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RESEARCH PAPER

Well-Being in Rural Appalachia: Age and Gender Patterns Across Five Indicators

Lindsey Roberts[1] · Victoria Banyard[2] · John Grych[3] · Sherry Hamby[4]

Abstract Psychological studies often include indicators of physical and mental health as outcomes. However, researchers are now beginning to include a wide range of measures of well-being. The current study uses a cross-sectional community sample from rural Appalachia to examine age and gender trends in traditional outcome measures and in subjective measures of well-being, including health-related quality of life, mental health, positive self-regard, spiritual well-being, and posttraumatic growth. Analyses revealed that while health-related quality of life tends to be lower for older participants, mental health and spiritual well-being tend to be higher for older participants. Positive self-regard showed no significant effects for either age or sex. Curvilinear age effects were seen for health-related quality of life (cubic), spiritual well-being (quadratic), and posttraumatic growth (quadratic), suggesting possible turning points across the lifespan for these indicators of well-being. Significant main effects for sex were seen in health-related quality of life, mental health, and posttraumatic growth, with males reporting better physical and mental health and females reporting higher levels of posttraumatic growth. Intervention and prevention efforts might aim to promote aspects multiple aspects of well-being throughout the lifespan, particularly those aspects that are most stable across age and sex (such as a positive self-regard), and future research could expand upon these patterns to include an older population.

Keywords Well-being · Health · Lifespan · Rural

✉ Lindsey Roberts
thomala@bgsu.edu

[1] Department of Psychology, Bowling Green State University, Psychology Building, Bowling Green, OH 43403, USA

[2] Department of Psychology, University of New Hampshire, Durham, NH, USA

[3] Department of Psychology, Marquette University, Milwaukee, WI, USA

[4] Department of Psychology, Sewanee: The University of the South, Sewanee, TN, USA

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1 Introduction

The construct of well-being has become increasingly popular in the psychology literature (Grych et al. 2015). Traditionally, researchers have studied symptoms and diseases, and people who did not meet diagnostic criteria for any given disorder were considered healthy (Keyes 2007). More recently, however, researchers have begun to conceptualize health as more than a mere absence of pathology (Keyes 2007) and have instead been moving towards a multi-faceted model of health that also includes subjective perceptions of well-being, such as satisfaction with life (Diener et al. 2013), spirituality (Crowther et al. 2002), and posttraumatic growth (Tedeschi and Calhoun 2004). This research has also examined gender and several studies have explored age patterns, usually in a specific developmental stage such as adolescence or adulthood. College students, or adolescents or adults from more accessible, urban settings are most often studied. Variability across different socio-demographic niches particularly in rural communities is less understood. The current study examined associations with age and gender in a variety of self-report measures of well-being, including: health-related quality of life, mental health, subjective well-being, spiritual well-being, and posttraumatic growth. It explored cross-sectional differences by age and gender to more fully document the rich variation in strengths and well-being among rural community participants.

Researchers have made significant strides in studying perceptions of well-being, but there has yet to be a single agreed-upon operationalization. For example, some studies measured subjective well-being as a combination of satisfaction with life, presence of positive emotion, and absence of negative emotion (Diener and Suh 1998); others conceptualized it as a presence of pleasure and absence of pain (hedonic), a sense of meaning and self-realization (eudaimonic), or both (Ryan and Deci 2001). Further, there has been significant variability in the number of domains that studies measured (Lenzi et al. 2015; Pollard and Lee 2003; Ryff 1989). According to one review, definitions of well-being spanned five primary domains: physical, psychological, cognitive, social, and economic, but the majority (80%) of studies only used indicators from a single domain, and another 13% only measured well-being with indicators from two domains (Pollard and Lee 2003). However, measuring only one or two domains fails to adequately capture the multidimensional nature of the construct (Grych et al. 2015; Lenzi et al. 2015; Sabina and Banyard 2015). Unfortunately, varying definitions with different degrees of overlap have led to mixed findings regarding age patterns and gender differences among the different constructs. Below, we review traditional indicators of well-being that have been studied, usually separate from one another.

1.1 Traditional Indicators

Research on age and gender patterns among more traditional indicators of well-being—health-related quality of life and mental health—is fairly consistent and well-established. Large scale, global studies have found that the prevalence of chronic health problems increases with age (Scott et al. 2008; WHO 2003), with health-related quality of life being closely related. Although men and women are largely affected by the same basic diseases (e.g., cardiovascular diseases, cancers, musculoskeletal diseases), both biological and social differences affect the degree to which men and women are exposed

to certain risk factors—leading to differing rates of specific diseases (WHO 2003)—and likely affecting the degree to which health problems contribute to overall quality of life.

The gender patterns for mental health issues are similar—both men and women are roughly equally likely to experience psychological disorders (Kessler et al. 2005), but tend to have different disorders (Rosenfield and Mouzon 2013). Internalizing disorders (such as anxiety and depression) are more prevalent in women, while externalizing disorders (such as conduct disorder and antisocial behavior) are more commonly found in men (Rosenfield and Mouzon 2013; WHO 2002). Unlike physical diseases that negatively affect health-related quality of life, prevalence of mental health disorders—most notably anxiety and depression—tend to decrease with age (Scott et al. 2008). For many people, physical health and mental health are closely linked—for instance, among people with mental illness, there was a higher prevalence of co-morbid physical illness (Jones et al. 2004)—and both directly affected health-related quality of life.

