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The Ups and Downs of Self-Regulation: Tracing the Patterns of Regulatory Abilities From Adolescence to Middle Adulthood in a Rural Sample

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Self-regulation is the ability to maintain physiological, emotional, cognitive, and behavioral control, particularly during times of adversity and distress. Although it has been a popular research topic, relatively few studies have included adolescents and adults in the same sample without large age gaps between the 2 groups. This study uses cross-sectional data from a large rural community sample of adolescents and adults ($N = 2,565$) to trace the trajectory of 5 regulatory abilities: emotional regulation, emotional awareness, anger management, psychological endurance, and coping. Gender differences also were tested. Analyses revealed that all types of regulatory ability except coping showed an overall linear increase from adolescence to adulthood. Emotional awareness displayed significant curvilinear effects of age. In general, adolescent participants reported the lowest levels of regulatory ability, while emerging adulthood and the entrance into middle adulthood appeared to be periods of growth for most regulatory strengths. Females displayed greater emotional awareness than males, although males displayed better emotional regulation. Although vulnerability during adolescence has been documented in previous research, the difficulties in self-regulation during young adulthood are relatively novel findings. Intervention and prevention efforts might seek to enhance interpersonal resources for adolescents and new parents to mitigate these periods of risk and promote growth.

Keywords: age trends, patterns, self-regulation, adolescence, rural

Self-regulation is the ability to maintain physiological, emotional, cognitive, and behavioral control, particularly during times of adver-

sity and distress (Grych, Hamby, & Banyard, 2015). Low regulatory ability has been linked to the development of several internalizing disorders, especially anxiety and depression (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Garnefski & Kraaij, 2006; Silk, Steinberg, & Morris, 2003) as well as externalizing disorders (Hill, Degan, Calkins, & Keane, 2006), aggression, and other problem behavior (Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Silk et al., 2003). The development of regulatory abilities across the life span has been the topic of extensive research (John & Gross, 2004; McRae et al., 2012; Nolen-Hoeksema & Aldao, 2011), which has led to apparent contradictions in the literature (Silvers et al., 2012). Although some studies have found that regulatory ability increases linearly with age (Carthy,

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Horesh, Apter, Edge, & Gross, 2010; Crone & Van Der Molen, 2007), others have found a quadratic effect (Carstensen et al., 2011; Casey et al., 2010) or both linear and quadratic effects (McRae et al., 2012; Silvers et al., 2012). Significant quadratic effects indicate that the slope of the trajectory of regulatory ability changes direction at some point in the life span rather than increasing linearly from beginning to end. The mixed nature of these findings is partially attributable to the complex interactions among several factors: neuroanatomy, cognitive development, and changes in social roles (McRae et al., 2012).

Several methodological issues also might contribute to the difficulty in tracing the development of regulation across the life span. First, there are very few studies that compare adults with adolescents, and those that do often have large age gaps between them (Garnefski, Legerstee, Kraaij, Van Den Kommer, & Teerds, 2002; Zimmermann & Iwanski, 2014). Second, children, adolescents, and adults will sometimes complete different measures, making it difficult to draw comparative conclusions (Amirkhan & Auyeung, 2007; Zimmermann & Iwanski, 2014). Further, because of age gaps between samples, very little attention has been paid to transitional periods such as emerging adulthood (ages 18–25), which entail changes in role status and developmental goals (Arnett, 2000; Carstensen et al., 2011). Finally, the developmental trajectory of regulatory ability from adolescence through adulthood likely never has been documented in a rural population. Historically underrepresented in academic research, rural individuals might differ in their development of self-regulation as a result of differences in the types of stressors to which they are exposed and difficulty in accessing various resources, particularly mental health care (Jameison & Blank, 2007; Nicholson, 2008). To fill these gaps in research, the present study assessed several dimensions of self-control in a large sample of 12- to 45-year-old participants recruited from rural communities in southern Appalachia and examined whether they exhibited significant linear or curvilinear relationships. Significant linear effects would indicate that, overall, regulatory ability increases from age 12 to 45. Significant curvilinear relationships would indicate that the slope of regulatory development changes in direction once (qua-

dratic) or twice (cubic) across this age span (i.e., that some age periods represent turning points).

