKeehan, & Wu, in press). The larger study, which consisted of a cluster-randomized controlled trial, was initiated in two waves over the course of a year (spring 2012 and fall 2012). The current study only used data collected at baseline during Wave Two of the *Team Up for Healthy Living* project, which included

administering a condition-specific HRQoL measure in addition to the generic HRQoL measure used in Wave One.

The inclusion criteria for participation included attendance at one of ten selected rural high schools in east Tennessee and enrollment in the *Lifetime Wellness* course during one of the two waves of data collection. Adolescents in the course were excluded if they presented with one of the following preexisting conditions or situations: a clinically diagnosed eating disorder, current participation in a weight management program, dietary or exercise restrictions at the time of the study, or underlying health conditions that could impact weight, such as Cushing's syndrome, steroid medication use, hypothyroidism, and/or a confirmed pregnancy.

Procedures

Prior to beginning the study, the project was approved by the university institutional review board. To confirm consent/assent for participation, students were given a form for a parent to sign in the event that parents did not wish for their children to participate. If the form was not returned to the school, then parental consent was assumed. Once the procedure for the study was explained to the students, those that wished to be included in the study were asked to sign an informed assent document. Additional details regarding the parent study may be found elsewhere (i.e., Slawson et al., in press).

For this study, students completed a survey on one occasion, which assessed a variety of health-related factors including HRQoL at baseline. The surveys were completed in the classroom or gymnasium in which the *Lifetime Wellness* class met. During the completion of the survey, trained graduate and undergraduate research assistants as well as the *Lifetime Wellness* instructor were available to provide any needed clarification and check the surveys for completeness when finished. In addition to survey completion, participants' actual weight and height were measured by trained graduate and undergraduate research assistants.

Measures

Demographics—The demographic data collected and analyzed in this study included: age in years and months, gender, grade in high school, parental education, family income, race/ethnicity, school attended, and home address.

Generic Pediatric Quality of Life Inventory Version 4.0 (PedsQL)—The generic measure of HRQoL utilized in this study was the PedsQL Version 4.0. (Varni, 1998b). This instrument includes 23-items which measure different HRQoL dimensions (i.e., physical, emotional, social, and school) for children and adolescents. Respondents are asked to rate on a five-point Likert scale the degree to which a statement has been a problem for them over the past month. Possible responses include: “never=0,” “almost never=1,” “sometimes=2,” “often=3,” or “almost always=4.” The measure consists of four subsets of statements. The first set of statements relate to problems about participants' physical health and activities, such as “It is hard for me to run” with the previously described response choices. The second set of questions relates to respondents' emotions; for instance, “I feel sad or blue” and “I have trouble sleeping.” The third set of statements involves how well participants get

along with their peers (i.e., their social functioning). These statements include “Other teens do not want to be my friend” and “It is hard to keep up with my peers,” for example. The final subcategory of statements relate to school functioning and assess factors like, “I forget things,” “I miss school because of not feeling well,” and “It is hard to pay attention in class” (Varni, 1998b). Scoring procedures include reverse scoring all items and linearly transforming these numbers to a 0 to 100 scale where an initial score of 0=100, 1=75, 2=50, 3=25, and 4=0.

The responses to the survey questions contribute to a total HRQoL score as well as summary scores for two subdimensions (physical and psychosocial HRQoL). Additionally, psychosocial HRQoL is further divided into emotional, school, and social HRQoL subscale scores). Scoring instructions have been described in detail elsewhere (Varni et al., 2001). Mean scores range from 0 to 100, and higher scores indicate higher levels of HRQoL whereas lower scores reflect lower levels of HRQoL. This instrument has strong psychometric properties, and has consistently received high reliability and validity scores. The PedsQL has been shown to have total Cronbach alpha scores ranging between .88 (Varni et al., 2001) and .91 (Varni, Burkwinkle, Seid, & Skarr, 2003) for adolescent self-report studies (even when controlling for factors such as gender, age, race, and socioeconomic status when using the known-groups method for demonstrating validity; Varni, Burkwinkle, & Seid, 2006). Feasibility scores determined by the percentage of missing responses have also been demonstrated to be .00001% among adolescents (Varni, Burkwinkle, & Seid, 2006). Cronbach alpha scores for the current study were as follows: .92 (total), .82 (physical), .90 (psychosocial), .83 (emotional), .79 (school), and .84 (social).