1.2 Positive Self-Regard

Satisfaction with life—a subjective appraisal of global quality of life (Diener et al. 1985)—is one of the most-commonly studied facets of subjective well-being (Pavot and Diener 2008). Self-concept and life regard are less often included in studies of well-being. Self-concept includes aspects of self-appraisal, such as self-esteem and a sense of mastery (Turner et al. 2012), and life regard entails having a positive regard for and sense of meaning in life (Battista and Almond 1973), both distinct but complementary aspects of positive self-regard. Several studies have examined age patterns in life satisfaction, and age was often a significant predictor (Diener and Suh 1998; Fugl-Meyer et al. 2002; Horley and Lavery 1995; Stone et al. 2010). Although there have been some conflicting findings on the nature of the relationship, multiple studies have found that life satisfaction was tied to increasing age (Fugl-Meyer et al. 2002; Horley and Lavery 1995). Age has also been linked to self-concept, with self-concept decreasing during pre- and early-adolescence, but then systematically increasing throughout adolescence and early adulthood (Marsh 1989). Regarding gender, studies have generally found no relationship between gender and the various components of positive self-regard (Fugl-Meyer et al. 2002; Harter 1982; Marsh 1989). Even in studies that have found significant differences, men and women showed very similar patterns of well-being (Stone et al. 2010).

1.3 Spiritual Well-Being

Much like other aspects of well-being, spirituality has been conceptualized and measured in various ways (Benson 2004; Scarlett and Warren 2010). Spirituality has sometimes been operationalized as affiliation with an organized religion, while other times, it has been conceptualized as an intrinsic and informal construct (Crowther et al. 2002; Scarlett and Warren 2010). Because of differing operational definitions, studies examining age and gender patterns in religion and spirituality often reported on slightly different aspects. A national survey in the United States showed that Americans between the ages of 18 and 29 years old were less likely than their older peers to identify as religious, to attend religious services, and to report engaging in private religious practices such as daily prayer (Pew Research Center 2010). Unfortunately, this survey did not include participants under 18, so no comparisons included younger peers. However, in a descriptive study spanning three national surveys, Smith et al. (2002) documented that among adolescents, girls were

more likely to be involved in religious services and to feel close to God. These gender differences persisted through early and later adulthood, with women and men engaging in different aspects of religion (Bryant 2007). The most recent national survey in the United States showed that women were far more likely than men to identify as Christian (the most prevalent faith in the country), while men were more likely than women to identify as "religiously unaffiliated" (Pew Research Center 2015).

1.4 Posttraumatic Growth

Posttraumatic growth is both a process and an outcome in which a person is able to experience positive change resulting from a highly stressful event; often, this growth coexists alongside significant personal distress (Tedeschi and Calhoun 2004). It is often studied in populations that have undergone a specific trauma, such as being diagnosed with an illness, a natural disaster, or loss of a loved one (Vishnevsky et al. 2010). Regarding age, one meta-analysis found that posttraumatic growth increased incrementally with age (Vishnevsky et al. 2010). Regarding gender patterns, two meta-analyses have found that across more than 70 studies spanning multiple types of trauma, women tended to report more posttraumatic growth than did men (Helgeson et al. 2006; Vishnevsky et al. 2010); however, the authors noted that in some studies, the sex composition of the sample was confounded with the nature of the stressor (e.g., women were more likely than men to experience breast cancer and sexual assault). Even so, these gender differences were notably small, yielding only mild-to-moderate effect sizes. Collectively, these findings suggest that while posttraumatic growth varies slightly with gender and age, the similarities likely outweigh the differences.

1.5 A Taxonomy of Outcomes

For many people, the various aspects of health and well-being are intertwined. For example, the traditional indicators of physical and mental health have long been linked to one another (Jones et al. 2004; Kessler et al. 2005; Scott et al. 2008), and have also been linked to more recently-included indicators of well-being, including subjective well-being and spirituality. For instance, physical health has been positively linked to spirituality (Chiswick and Mirtcheva 2013; Cotton et al. 2006; Hill and Pargament 2003) and subjective well-being (Diener and Chan 2011; Okun et al. 1983); mental health has also been positively associated with spirituality (Hackney and Sanders 2003) and subjective well-being (Keyes 2002). Similarly, spirituality has been positively associated with posttraumatic growth (Shaw et al. 2005) and subjective well-being (Ellison 1991). Given that these outcomes are often linked to one another, including a variety of indicators provides a more complete picture of the many facets of well-being.

1.6 Rural Appalachian Indicators

While urban settings are well-represented in the literature, rural samples are less common. However, it is possible that well-being might differ depending on geographic location. For instance, regarding the traditional indicator of health-related quality of life, rural Appalachia has often ranked among the lowest national percentiles on indices of healthcare costs, coverage, and access, resulting in barriers to accessing care and premature mortality (Appalachian Regional Commission 2012); further, counties that ranked the lowest on several health indicators are often concentrated in rural areas. Similarly, the incidence of

both major depressive disorder and severe psychological distress were also higher in Appalachia than in the rest of the United States (Appalachian Regional Commission 2008; Post et al. 2013); once again, these disparities concentrated around rural coal-mining regions. However, it should be noted that these findings relate to Appalachia specifically. In another study that focused on health discrepancies, Amato and Zuo (1992) found that although participants in urban areas reported higher health than participants in rural areas, neither happiness nor depression varied by location.