Development and Deficits in Regulation Through Adolescence

Regulatory ability increases linearly with age from infancy through middle childhood, following the development of the prefrontal cortex and corresponding cognitive functioning (Casey et al., 2010). However, research has documented a disruption in this linear increase in regulation during adolescence, indicating risk and vulnerability. Indeed, research in psychopathology reveals that many disorders linked to emotional regulation manifest in adolescence (Pitskel, Bolling, Kaiser, Crowley, & Pelphey, 2011). Adolescence also marks an increase in suicide and accidental death, and anxiety is at an all-time high (Casey et al., 2010).

Much of the research on regulation examines between-groups differences in adolescents as a whole compared to younger children and, less often, to adults. However, there are patterns and variation within adolescence that are important to document (Zimmermann & Iwanski, 2014), with limited research showing a downward trend that spans early adolescence (ages 12–14), reaching a low point in middle adolescence (15–17), and finally increasing through late adolescence (18–20) and into adulthood. This pattern has been shown in studies examining stability in the daily experience of emotions (Larson, Moneta, Richards, & Wilson, 2002), the use of adaptive emotional regulation strategies (Garnefski & Kraaij, 2006; Zimmermann & Iwanski, 2014), and the ability to downregulate or reappraise one's response to negative stimuli (McRae et al., 2012; Silvers et al., 2012). These age differences emerged in regulatory success but not in initial emotional reactivity (McRae et al., 2012; Silvers et al., 2012).

Adolescents show gains in cognitive abilities such as perspective-taking and metacognition (Garnefski et al., 2002), but it is possible that these abilities account for the more frequent use of maladaptive coping patterns documented during adolescence, such as rumination and venting (Zimmer-Gembeck & Skinner, 2011). However, with age comes practice and maturity. The onset of late adolescence and progression into adulthood are marked with greater emotional stability, a wider repertoire, and more

adaptive use of regulatory strategies, and overall greater regulatory success (Garnefski & Kraaij, 2006; Silvers et al., 2012; Zimmer-Gembeck & Skinner, 2011).

Regulation in Adulthood

Although most literature on regulation focuses on infancy and childhood, regulation and coping might undergo profound changes throughout the adult years (Carstensen, Fung, & Charles, 2003; John & Gross, 2004). The existing literature on the topic provides evidence for increasing regulatory ability with age. Several studies have examined within-subject age trajectories longitudinally, finding that aging is associated with greater emotional stability (Carstensen et al., 2011; Charles, Reynolds, & Gatz, 2001), a decrease in negative affect (Charles et al., 2001), and an increase in the ratio of positive to negative emotions (Carstensen et al., 2011). Among samples of young, middle, and older adults, age corresponds with greater success at positive reappraisal (Shiota & Levenson, 2009), more frequent use of problem-solving strategies (Amirkhan & Auyeung, 2007), and a decline in maladaptive coping patterns such as rumination and avoidance (Amirkhan & Auyeung, 2007; Nolen-Hoeksema & Aldao, 2011). Age also was associated with superior inner and outer control of anger (Zimprich & Mascherek, 2012) and the use of more calming strategies and less rumination following anger-inducing stimuli (Phillips, Henry, Hosie, & Milne, 2006).

Improved regulatory ability in adults might be attributed to several factors. As people age, increased professional and familial responsibilities might necessitate greater regulation (John & Gross, 2004). Further, older adults might become better at selecting and deploying the most effective regulatory strategies in distressing situations, evidenced by the finding that older and younger copers differed in the types of strategies used but not the number of strategies they could deploy (Amirkhan & Auyeung, 2007). Socioemotional selectivity theorists attribute this greater skill and efficiency in regulation to the recognition of a limited amount of time remaining in life, leading to a desire to optimize meaning and positivity and a decreased willingness to engage in negative emotional experiences (Carstensen et al., 2011).