Pediatric Quality of Life Multidimensional Fatigue Scale—The condition-specific instrument for HRQoL used in this study was the Multidimensional Fatigue Scale (Varni, 1998a). This measure includes 18 questions that assess fatigue levels in the pediatric population. Six questions are linked to each subdimension of fatigue, which include the General Fatigue Scale (i.e. “I feel too tired to do things that I like to do”), Sleep/Rest Fatigue Scale (i.e. “I feel tired when I wake up in the morning”), and the Cognitive Fatigue Scale (i.e. “It is hard for me to remember what I just heard”; Varni, 1998a). Similar to the Generic PedsQL, the Likert scale includes five response options on a continuum from “never=0” to “almost always=4” reverse scored and linearly transformed. The responses to the survey questions contribute to a total fatigue HRQoL score as well as general, sleep/rest, and cognitive scores. Mean scores range from 0 to 100 and higher scores indicate higher levels of HRQoL whereas lower scores reflect lower levels of HRQoL. The psychometric properties of the Multidimensional Fatigue Scale have been demonstrated with children who are obese (e.g., total Cronbach alpha = .90, demonstrated feasibility with minimal missing responses at 1.6%; Varni et al., 2010), healthy young adults and those with chronic conditions (Cronbach alpha = .90, Varni & Limbers, 2008), and pediatric cancer patients (e.g. Cronbach alpha scores .77–.89, Varni, Burwinkle, Katz, Meeske, & Dickinson, 2002). Cronbach alpha scores for the current study were as follows: .92 (total), .88 (general fatigue), .79 (sleep/rest fatigue), and .91 (cognitive fatigue).

Weight Categories—Height and weight were measured and used to calculate standardized body mass index (zBMI) and percentile scores. Specifically, height was measured by undergraduate and graduate research assistants using a SECA 213 height rod. Students were instructed to stand with their backs to the wall and with their heels flat against the instrument; research assistants asked students to “stand up straight and keep [their] feet flat on the floor”. The research assistants were trained to ensure that students followed these instructions. Weight was measured using an OHAUS Model SD200 scale. Height and weight were both recorded using metric units, and then each measurement was repeated with the same procedure. In the instances for which a discrepancy of greater than 0.5cm for height or greater than 0.3kg for weight was recorded, a third measurement was collected. These measurements were then averaged in order to record a more accurate height and weight than was possible with only one measurement.

CDC SAS syntax was used to calculate standardized zBMI scores and percentile scores from the gathered measurements based on the 2000 CDC growth charts (Kuczmarski, Ogden, Guo, Grummer-Strawn, Flegal, Mei, Wei, Curtin, Roche, Johnson, 2002). Participants were assigned to one of four CDC weight categories based on their percentile scores [i.e., underweight (less than the 5th percentile for gender and age), healthy weight (5th–84th percentile for gender and age), overweight (85th–94th percentile for gender and age), or obese (equal to or more than the 95th percentile for gender and age); CDC, 2011].

Data Analysis

Descriptive statistics (i.e., means, standard deviations, and frequencies) for all demographic variables and variables of interest were calculated. A factorial analysis of variance (ANOVA) was calculated to compare mean scores of total HRQoL across weight category and gender. The first fixed factor independent variable, the weight category, had four levels (i.e., underweight, healthy weight, overweight, and obese). The second fixed factor independent variable, gender, had two categorical levels (male and female). The dependent variable was the total HRQoL score calculated with the generic measure (PedsQL). A second factorial ANOVA was then calculated with the same independent variables but total HRQoL from the condition-specific measure (Multidimensional Fatigue Scale) as the dependent variable. Each analysis assessed for main effects between HRQoL and weight category as well as HRQoL and gender. Further, interaction effects of gender on total HRQoL and weight category were assessed.