In light of the evidence that rural Appalachia tends to trail the rest of the country in traditional indicators of well-being, Wilson et al. (1997) argued that because poverty is so widespread in many rural Appalachian regions, indicators such as income or objective economic conditions may be less influential in predicting life satisfaction than they might be in other more urban areas, and that instead more subjective indicators such as self-perceived personal, family, or community circumstances might better reflect regional values and perceptions of well-being. In their longitudinal study of youth from rural Appalachia, Wilson et al. (1997) found that neither gender nor family income were correlated with life satisfaction, and that in general, when compared to objective variables, subjective variables (e.g., goals, self-esteem) explained a larger portion of the overall variance in life satisfaction. Similarly, other studies have also found that even when no demographic predictors were significant, subjective indicators—including spirituality—have been associated with life satisfaction in a rural sample (Yoon and Lee 2006). These findings underscore the need to include both objective and more subjective indicators when assessing well-being in this understudied region. Understanding more about the presence of a variety of dimensions of perceptions of well-being can shed important light on sources of strength as well as risk for health problems in rural samples.

1.7 The Current Study

The current study used a large community sample from rural Appalachia to examine age and gender patterns in multiple domains of well-being, including: health-related quality of life, mental health symptoms, positive self-regard, spiritual well-being, and posttraumatic growth. The taxonomy of outcomes included here built on prior empirical work that focused on age and gender patterns but included a larger variety of domains (Lenzi et al. 2015; Pollard and Lee 2003). Moreover, the current study is a first step to studying multiple developmental time points in the same study and using the same set of outcomes. By spanning both adolescence and adulthood in the same study, we were also able to examine curvilinear patterns among variables, potentially providing a more comprehensive view of how these outcomes might change (or stabilize) across the lifespan.

The extensive age range of this sample allowed us to examine developmental patterns from early adolescence through middle adulthood; it is uncommon for samples to include both adolescents and adults. Further, the large sample size allowed us to explore whether gender interacts with age and whether age patterns vary for men and women. Once again, we were able to examine whether a linear or curvilinear trend best represents the patterns seen for men and women. Based on existing literature, we hypothesized that health-related quality of life would decline with age, while mental health would increase with age; we predicted that there would be no observed gender differences. Regarding perceptions of well-being, we hypothesized that all three measures—positive self-regard, spiritual well-being, and posttraumatic growth—would increase with age. Regarding gender differences, we expected that there would be no gender differences for positive self-regard, but that

women would score higher than men on measures of both spiritual well-being and post-traumatic growth.

2 Methods

2.1 Participants

As part of a larger study on character development and personal strengths, 2444 individuals participated in the study. Participants ranged in age from 11 to 79 years old ($M = 30.0$ years; $SD = 13.2$ years), and 64% were female. Our sample was drawn from a largely rural area of the Southern United States, with 88% of the sample living in a small town (population less than 20,000) or rural area (population less than 2500). Regarding education, 18% of participants were currently attending either middle or high school; 7% of participants did not graduate high school; 35% of participants completed high school or a GED; 40% of participants had at least some education beyond high school. Regarding employment, nearly half (47%) of participants were employed full-time, while 14% were employed part-time, and 20% were unemployed (or laid off) and looking for work. Over one-third (39%) of participants reported a total household income (for 2012) of less than $20,000, another 36% reported a total household income of between $20,000 and $50,000, and one quarter (25%) of participants reported a total household income of more than $50,000; more than one-third (36%) of participants reported receiving federal aid such as food stamps or Medicare. Similar to census data for the region, 77% of participants reported their race as White Non-Latino, 12% reported Black Non-Latino, 7% reported Latino/a, and 4% reported Multiracial.

2.2 Procedure

Participants were recruited through a range of advertising techniques. The majority of participants (76%) were recruited at local community events, such as local arts and crafts festivals and county fairs. Word-of-mouth was the second most productive recruitment strategy, accounting for 12% of participants. The remaining 12% were recruited through other strategies, including flyers, newspaper and radio ads, and direct mail. This wide range of recruitment strategies allowed us to reach segments of the population who are rarely included in psychology research. Interviewers offered to meet participants in multiple locations throughout the community (including our research center, other campus locations, their homes, restaurants, and parks), during daytime or evening hours. This flexibility provided people with limited availability or transportation an opportunity to participate. This region of Appalachia still has limited and often unreliable cellular and internet service; therefore, the survey software was specifically chosen to operate without internet connectivity. The survey was administered using Snap10 survey software on laptops and iPads. An audio option was available. Technical problems (such as iPads overheating) and time limitations prevented some individuals from completing the survey; overall, the completion rate was 85% and the median completion time was 51 min. This is an excellent result by current survey standards, especially considering the fairly long survey, with current completion rates often under 70% (Abt SRBI 2012) and sometimes under 50% (Galesic and Bosnjak 2009). All participants received a $30 Walmart gift card and information on local resources. Participants over the age of 18 gave informed consent for themselves; for

participants under 18 years old, researchers obtained both consent from parents and assent from the participant. The IRB of the study's home institution, Sewanee: The University of the South, approved all procedures.

2.3 Measures

2.3.1 Health-Related Quality of Life

To measure health-related quality of life, 5 items were adapted from three modules of the Healthy Days measure (Control & Prevention 2000). One item asked about general health (with answers ranging from "poor" to "excellent), and four items assessed health over the past 30 days. Three items were reverse coded, and item-level raw scores were converted into standardized z-scores. To address validity, a pilot study was conducted with 104 participants from the same community, and internal consistency (Cronbach's alpha) was .74; moderate correlations with other outcome measures also suggest convergent validity. For participants who responded to at least half of the items on the scale, z-scores were used to calculate a scale-level mean, with higher scores indicating better health-related quality of life.