Gender Differences in Regulation

Gender has long been recognized as an important factor in self-regulation, particularly in the context of emotions. Women are typically considered to be more emotionally adept than men. They score higher on measures of social and emotional competencies such as awareness and problem-solving (Romer, Ravitch, Tom, Merrell, & Wesley, 2011), perform better at selecting emotional regulation strategies in hypothetical situations (Joseph & Newman, 2010), and display greater emotional awareness during relationship-specific situations (Croyle & Waltz, 2002).

Yet, women are more likely to be diagnosed with depression, all anxiety disorders except OCD, borderline personality disorder, and eating disorders, all of which can be partially attributed to an inability to downregulate negative emotions (Nolen-Hoeksema, 2012; Zahn-Waxler, Shirtcliff, & Marceau, 2008). Women engage in more types of coping strategies (Nolen-Hoeksema, 2012), use the majority of strategies at a greater frequency (Tamres, Janicki, & Helgeson, 2002), and are more likely to report multiple strategies for a single situation (Nolen-Hoeksema & Aldao, 2011). One strategy men use at a greater frequency is coping through alcohol consumption (Nolen-Hoeksema, 2004). However, women also are more likely to ruminate, which is associated with psychological distress, depression, and anxiety symptoms (Aldao et al., 2010; Nolen-Hoeksema, 2012). fMRI studies show that women have greater activation in the limbic system while processing negative emotions (Koch et al., 2007).

Taken together, these findings suggest that women are more aware of their emotions, leading them to engage in more effortful, emotion-focused strategies to self-regulate. These strategies are not always adaptive, contributing to more rumination and higher incidences of internalizing disorders. Meanwhile, it is theorized that men might participate in more automatic regulation that current metrics have been unable to capture (Nolen-Hoeksema, 2012). Of course, differential exposure to stressors partially explains these gender differences. For example, women are more likely to experience interpersonal violence (Finkelhor, Turner, Ormrod, Hamby, & Kracke, 2009). Women also take on a greater burden of housework and childcare,

even when both adults work, resulting in more potential stressors and less free time (Baxter, Hewitt, & Haynes, 2008).

Potential Differences in Rural Populations

Although deficits in regulatory ability in rural populations might be expected because of less access to education, employment, health care, and leisure and recreation activities (Hart, Larson, & Lishner, 2005; Nicholson, 2008), there also might be mitigating factors such as strong networks of familial and community support as well as greater religiosity (Gill, Barrio Minton, & Myers, 2010; Nicholson, 2008). Rural and urban individuals likely face different types of stressors and daily hassles (Nicholson, 2008). For example, rural individuals are less likely to encounter noise pollution and heavy traffic, but they might have to deal with poor road conditions and struggle to find reliable transportation. Given that rural residents are less likely to use mental health care resulting from a lack of integration with physical health care, lack of access, and social stigma (Jameson & Blank, 2007; Nicholson, 2008), it is especially important to understand the development of the ability to self-regulate emotions in rural populations.

Research Gaps

Although the literature reviewed above provides valuable insight into the development of self-regulation throughout the life span, there are a number of gaps in the research. First, Zimmerman and Iwanski (2014) noted that most research focuses on infancy, childhood, or adulthood, with relatively little documenting the changes that occur during adolescence. Even fewer studies compare adolescents to adults, instead studying each age group in isolation (for exceptions see Amirkhan & Auyeung, 2007; Garnefski et al., 2002; Zimmermann & Iwanski, 2014). Second, many studies also use different scales for each age group, which is problematic for comparison purposes (Amirkhan & Auyeung, 2007). Third, using a predetermined cut-off point to distinguish adolescence from adulthood (i.e., age 18) makes it difficult to examine the changes that occur during transitional periods. For example, emerging adulthood (i.e., ages 18–25) typically is characterized by drastic changes in role status (Arnett, 2000). Fourth,

most studies examine only single domains of regulation. Although such a targeted approach is valuable, it also is important to compare and contrast several different aspects of regulation within the same sample. Finally, this research has rarely, if ever, been conducted in rural populations, which are largely underrepresented in psychological research and underserved by mental health resources.