Furthermore, two sets of factorial multivariate analyses of variance (MANOVA) tests were conducted to assess for main and interaction effects in the subdomain scores of each measure. The first set of four MANOVAs included two independent variables, the weight category (i.e., underweight, healthy weight, overweight, or obese) and gender (male or female). The dependent variables were the PedsQL HRQoL subdomain scores (i.e., physical, social, school, and emotional). A second set of three MANOVAs had the same independent variables with the dependent variables being the Multidimensional Fatigue Scale subdomain scores (i.e., general fatigue, sleep/rest fatigue, and cognitive fatigue). Fisher’s Least Significant Difference (LSD) post hoc analyses were run to assess differences between groups, at a significance level of 0.05.

Results

Sample Characteristics

Gender was equally distributed (50% Female) in this primarily Caucasian sample (93%) with nearly 90% of the sample being 9th graders. Approximately half of the sample fell into the healthy weight category, and the majority of remaining participants fell into the overweight or obese category (27.3% obese) with less than 2% of participants falling into the underweight category. Additional sample characteristics can be found in Table 1.

Pediatric Overweight/Obesity and Generic HRQoL

A factorial ANOVA using the PedsQL total score as the dependent variable yielded no interaction effect between weight category and gender, $F(3, 910) = .501, p = .681$, however, a main effect for both weight category, $F(3, 910) = 3.52, p = .015$, and gender, $F(1, 910) = 7.87, p = .005$ was found. Fisher's LSD post hoc analyses identified significant differences between healthy weight and obese participants ($p = .017$) and between overweight and obese participants ($p = .018$). Obese participants reported significantly lower health related quality of life ($M = 74.14, SD = 14.28$) than both healthy weight ($M = 76.77, SD = 14.26$) and overweight participants ($M = 77.37, SD = 14.31$). Female participants across all weight categories reported significantly lower HRQoL scores ($M = 73.98, SD = 13.90$) than male participants across all weight categories ($M = 78.35, SD = 14.31$). Means and standard deviations for PedsQL total scores for the overall sample as well as by gender can be found in Table 2.

The MANOVA analyses using the PedsQL subdomains as dependent variables revealed no interaction with weight category and gender, $F(3,900) = .62, p = .864$ [Physical $F(3,900) = .35, p = .788$; Emotional $F(3,900) = .08, p = .973$; Social $F(3,900) = .47, p = .705$; School $F(3,900) = 1.50, p = .214$]. However, a main effect for the weight category was found, $F(3,900) = 2.13, p = .007$. A significant difference was identified for the PedsQL Physical HRQoL subdomain, $F(3,900) = 7.29, p < .001$. Fisher's LSD post hoc analyses showed that there was a significant difference in Physical HRQoL between healthy weight and obese participants ($p < .001$) and between overweight and obese participants ($p = .001$). Obese participants reported significantly lower physical HRQoL ($M = 77.29, SD = 15.53$) than both healthy weight ($M = 81.45, SD = 15.49$) and overweight participants ($M = 82.22, SD = 14.82$). The remaining subdomains were non-significant [Emotional $F(3,900) = 1.02, p = .381$; Social $F(3,900) = 2.15, p = .092$; School $F(3,900) = 1.60, p = .189$]. Means and standard deviations for the PedsQL subdomain scores are shown in Table 3.

A main effect for gender was also found, $F(1, 900) = 2.79, p = .016$. Female participants had significantly lower Physical HRQoL ($M = 77.24, SD = 15.13$) than male participants ($M = 83.62, SD = 15.15$), $F(1,900) = 8.79, p = .003$. Female participants had significantly lower Emotional HRQoL ($M = 66.82, SD = 20.24$) than male participants ($M = 75.38, SD = 19.75$), $F(1,900) = 6.45, p = .011$. Female participants had significantly lower School HRQoL ($M = 69.68, SD = 17.62$) than male participants ($M = 70.93, SD = 18.55$), $F(1,900) = 5.73, p = .017$. No significant difference in male scores ($M = 80.37, SD = 18.43$) compared to female scores ($M = 80.39, SD = 16.57$) for Social HRQoL was found $F(1,900) = .79, p = .374$.