2.3.2 Mental Health

Ten items from the Trauma Symptom Checklist for Children (Briere 1996) assessed psychological symptoms over the past 30 days. An adolescent version of the scale, which uses simplified wording to assess common symptoms, was selected so that the same version of the scale could be given to both adolescents and adults in order to facilitate comparison across ages. Samples of symptoms included feeling lonely, feeling sad or unhappy, wanting to yell at people, and worrying about things. Participants responded on a 4-point Likert scale ranging from "not true about me" to "mostly true about me," and items were reverse coded so that higher scores indicated better mental health. Therefore, this scale measures mental health as an absence of symptoms rather than through the presence of positive facets of mental health. Item-level scores were then converted into standardized z-scores, which were used to create a scale-level mean for participants who answered at least half of the items on the scale.

2.3.3 Positive Self-Regard

Items from several well-established scales were compiled to assess positive self-regard, including: 5 items from the Satisfaction with Life Scale (Diener et al. 1985), 4 items from the Self-Concept Scale (Turner et al. 2012), and 4 items from the Life Regard Index (Battista and Almond 1973). To address validity, a pilot study was conducted with 104 participants from the same community, and internal consistency (Cronbach's alpha) was .94; moderate to strong correlations with other outcome measures also suggested convergent validity. In an exploratory factor analysis of the main sample, all 13 items loaded onto the same factor; therefore, for analyses, all three components are included in a single scale. Participants responded to all items using a 4-point Likert scale ranging from "not at all true" to "mostly true," and item-level scores were standardized into z-scores. For participants who responded to at least half of the items in the scale, z-scores were used to calculate a scale-level mean, with higher scores indicating more subjective well-being.

2.3.4 Spiritual Well-Being

The Awe Index (Hamby et al. 2013) comprised 5 original items that assess a sense of spiritual well-being from diverse sources, including both traditionally-religious and non-religious sources. To address validity, a pilot study was conducted with 104 participants from the same community, and internal consistency (Cronbach's alpha) was .81; strong correlations with other outcome measures also suggested convergent validity. In an exploratory factor analysis of the main sample, all items loaded on the same factor. Participants responded using a 4-point Likert scale ranging from "not at all true" to "mostly true," and item-level scores were standardized into z-scores. For participants who responded to at least half of the items in the scale, z-scores were used to calculate a scale-level mean, with higher scores indicating more spiritually-derived well-being.

2.3.5 Posttraumatic Growth

The Posttraumatic Growth Inventory (Tedeschi and Calhoun 1996) assessed positive outcomes following trauma or adversity. We included 9 items (of 21) that asked participants to think of "the most stressful event experienced in the past year," and that assessed whether participants experienced increased strengths, spirituality, and appreciation of life as a result. To address validity, a pilot study was conducted with 104 participants from the same community, and internal consistency (Cronbach's alpha) was .90; strong correlations with other outcome measures also suggested convergent validity. Participants responded using a 4-point Likert scale ranging from "not at all true" to "mostly true," and item-level scores were standardized into z-scores. For participants who responded to at least half of the items in the scale, z-scores were used to calculate a scale-level mean, with higher scores indicating more posttraumatic growth.

3 Results

To smooth trends and minimize influence of extreme values, moving averages were calculated for each outcome by averaging across three time points (e.g., the plotted value for 14–15 year olds is the average of values for 12–13 year olds, 14–15 year olds, and 16–17 year olds), and the standardized scores for each outcome were plotted as a function of age and gender. Descriptive statistics for measures are included in Table 1, and correlations between demographic variables and measures are presented

Table 1 Descriptive statistics for scales

Scale	N	Cronbach's α	Min.	Max.
HRQOL	2536	.81	− 3.70	1.42
Mental health	2554	.90	− 2.44	1.45
Positive self regard	2494	.94	− 3.09	1.53
Spiritual well-being	2417	.85	− 2.51	1.10
Posttraumatic growth	2527	.90	− 2.98	1.12

Cronbach's alphas listed are for the primary sample only. As scales were centered, means are 0 and standard deviations are 1

HRQOL health related quality of life

Table 2 Correlations between variables

Scale	Age	Gender	HRQOL	Mental health	Positive self regard	Spiritual well-being	Posttraumatic growth
Demographics							
Education	.44**	.06*	.07*	.14**	.07**	.04*	.08**
Employment	.32**	− .06**	.13**	.16**	.07*	.01	.03
Income	.12**	− .07*	.27**	.19**	.21**	.04*	− .05*
Financial strain	.10**	.06*	− .34**	− .26**	− .26**	− .05*	− .00
Relationship status	.21**	.02	.02	.13**	.10**	.05*	.04*
Primary variables							
HRQOL	− .18**	− .11**					
Mental health	.15**	− .08**	.38**				
Positive self regard	− .01	− .01	.33**	.38**			
Spiritual well-being	.10**	.04	.12**	.18**	.58**		
Posttraumatic growth	.05*	.09**	.11**	.10**	.55**	.58**	–

Gender coded such that 0 = Female and 1 = Male; Relationship Status coded such that 0 = not currently in a relationship and 1 = currently in a relationship; Employment coded such that 0 = not employed full time and 1 = employed full time; *HRQOL* health related quality of life

*$p < .01$; **$p < .001$

in Table 2. Relations of demographic indicators with age and gender were small to moderate, with significant relations ranging from .06 to .44. The strongest of these relations were between age and employment ($r = .44$) and age and education ($r = .32$); the remainder of the correlations were small in magnitude ($r < .2$). Relations between demographic indicators (other than age and gender) with variables of interest were weak, with significant correlations ranging from .04 to − .26. Of the primary variables of interest, correlations were small to large, ranging between .10 and .58.