Goals and Hypotheses in the Current Study

The present study uses survey data from a large rural sample including both adolescent and adult participants who were administered the same scales suitable for a 6th-grade reading level. Part of a larger study on character strengths and resilience, the survey contained scales on several aspects of self-regulation: emotional awareness, emotional regulation, psychological endurance, anger management, and coping. Age trends and gender differences are illustrated graphically, and linear, quadratic, and cubic models as well as their interactions with gender were tested for significance. The following hypotheses were tested:

H1: There will be an overall linear increase in all regulatory abilities from adolescence through adulthood.

H2: Given findings that there can be both significant linear and quadratic effects of age (McRae et al., 2012; Silvers et al., 2012), we predict there will be a significant curvilinear relation between age and each regulatory ability, resulting from declines during adolescence, increases during young adulthood, and a leveling off during middle adulthood.

H3: Males will score higher in emotional regulation, and females will score higher in emotional awareness and coping.

Method

Participants

Participants were 2,565 individuals from the Appalachian region of three Southern states. The sample was 63.9% female. The sample included adolescents and adults ages 12 and over, with a mean age of 30.0 years ($SD = 13.2$)

and a median of 27. Educational status included 18.1% who were still in middle or high school, 34.8% who had a high school diploma or equivalent, 7.2% with less than a high school education (and not currently in school), 18.6% with some college but no degree, 8% with an associate's degree, 7.9% with a bachelor's degree, and 5.4% with more than a bachelor's degree. Almost two in five (39.2%) of the sample reported household income less than \$20,000 per year, 36% earned \$20,000 to \$50,000, and 24.9% of the sample earned more than \$50,000 per year. More than a one third of the sample (35.6%) received some form of public assistance. The sample identified as 75.6% White/European American (non-Latino), 12% Black/African American (non-Latino), 6.4% Latino (any race), 1.2% American Indian/Alaska Native, 0.6% Asian, 0.3% Pacific Islander, and 3.9% multiracial.

In terms of residency, over half (67.8%) of our sample reported that they lived in a small town (population with about 2,500 to 20,000 residents), 20.2% reported they lived in a rural area (less than 2,500 residents), 6.3% reported they lived in a suburb of a large city, 3.8% said they lived in a smaller city (about 100,00 to 300,00 residents), 1.6% said they lived in a large city (more than 300,000 residents), and 0.3% said they lived in a town (20,000 to 100,000 residents).

Procedure

Participants were recruited through a range of advertising techniques. The majority of participants (76%) were recruited at local community events, such as 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 methods allowed us to reach segments of the population rarely included in psychology research. Interviewers offered to meet participants in multiple locations throughout the community (including our research center, other campus locations, and their homes), during daytime or evening hours. This flexibility provided people with limited availability or transportation an opportunity to participate. This region of Appalachia still has un-

reliable cellular and Internet service; therefore, the survey software was specifically chosen to operate without Internet connectivity. The survey was self-administered using Snap10 survey software on laptops and iPads. An audio option was available. Adolescents and adults were surveyed using the same questions, settings, procedure, and technology. 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 53 min. This is an excellent result by current survey standards, especially considering the survey length, with current completion rates often under 70% (Abt SRBI Inc., 2012) and sometimes under 50% (Galesic & Bosnjak, 2009). All participants received a \$30 Walmart gift card and information on local resources. All procedures were conducted in accordance with American Psychological Association ethical principles and approved by the institutional review board of the study's home institution.

Measures

Given that our sample included significant numbers of young adolescents and individuals with limited educational attainment, it was essential that the reading level be appropriate for all participants. Brevity also was a priority. We simplified and adapted items from existing questionnaires and wrote new items for constructs for which no suitable measure could be found. To establish reliability and validity for new and adapted items, we conducted a pilot study with 108 participants from the same community as the main sample, recruited through a local email classifieds list and word-of-mouth. Each pilot study participant was accompanied by a close informant, who responded to the items about the participant to assess validity. Reliability and validity were further examined in the main sample using internal consistencies and correlations with related constructs.