Pediatric Overweight/Obesity and Condition-Specific HRQoL

The factorial ANOVA utilizing the Multidimensional Fatigue Scale total score as the dependent variable also showed no interaction effect between weight category and gender, $F(3, 910) = .55, p = .650$. No main effects of total HRQoL across weight category were found, $F(3,910) = .84, p = .471$; however, a main effect for gender was found, $F(1, 910) = 5.54, p = .019$. Female participants across all weight categories reported significantly lower HRQoL ($M = 67.92, SD = 16.06$) than male participants across all weight categories ($M = 71.84, SD = 16.06$). Means and standard deviations for Multidimensional Fatigue Scale total scores for the overall sample as well as by gender can be found in Table 4.

The MANOVA analyses using the condition-specific subdomains as dependent variables showed no interaction effect between weight category and gender, $F(3, 906) = .53, p = .854$. [General Fatigue $F(3,906) = .12, p = .949$; Sleep Rest Fatigue $F(3,906) = 1.12, p = .340$; Cognitive Fatigue $F(3,906) = .35, p = .790$]. Additionally, no overall significant main effects across weight categories were found, $F(3, 906) = .73, p = .684$ [General Fatigue $F(3,906) = 1.09, p = .353$; Sleep Rest Fatigue $F(3,906) = .496, p = .685$; Cognitive Fatigue $F(3,906) = .97, p = .406$]. Similarly, no overall significant main effects were found for gender, $F(1, 906) = 1.83, p = .140$ [General Fatigue $F(1,906) = 3.80, p = .052$; Sleep Rest Fatigue $F(1,906) = 4.05, p = .045$; Cognitive Fatigue $F(1,906) = 3.93, p = .048$].

Discussion

Consistent with previous literature (Griffiths, et al., 2010; Tsiros et al., 2009), total HRQoL assessed via the generic PedsQL was significantly lower in obese compared to both healthy weight and overweight participants. However, HRQoL was not significantly lower in overweight compared to healthy weight participants, which was unexpected because some research suggests that overweight participants also have lower HRQoL scores than their healthy weight peers (Ul-Haq, et al., 2013). In fact, several mean dimension scores were slightly higher. Obese participants also reported lower physical HRQoL than both overweight and healthy weight peers, which is consistent with the literature for the physical subdomain (Griffiths, et al., 2010; Tsiros et al., 2009). In the current study, no significant differences across weight categories for the remaining subdomains (psychosocial, emotional, social, and school) were found. This is consistent with current literature reporting mixed findings for these subdomains.

The current study also examined the role of gender across weight categories and generic HRQoL. Findings revealed no interaction effects. However, females reported significantly lower total HRQoL as well as lower physical, emotional, and school subdomain scores using the generic measure. These findings build on research to date indicating females tend to report lower HRQoL than males (Tsiros, et al., 2009; Keating, et al., 2011). Therefore, the results regarding gender are also consistent with the developing literature.

The findings for condition-specific HRQoL scores were inconsistent with recent reviews of the literature (Maciejewski, et al., 2005; Matza, et al., 2004) as well as a study validating the Multidimensional Fatigue Scale for use with overweight and obese adolescents (Varni et al., 2010). Although the current literature suggests that obese adolescents report lower total

HRQoL on this measure than their healthy weight peers, this study found no significant differences in scores between weight categories. Additionally, this indicates that in this study's sample the Multidimensional Fatigue Scale assessing condition-specific HRQoL was not more sensitive than the PedsQL 4.0. These findings are inconsistent with the researchers' hypothesis which was guided by related studies to date (Maciejewski et al., 2005; Matza et al., 2004).