Regression analyses were used to test the linear, quadratic, and cubic effects of age in addition to interactions with sex. In each model, age and sex were entered in step 1; the quadratic and cubic terms for age were added in step 2; the interaction terms (age by sex, age squared by sex, and age cubed by sex) were added in step 3. Age terms were centered and relations were graphed following recommendations from Aiken et al. (1991). Although sex was significantly correlated with the three age terms (r's ranged from .059 to .076), the small correlation coefficients suggests that relations between predictors likely had minimal effects on the predictive power of individual variables. In the event of missing values, prorated means were calculated if participants answered at least half of the items in a given scale. The most parsimonious model is reported below such that, if interaction terms entered on later steps of the equation did not contribute significantly to the variance in the outcome variable, that step of the analysis was removed. However, r^2 for each model tested are presented in Table 3, and complete regression analyses are presented in Table 4.

Table 3 Changes in the explained variance

	R^2	Δ F	*p*
Health-related quality of life			
Step 1	.042	51.96**	.000
Step 2	.053	13.20**	.000
Step 3	.055	1.90	.127
Mental health			
Step 1	.032	39.87**	.000
Step 2	.032	.14	.869
Step 3	.032	.79	.499
Positive self-regard			
Step 1	.000	.45	.637
Step 2	.005	5.56*	.004
Step 3	.007	1.25	.290
Spiritual well-being			
Step 1	.010	10.97**	.000
Step 2	.014	4.89*	.008
Step 3	.016	1.86	.134
Posttraumatic growth			
Step 1	.008	9.40**	.000
Step 2	.009	1.51	.222
Step 3	.012	2.55	.054

*$p < .01$; **$p < .001$

3.1 Health-Related Quality of Life

Age trajectories and gender differences for health-related quality of life are shown in Fig. 1. In step 1 of the hierarchical regression analyses, both the linear effect of age and gender contributed significantly to the model, $F(2,2368) = 51.96$, $p < .000$, and explained 4.2% of the overall variance. Health-related quality of life was lower for older participants, and men scored higher than women [t (2484) = 5.29; $p < .01$]. Introducing the quadratic and cubic terms for age explained at additional 1.1% of the overall variance ($p < .000$), and the model as a whole remained significant, $F(4,2366) = 32.85$, $p < .000$. The linear effect of age, the quadratic effect of age, and sex accounted for unique portions of explained variance. Adding interactions between linear, quadratic, and cubic models of age with sex did not explain a significant amount of additional variance (see Table 1 for changes in variance explained at each step of the model). Looking at Fig. 1, mean scores for health-related quality of life were lower for older participants, with the slope changing around the late 20's. The gender disparity appears to be smaller in later adulthood; rate of change increased for males in the mid- to late-20s (as opposed to in late adolescence for females).

3.2 Mental Health

See Fig. 2 for age trajectories and sex differences in mental health. In step 1 of the hierarchical regression analyses, both the linear effect of age and gender contributed significantly

Table 4 Results of multiple regression analyses

Predictor	HRQOL			Mental health			Positive self regard			Spiritual well-being			Posttraumatic growth		
	β	t	*p*	β	t	*p*	β	t	*p*	β	t	*p*	β	t	*p*
Step 1		8.94	.000		− .20	.843		1.06	.291		− 3.46	.001		− 4.06	.000
Age	− .17	− 8.59	.000	.16	7.79	.000	− .01	− .26	.798	.09	4.40	.000	.04	1.73	.083
Sex	− .10	− 4.84	.000	− .10	− 4.92	.000	− .02	− .90	.371	.03	1.27	.203	.08	3.84	.000
Step 2		8.30	.000		− .47	.637		.70	.487		− 3.83	.000		− 2.71	.007
Age	− .25	− 8.41	.000	.17	5.51	.000	− .03	− 1.01	.313	.10	3.30	.001	.03	.92	.355
Sex	− .10	− 4.73	.000	− .10	− 4.92	.000	− .02	− .81	.418	.03	1.34	.181	.08	3.80	.000
Age^2	.09	2.02	.044	.02	.43	.670	.11	2.46	.014	.14	3.30	.002	− .07	− 1.70	.090
Age^3	.05	.95	.341	− .03	− .53	.597	− .04	− .79	.430	− .12	− 2.14	.032	.07	1.21	.227
Step 3		4.79	.000		1.07	.285		− .16	.873		− .83	.409		− 1.75	.080
Age	− .45	− 4.07	.000	.01	.08	.940	− .03	− .28	.779	− .03	− .29	.774	.03	.27	.789
Sex	− .12	− 3.75	.000	− .10	− 3.12	.002	.02	.59	.556	.07	2.24	.025	.14	4.46	.000
Age^2	− .11	− .74	.463	− .02	− .10	.920	.29	1.89	.059	.34	2.21	.027	.30	1.97	.049
Age^3	.44	2.42	.015	.13	.73	.466	− .09	− .48	.632	− .15	− .77	.442	− .21	− 1.13	.259
Age × sex	.20	1.84	.067	.17	1.49	.136	.00	.02	.982	.14	1.25	.210	.00	.01	.994
Age^2 × sex	.21	1.37	.171	.03	.21	.833	− .20	− 1.23	.221	− .23	− 1.42	.156	− 2.58	− 2.58	.010
Age^3 × sex	− .42	− 2.23	.026	− .17	− .89	.374	.05	.27	.784	.04	.21	.833	1.57	1.57	.117