Further details on each measure are below. Unless specified, response categories were on a 4-point Likert-type scale ranging from 1 (*not true about me*) to 4 (*mostly true about me*). Using standardized response categories across items reduces the respondent burden, shortens survey time, and minimizes method variance and is common for large scale community sur-

veys (e.g., Finkelhor, Shattuck, Turner, & Hamby, 2014; Finkelhor, Turner, Hamby, & Ormrod, 2011). In all cases, higher scores represent higher levels of strengths. See <http://lifepathsresearch.org> for complete scales and further details on measure development.

Emotional Awareness used two items from the Difficulty in Emotional Regulation Scale (Gratz & Roemer, 2004) assessing the ability to monitor one's own feelings. The items were "I am aware of my feelings" and "I pay attention to how I feel." Internal consistency (coefficient alpha) for the pilot and main samples were .80 and .82, respectively. Validity was established in the main sample through moderate correlations with Anger Management ($r = .43$) and with well-being measures, such as Subjective Well-Being ($r = .46$) and Spiritual Well-being ($r = .36$).

Emotional Regulation was comprised of four items assessing one's ability to manage distressing feelings from the DERS (Gratz & Roemer, 2004). A sample (reverse-scored) item is "When I'm upset, I feel out of control." Internal consistency (coefficient alpha) for the pilot and main samples were .83 and .82, respectively. Validity was established in the main sample with moderate to strong correlations with Optimism ($r = .44$) and Mental Health ($r = .57$).

The Psychological Endurance Scale includes six items assessing one's ability to persevere despite challenges (Hamby, Grych, & Banyard, 2013; partially adapted from Zimbardo & Boyd, 1999). A sample item is "I am quick to pick myself up when I get 'knocked down.'" Internal consistency (coefficient alpha) for the pilot and main samples were .81 and .86, respectively. Validity was established in the main sample with strong correlations with other regulatory strengths, such as Anger Management ($r = .64$) and Coping ($r = .63$), and with well-being measures, such as Subjective Well-Being ($r = .64$) and Spiritual Well-being ($r = .52$).

The Anger Management Scale-Brief Trait Version (Hamby et al., 2013) includes five items assessing one's general ability to recognize and positively deal with feelings of anger adapted from Stith and Hamby's (2002) partner-specific scale. A sample item is "I can calm myself down when I am upset." Internal consistency (coefficient alpha) for the pilot and main samples were .77 and .87, respectively. Validity was established in the main sample

with moderate to strong correlations with other regulatory strengths, including Psychological Endurance ($r = .64$) and Emotional Awareness ($r = .43$), and a strong correlation Subjective Well-Being ($r = .51$).

The Coping Scale (Hamby et al., 2013) includes 13 items assessing one's use of both behavioral and cognitive-emotional mechanisms for dealing with adversity. Items were partially adapted from Holahan and Moos (1987) and from Spitzberg and Cupach (2008). A sample item is "When dealing with a problem, I spend time trying to understand what happened." Internal consistency (coefficient alpha) for the pilot and main samples were .88 and .91, respectively. Validity was established in the main sample with strong correlations with Anger Management ($r = .57$) and Endurance ($r = .63$), as well as with measures of well-being, such as Subjective Well-Being ($r = .53$) and Posttraumatic Growth ($r = .65$).

Analysis

Scale scores were standardized by converting to Z-scores using the SPSS descriptives procedure (Field, 2009, p. 102), in which the sample's mean scale score is converted to 0 and each individual score is determined by its deviation from the mean. To prevent issues of collinearity among predictors in the regression analyses, the linear, cubic, and quadratic effects of age were mean-centered (Shieh, 2011).