One possible explanation for these findings is that the current sample has a higher percentage of overweight and obese participants and was not nationally representative. Specifically, 47.7% of the current sample was categorized as overweight or obese, with over 27% being obese compared to national statistics of 34.5% overweight or obese and 20.5% obese (Ogden et al., 2014). Increased frequency of overweight and obesity in this sample could contribute to shifting norms or less perceived differences in HRQoL compared to healthy weight peers in this east Tennessee region. Further, this sample reported lower mean generic total HRQoL score ($M = 76.16$; $SD = 14.26$) than a national healthy sample ($M = 83.84$; $SD = 12.65$) and slightly higher than an obese sample ($M = 74$; $SD = 14.20$); both samples were described previously (Varni, Limbers, & Burwinkle, 2007). The current sample also lacked a diverse racial representation which may have influenced findings. Future research should examine potential reasons for lower HRQoL in adolescents in southern Appalachia compared to other samples.

Another explanation may be related to the use of the condition-specific measure which was validated with an obese sample. Instead, the study compared findings in the obese sample to a cancer and healthy sample. Additionally, this study did not identify the weight category of participants in the healthy sample (Varni et al., 2010). Furthermore, other studies that have examined HRQoL with this condition-specific measure focus on changes in HRQoL related to weight loss (Maciejewski et al., 2005) rather than cross-sectional comparisons based on weight status.

Similar to findings with the generic measure, use of the condition-specific measure showed that females reported lower HRQoL than males for total HRQoL. Additionally, as with the PedsQL (general HRQoL measure), no interaction effect among gender, weight category, and HRQoL score was found.

Strengths and Limitations

This study has several strengths including a relatively large sample size ($n=918$), even gender distribution (50% female), focus on an underserved population in southern Appalachia, the use of two different HRQoL measures within the same population, and psychometrically sound measures that have been shown to be feasible, reliable, and valid with similar populations (Varni et al, 2006; Varni et al, 2010). However, some limitations exist as well. Namely, the condition-specific measure used was designed for chronic conditions associated with pain and fatigue, not specifically obesity; although the measurement properties have been demonstrated for use with pediatric obesity (Varni, 2010). It may be that fatigue is not the most pertinent consequence of overweight and obesity. Additionally, the current study was a cross-sectional study, and therefore, the sensitivity of each measure related to weight loss efforts was not assessed. Lastly, the

sample population was predominantly Caucasian (93.6%) and 9th graders (89.2%), which limits the generalizability of the results to other ethnic groups and ages. Future research is needed on a variety of generic and condition-specific measures used within both cross-sectional and intervention studies with participants across all weight categories (i.e.-underweight, healthy weight, overweight, and obese) from more diverse populations. This research may guide interpretation of studies using different methodologies. Further, future research should explore the role of gender related to HRQoL and weight status because little is currently known about the influence of gender across weight categories.

Clinical Implications

Clinicians and other professionals should use caution when interpreting and comparing the findings of current HRQoL studies as the variety of measures may influence outcomes. Health care providers including those in school based settings should recognize HRQoL as a significant health outcome and be aware of the factors related to HRQoL including weight status and gender differences. Further studies to better understand influences on HRQoL and its subdomains may guide practice interventions for improving overall HRQoL in adolescents.

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Highlights

- HRQoL is an important psychosocial health domain and target for obesity initiatives.
- Studies assessing pediatric obesity and HRQoL differ in HRQoL measures.
- We examined HRQoL using a general and condition-specific measure.
- Differences in HRQoL across weight categories differed based on measure utilized.
- Clinicians should use caution when interpreting and comparing HRQoL findings.

Table 1

Sample Characteristics

Demographic	N (M, SD) or N (Valid %)
Age*	918 (M=14.70; SD=0.72)
Grade in High School	
8 th Grade	4(0.4)
9 th Grade	800(89.2)
10 th Grade	56(6.2)
11 th Grade	22(2.5)
12 th Grade	14(1.6)
Gender	
Male	459(50)
Female	459(50)
Race	
White/Caucasian, non-Hispanic	829(93.6)
Black or African American	4(0.5)
Hispanic or Latino	24(2.7)
Asian	3(0.3)
American Indian/Alaska Native	7(0.8)
Native Hawaiian/Pacific Islander	1(0.1)
Other	18(2.0)
Education Level (Mother)	
Less than high school	55(6.2)
High School Diploma or GED	254(28.8)
Some College	194(22.0)
College Degree	232(26.3)
I don't know	148(16.8)
Education Level (Father)	
Less than high school	74(8.4)
High School Diploma or GED	287(32.7)
Some College	139(15.8)
College Degree	180(20.5)
I don't know	197(22.5)
Family Household Income	
Under \$20,000	34(3.8)
\$20,000–\$44,999	68(7.5)
\$45,000–\$74,999	67(7.4)
\$75,000 or more	74(8.2)
I don't know	658(73.0)
Weight Category	
Underweight	11(1.2)