HRQOL health related quality of life

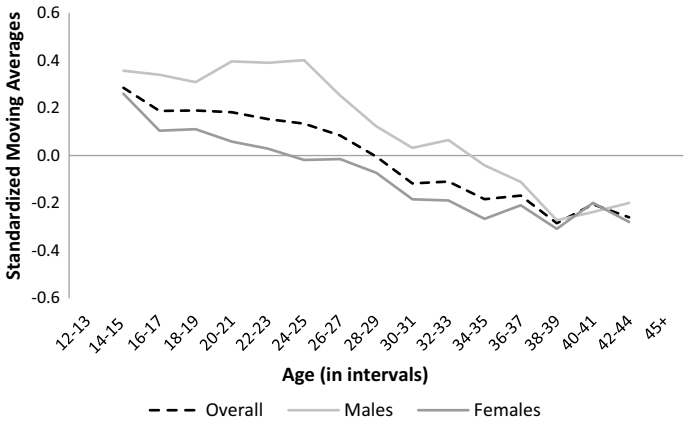

Fig. 1 Age and sex patterns in health-related quality of life. Note: Significant linear and quadratic effects of age. Significant main effect for sex

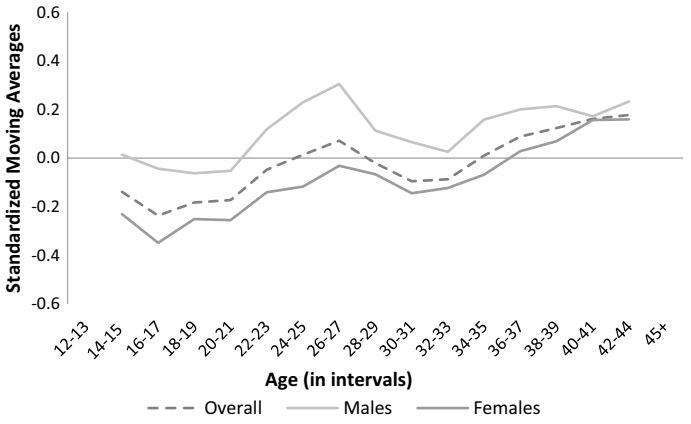

Fig. 2 Age and sex patterns in mental health. Note: Significant linear effect of age. Significant main effect of sex. This scale is coded such that mental health is represents an absence of symptoms of mental illness

to the model, $F(2,2383) = 39.87$, $p < .000$, and explained 3.2% of the overall variance. The linear effect of age and sex accounted for unique portions of explained variance. Neither adding curvilinear age effects nor interactions of age and sex explained a significant amount of additional variance (see Table 1 for changes in explained variance at each step of the model). Males tended to have better mental health throughout the lifespan [$t(2502) = 4.20$; $p < .01$]. As Fig. 2 shows, mean scores for mental health appeared to be lowest in mid-adolescence, but tended to be higher throughout early adulthood.

3.3 Positive Self-Regard

Age trajectories and gender differences for positive self-regard are shown in Fig. 3. Step 1 of the hierarchical regression model was non-significant. However, introducing the

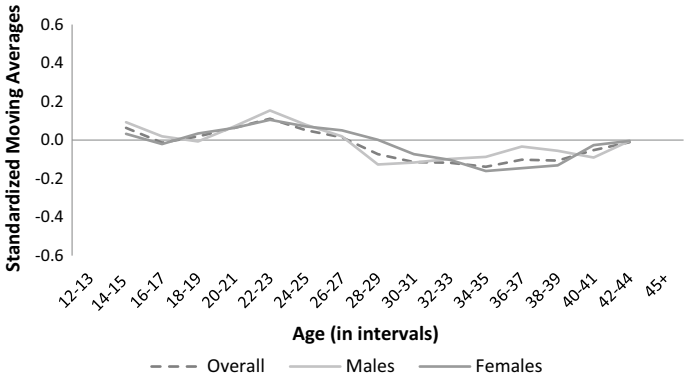

Fig. 3 Age and sex patterns in positive self-regard. Note: Significant quadratic effect of age

quadratic and cubic age terms to the model (step 2) did contribute significantly to the model, $F(4,2339) = 3.01$, $p < .05$, and explained 7.2% of the overall variance. The quadratic effect of age accounted for a unique portion of explained variance. Adding interactions between linear, quadratic, and cubic models of age with sex did not explain a significant amount of additional variance (see Table 1 for changes in explained variance at each step of the model). Figure 3 shows that positive self-regard scores were the highest for participants in their early 20s, and were lowest for participants in their mid-30s.

3.4 Spiritual Well-being

Age trajectories and gender differences for spiritual well-being are shown in Fig. 4. In step 1 of the hierarchical regression analyses, the linear effect of age contributed significantly to the model, $F(2,2276) = 10.97$, $p < .000$, and explained 1% of the overall variance. Introducing the quadratic and cubic terms for age explained at additional .4% of the overall variance ($p < .01$), and the model as a whole remained significant, $F(4,2274) = 7.95$, $p < .000$.

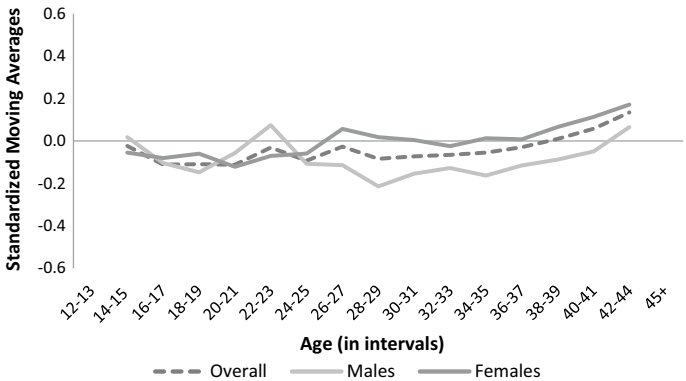

Fig. 4 Age and sex patterns in spiritual well-being. Note: Significant linear, quadratic, and cubic effects for age

The linear effect of age, the quadratic effect of age, and the cubic effect of age accounted for unique portions of explained variance. Adding interactions between linear, quadratic, and cubic models of age with sex did not explain a significant amount of additional variance (see Table 1 for changes in explained variance at each step of the model). Figure 4 shows that spiritual well-being appeared to be at the lowest in late adolescence, and at the highest in middle adulthood.