We used hierarchical regression analyses to determine the best fitting model. Using each regulatory ability as an outcome, the linear age effect and gender were entered in Block 1. The quadratic and cubic age effects were added in Block 2. Interactions between the linear, quadratic, and cubic age effects with gender were added in Block 3. The best fitting model was determined as the highest level model that accounted for a significant amount of additional variance. To plot the age trends graphically, moving (or running) averages for each age were calculated by averaging scale scores for participants at that age, those at the immediately preceding age, and those at the immediately succeeding age.

Results

A correlation matrix for the five scales is displayed in Table 1. The results of the regres-

Table 1
Correlations Between Measures of Self-Regulation

Measure	1	2	3	4	5
1. Emotional awareness	—	.06	.45	.43	.45
2. Emotional regulation	—	—	.10	.16	.02
3. Psychological endurance	—	—	—	.64	.62
4. Anger management	—	—	—	—	.56
5. Coping	—	—	—	—	—

Note. Bold indicates significance at $p < .01$.

sion analyses are listed below, organized by outcome. We report the statistical significance of linear, quadratic, and cubic effects of age as well as interactions with gender. It should be noted that statistical significance does not equate to clinical significance, a point we address further in the Limitations section.

Emotional Awareness

Overall age trajectories and gender differences are displayed in Figure 1. The hierarchical multiple regression revealed that in Block 1, the linear effect of age and the main effect of gender contributed significantly to the regression model, $F(2, 2385) = 16.19, p < .001$, and accounted for 1.3% of the variation in emotional awareness. Emotional awareness increased with age, and women showed higher levels. Introducing the quadratic and cubic effects of age explained an additional .2% of variation in emotional awareness, $p < .05$. The model as a whole was significant, $F(4, 2383) = 9.62, p < .001$. The linear effect of age, $\beta = .09, p < .01$, quadratic effect of age, $\beta = -.11, p < .01$, and cubic effect of age, $\beta = .11, p <$

.05, each accounted for significant amounts of unique variance. Looking at the graph, emotional awareness appears to decline in young adulthood and rebounds as one approaches middle adulthood. Adding interactions between linear, quadratic, and cubic models of age with gender did not explain a significant amount of additional variance.

Emotional Regulation

Age trajectories and gender differences for emotional regulation are displayed in Figure 2. The hierarchical multiple regression revealed that in Block 1, the linear effect of age and the main effect of gender together contributed significantly to the regression model, $F(2, 2382) = 57.58, p < .001$, and accounted for 4.5% of the variance in emotional regulation. Both age, $\beta = .11, p < .001$, and gender, $\beta = .04, p < .05$, accounted for significant amounts of unique variance. Overall, emotional regulation increased with age, and men displayed higher levels. Introducing the quadratic and cubic effects of age did not explain a significant amount of additional variance, nor did adding interactions between linear, quadratic, and cubic models of age with gender.

Psychological Endurance

Graphic depictions of age and gender trends for psychological endurance can be found in Figure 3. The hierarchical multiple regression revealed that Block 1, including the linear main effect of age and gender was significant, $F(2, 2361) = 13.50, p < .001$, and accounted for

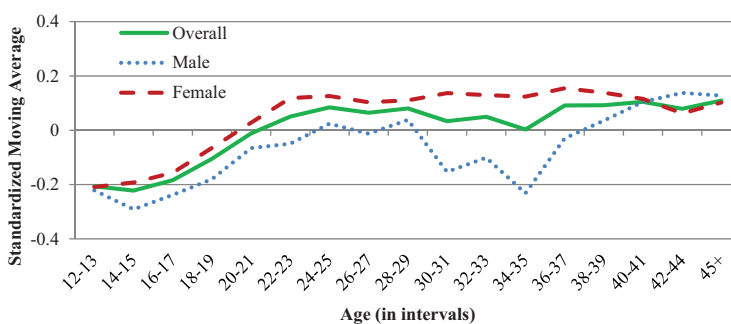


Figure 1. Age and gender patterns in the development of emotional awareness. Significant linear, quadratic, and cubic effects of age. Significant main effect of gender. See the online article for the color version of this figure.