Demographic	N (M, SD) or N (Valid %)
Healthy Weight	469(51.1)
Overweight	187(20.4)
Obese	251(27.3)

Note: N, number. M, mean. SD, standard deviation.

* Age calculated from Participant's Date of Birth to Date of Measurement.

Table 2**PedsQL 4.0 Total Scale Scores and CDC Weight Category**

	N	Overall			Male			Female		
		N	M	SD	N	M	SD	N	M	SD
Underweight	11	75.69	9.43	7	79.81	8.58	4	68.48	6.34	
Healthy Wt	469	76.77	14.26	216	78.98	14.23	253	74.88	14.05	
Overweight	187	77.37	14.31	88	80.76	14.16	99	74.36	13.82	
Obese	251	74.15	14.29	148	75.91	14.49	103	71.61	13.64	
Overall	918	76.16	14.26	459	78.35	14.31	459	73.98	13.90	

Note. CDC, Centers for Disease Control and Prevention. Wt, weight. N, number. M, mean. SD, standard deviation.

Table 3

PedsQL 4.0 Subdomain Scale Scores and CDC Weight Category

	Physical			Psychosocial			Emotional			Social			School		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Underweight	11	78.41	14.75	11	74.24	12.90	11	75.45	11.28	11	83.18	13.09	11	64.09	21.07
Healthy Wt	465	81.45	15.49	465	74.39	15.51	465	71.54	20.28	465	80.89	17.23	465	70.72	18.29
Overweight	184	82.22	14.82	184	74.81	15.73	184	71.15	21.33	184	82.09	16.76	184	71.18	17.50
Obese	248	77.29	15.53	248	72.41	15.91	248	70.04	20.41	248	78.04	18.56	248	69.15	18.03
Overall	908	80.43	15.46	908	73.93	15.64	908	71.10	20.44	908	80.39	17.51	908	70.30	18.09

Note. CDC, Centers for Disease Control and Prevention. Wt, weight. N, number. M, mean. SD, standard deviation.

Table 4
Pediatric Quality of Life Multidimensional Fatigue Scale Total Scores and CDC Weight Category

	N	<u>Total</u>			<u>Male</u>			<u>Female</u>		
		M	SD	N	M	SD	N	M	SD	N
Underweight	11	72.31	13.27	7	76.73	13.86	4	64.58	8.82	
Healthy Weight	469	70.37	16.45	216	71.95	15.98	253	69.02	16.75	
Overweight	187	69.76	17.84	88	72.55	17.91	99	67.28	17.50	
Obese	251	68.90	15.04	148	70.95	15.18	103	65.97	14.41	
Overall	918	69.87	16.33	459	71.82	16.06	459	67.92	16.38	

Note. CDC, Centers for Disease Control and Prevention. N, number. M, mean. SD, standard deviation.

Table 5
Pediatric Quality of Life Multidimensional Fatigue Scale Subdomain Scores and CDC Weight Category

	General Fatigue			Sleep/Rest Fatigue			Cognitive Fatigue		
	N	M	SD	N	M	SD	N	M	SD
Underweight	11	75.38	14.37	11	69.39	12.19	11	72.35	18.94
Healthy Weight	469	76.97	17.41	469	62.16	19.46	469	71.98	20.82
Overweight	183	76.26	18.47	183	61.58	20.66	183	72.26	21.54
Obese	251	75.16	16.67	251	61.67	18.18	251	69.88	20.79
Overall	914	76.31	17.39	914	62.00	19.29	914	71.46	20.93

Note. CDC, Centers for Disease Control and Prevention. N, number. M, mean. SD, standard deviation.