3.5 Posttraumatic Growth

Age trajectories and gender differences for posttraumatic growth are shown in Fig. 5. In step 1 of the hierarchical regression analyses, gender contributed significantly to the model, $F(2,2362) = 9.40$, $p < .000$, and explained .8% of the overall variance. Females tended to score higher on posttraumatic growth than did males [$t\ (2480) = -4.22$; $p < .01$]. Neither adding curvilinear age effects nor interactions of age and sex explained a significant amount of additional variance (see Table 1 for changes in explained variance at each step of the model). As Fig. 5 demonstrates, posttraumatic growth tended to be lowest in early adolescence, and appears to be highest in early adulthood (early 20s) and middle adulthood (early 40s).

4 Discussion

The current study presents age and sex patterns of multiple indicators of well-being—including health-related quality of life, mental health, positive self-regard, spiritual well-being and posttraumatic growth—from early adolescence through middle adulthood in a rural Appalachian sample. The majority of results are consistent with those found in the existing literature and extends the existing body of research on age and gender trends in well-being with a more comprehensive taxonomy of outcomes and a rural Appalachian sample. To our knowledge, the current study uses the largest psychological dataset to be collected in rural Appalachia and is the first to examine a wide variety of well-being indicators in both adolescents and adults. Further, it appears to be one of very few studies examining curvilinear trends in these indicators, with the curvilinear patterns seen in

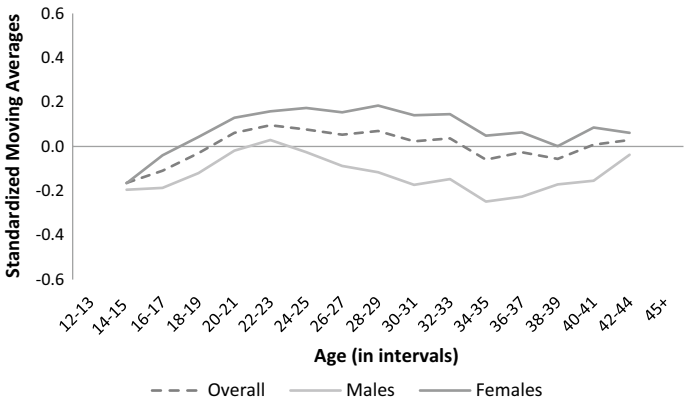

Fig. 5 Age and sex patterns in posttraumatic growth. Note: Significant main effect for sex

health-related quality of life, spiritual well-being, and positive self-regard suggesting that expanding beyond linear patterns is an important contribution of the current study.

Overall trends for the traditional health indicators—physical and mental health—were largely consistent with a well-established body of literature. Health-related quality of life demonstrated a curvilinear trend, with lower scores for older participants and an accelerated rate of change in early adulthood. Conversely, our data show a significant linear effect of age on mental health, increasing steadily over the lifespan (as evidenced by fewer symptoms of mental illness). Our data on mental health, however, diverge from much existing research in that they show a significant main effect of sex; whereas many studies show no difference between men and women, in our sample, men reported better mental health than women. This finding might be due in part to the symptoms included in the assessment, which are more oriented towards internalizing symptoms than they are towards externalizing symptoms. Given that women tend to exhibit more internalizing symptoms than do men (WHO 2002), our findings might reflect a bias in the *types* of symptoms experienced rather than a difference in *overall* rates of mental health. This explanation is also consistent with our finding that on average, women endorsed more symptoms, and therefore had lower mental health scores, than did men. Similarly, our data on health-related quality of life also diverge from existing literature, as we found a significant main effect for sex, with males reporting better health-related quality of life than females. Given that the measure asked about how health impacted quality of life (rather than being a checklist of symptoms), it is possible that given their particular social roles, health symptoms might affect women more substantially than they do men; alternatively, this finding might reflect that women were more likely than men to disclose that health problems have a negative impact on their lives. Lastly, although the effect sizes in our data are small, the large mean differences in age and sex indicate that these effects are nonetheless clinically relevant. Further, as both health-related quality of life and mental health can profoundly affect all areas of one's life, the age and sex differences may have important implications for both clinicians and researchers, particularly those interested in prevention and intervention efforts (e.g., programming may differ for men and women).

Positive self-regard did not differ by either age or sex, and scores were most similar for participants of all ages, suggesting that it might be most stable of the health outcomes included in this study. Similarly, scores on spiritual well-being were also fairly similar for participants of all ages and did not significantly vary by sex. Although these findings are somewhat inconsistent with existing literature on religiosity, which generally shows that women are more religious and that religiosity tends to increase with age, this discrepancy might simply reflect that our measure expands beyond traditional religiosity to include other sources of spiritual well-being and awe (e.g., nature). These findings suggest that both positive self-regard and spiritual well-being might be equally achievable for both men and women across ages, which is promising in light of Wilson et al. (1997) earlier work demonstrating the importance of subjective appraisals and spirituality in predicting happiness among a similar study sample. Further, these particular aspects of well-being stand out as two indicators that are less tied to tangible resources—such as access to health care—and are potentially promising targets for programs designed to promote well-being.