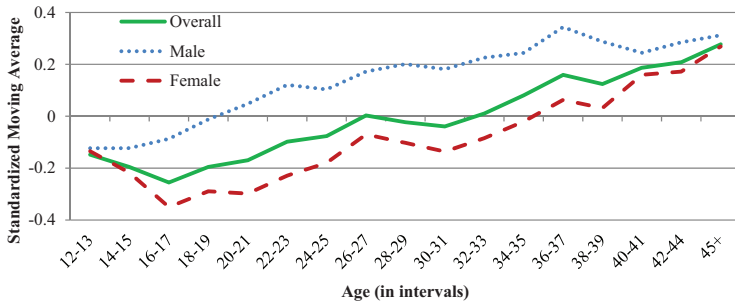


Figure 2. Age and gender patterns in the development of emotional regulation. Significant linear effect of age. Significant main effect of gender. See the online article for the color version of this figure.

1.0% of the variance in psychological endurance. The linear effect of age, $\beta = .10, p < .001$, indicated that psychological endurance increased with age. Gender was not significantly associated with endurance. Introducing the quadratic and cubic effects of age did not explain a significant amount of additional variance, nor did adding interactions between linear, quadratic, and cubic models of age with gender.

Anger Management

Age trajectories and gender differences are displayed graphically in Figure 4. The hierarchical multiple regression revealed that Block 1, the linear main effects of age and gender, was significant, $F(2, 2336) = 13.98, p < .001$, and accounted for 1.1% of the variance in anger management. This was due to age, $\beta = .11, p < .001$, indicating anger management increased across the life span. Introducing the quadratic and cubic effects of age did not explain a significant amount of additional variance, nor did

adding interactions between linear, quadratic, and cubic models of age with gender.

Coping

Age and gender patterns in coping are displayed in Figure 5. The hierarchical multiple regression indicated that none of the models accounted for a significant amount of variance. Coping ability was stable across the age range and similar for both genders.

Discussion

The current study presents the developmental trajectories of five self-regulatory abilities (emotional awareness, emotional regulation, psychological endurance, anger management, and coping) from early adolescence to middle adulthood. Many of our results were consistent with previous research findings, adding nuance and extending past research by tracing regulatory ability from adolescence to middle adult-

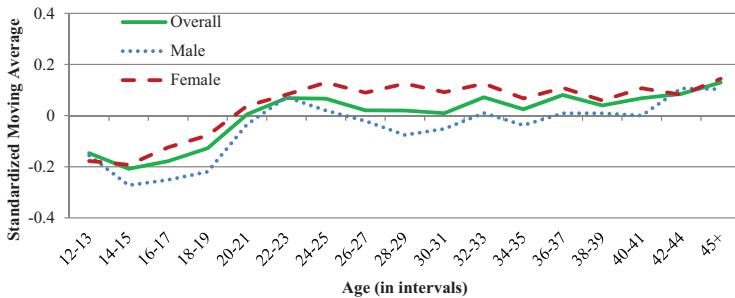


Figure 3. Age and gender patterns in the development of psychological endurance. Significant linear effect of age. See the online article for the color version of this figure.

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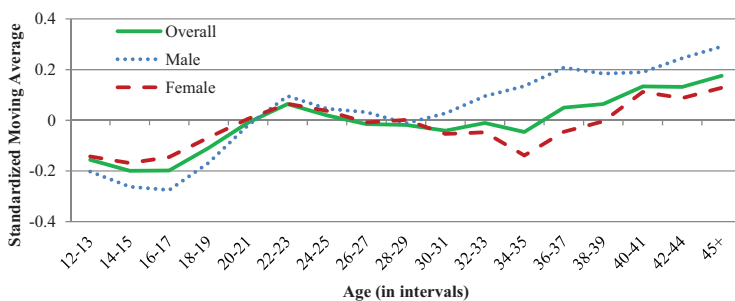