The curvilinear trend seen for posttraumatic growth was somewhat more surprising. Given that much of the existing research supports an increase in posttraumatic growth throughout the lifespan, the quadratic model of age was an unexpected finding. Patterns in our data suggest that while the ability to grow from trauma is higher for adults than adolescents, the rate of change of this growth may be slower during early adulthood. However, the patterns seen for men and women are consistent with much of the exiting research, with

females reporting statistically significant higher levels of growth. Also keeping with prior research, the differences between men and women are fairly small and generally follow the same trend, suggesting that the similarities between sexes likely outweigh the differences. It does appear, however, that men and women might differ the most on posttraumatic growth during early- and mid-adulthood, with smaller differences seen through later adulthood.

More research is needed to better understand the age patterns identified in the current study; identifying causal mechanisms could allow for targeted intervention efforts to promote multiple types of health and well-being. Rural Appalachia is an underserved, impoverished area of the country (Appalachian Regional Commission 2012). Although increasing tangible resources—such as infrastructure, transportation, and health care providers—is one promising target for intervention efforts, there may be other, less-costly ways to improve quality of life for both men and women of all ages. Individual, resilience-based protective factors are resources that may be strengthened in many different community settings (Maton 2008). Previous research has found that rural communities are often underserved by formal helping sites (e.g., medical and mental health centers), but rural residents are also less likely to seek services in these locations (Gessert et al. 2015). However, protective factors such as forgiveness, gratitude, or optimism can be strengthened in many different settings, such as churches, community clubs, or youth organizations. Further, research suggests that there may be culturally-specific aspects of resilience that may be particularly important for this region (Gessert et al. 2015; Woodard 2011), including strengths such as self-reliance, spiritual well-being, and fulfilling social roles. More research is needed to understand how strengths may interact with a cultural context to promote well-being. Additionally, work by Peterson and Seligman (Peterson and Seligman 2004) suggests that other character traits, such as curiosity, kindness, and hope, may be more universal and generalizable, and may help promote health and buffer against negative effects of poverty and other stressors. Further research is needed to examine which aspects of resilience generalize across not only demographic variables, such as gender and age, but also across cultural and geographic context. The current study begins to address this question, and results suggest age and gender trends that are likely generalizable beyond the scope of the current sample. Understanding typical age and gender patters is important for designing effective and cost-efficient intervention and prevention efforts. Although there is certainly individual variation, prevention programs may benefit from understanding which assets and vulnerabilities men and women may be most likely to experience at a given age. For example, programs would likely benefit from understanding whether there are common gender differences at a certain age, and whether they should target boys and girls differently. The results of the current study begin to inform this effort by examining which components of well-being may be particularly important (or particularly challenging) for certain age groups.

4.1 Limitations

As always, limitations of the data should be considered. Primarily, as the data are cross-sectional, we are only able to examine patterns and trends rather than trajectories. Similarly, we are also unable to control for potentially-confounding cohort effects. However, by using cross-sectional data, we were able to collect a much larger sample and include many more age ranges than we would otherwise. Statistically, by using non-linear terms to explore age patterns, we are unable to prevent strong correlations

between the non-linear predictors, potentially posing issues with collinearity. Although it is likely that the high correlations among non-linear age terms attenuate the predictive power of individual variables, this limitation does not affect the predictive power of the overall model. Further, we felt that the potential benefits of exploring non-linear relationships outweighed the potential statistical limitations inherent with creating quadratic and cubic terms. Similarly, the current paper does not examine the effect that other demographic indicators may have on well-being. However, the relations between these indicators and variables of interest were weak and in the expected directions; therefore, by excluding traditional control variables, we were able to maintain focus on age and gender trends.

Finally, although the unique sample is an asset to the current study, it also potentially limits the ability to generalize findings. For instance, although the demographic composition of our sample is consistent with census data for the area, the sample is primarily White; thus, our findings may not generalize to minorities. Further, our sample was primarily an opportunity sample in that it includes participants who were available at the time the study was being conducted. Although this sampling method may have resulted in a small selection bias (e.g., participants who are prosocial) and may therefore further limit the generalizability of our findings, researchers made extensive efforts to offer the opportunity to participate to a wide range of audiences. For example, researchers offered to meet participants at many locations, including participants' homes, in the evenings and on weekends to ensure that our survey was available to participants with limited transportation, child care conflicts, or variable work schedules. Additionally, researchers carefully chose a survey platform that would operate without an active internet or phone connection to allow for the inclusion of participants who may not have the financial or geographic access to these services, as well as selected the measures and worded the survey so that it would be accessible to participants with limited reading ability. However, despite these efforts, our sample is most representative of community members with at least a 6th grade reading level and some basic familiarity with computers.

4.2 Future Directions

The current study highlights the importance of including a variety of indicators of well-being. Although traditional indicators are an important piece of understanding the health of a community, they do not fully encompass well-being. Similarly, while subjective indicators are important predictors of happiness (Wilson et al. 1997), they alone cannot provide a complete picture of well-being (Diener and Chan 2011). Further, the current study highlights the importance of including both adolescents and adults in the same sample, as focusing on only one group precludes examining long-term patterns that span multiple developmental periods. Finally, while linear trends are most often studied, future research should also test for curvilinear effects. Overall, our findings highlight important trends in both traditional and subjective indicators of well-being; however, future research could use longitudinal methods to further examine trajectories in well-being. Similarly, future research could expand the age range to include older adults throughout important life periods that often do not occur before age 45 (such as retirement). These findings suggest that other aspects of well-being—such as positive self-regard and spirituality—might be promising targets for intervention efforts, as they are could be less costly ways to improve quality of life for both men and women of all ages.

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