Figure 4. Age and gender patterns in the development of anger management. Significant linear effect of age. See the online article for the color version of this figure.

hood. However, there are likely qualitative and quantitative differences in the experience and response to stress among rural individuals compared to their urban and suburban counterparts (Elgar, Arlett, & Groves, 2003). To our knowledge, this study uses the largest psychological dataset ever collected in rural Appalachia, a region historically underrepresented in psychological research and underserved by mental health resources (Moreland, Raup-Krieger, Hecht, & Miller-Day, 2013). The points at which our findings differ from those in previous research might result from psychological and sociocultural factors specific to our rural Appalachian population as well as methodological differences.

Consistent with the first hypothesis, predicting an absolute increase in regulatory ability across the life span, as well as previous research (Garnefski & Kraaij, 2006; Zimmermann & Iwanski, 2014), regulatory ability was lowest during adolescence and increased into adulthood. With the exception of coping, age had a significant linear effect on all regulatory abili-

ties represented in this study. The second hypothesis, that regulatory ability also would reveal curvilinear effects of age, was partially supported. Quadratic and cubic models of age were significant for emotional awareness, indicating that there were turning points at which the slope of age effects changed from positive to negative or vice versa. Looking at the graph, emotional awareness appears to decline in young adulthood and rebound as one approaches middle adulthood. Contrary to hypothesized gains in young adulthood, emotional awareness experienced stagnation or even slight decline in the late 20's and early 30's, recovering in middle adulthood. Visually, other graphs, such as those for anger management and coping, suggest similar patterns, but the curvilinear effects did not reach significance by the mid-40's. Future research could explore whether growth continues or eventually plateaus.

Consistent with Hypothesis 3 regarding gender differences in emotional awareness and regulation, males scored higher in emotional regulation, and females scored higher in emotional

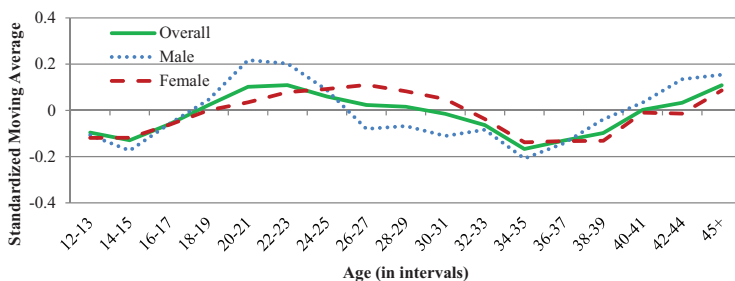


Figure 5. Age and gender patterns in the development of coping. No significant effects. See the online article for the color version of this figure.

awareness, producing significant main effects of gender. The gender differences are greatest during the two periods of risk we identified. During adolescence, girls displayed a sharp drop in emotional regulation not seen in boys. In young adulthood, men, but not women, experienced a decline in emotional awareness. Contrary to our expectations, women did not score significantly higher on coping.

Our documentation of difficulties in self-regulation during adolescence is consistent with previous research (McRae et al., 2012; Silvers et al., 2012; Zimmermann & Iwanski, 2014). The causes of this vulnerability are varied and complex, ranging from a still-developing prefrontal cortex, increases in social and academic pressure accompanying entrance into high school, and hormonal changes (Casey et al., 2010). Although it is fairly well-established that adults display superior regulatory ability to adolescents (Amirkhan & Auyeung, 2007; Zimmermann & Iwanski, 2014), relatively little attention has been paid to the ages when these gains actually occur because of age gaps between adolescent and adult samples. The current findings show gains in regulatory ability during emerging adulthood (18–25), somewhat contrary to its previous characterization as a period of extended adolescence and continued instability (Arnett, 2000; Zimmermann & Iwanski, 2014). Coupled with the graphs that show emotional regulation, anger management, and coping scores increasing in the late 30's, it appears that, beyond adolescence, periods of transition are typically met with strength and growth.

One potential explanation is the increase in meaning that accompanies age and the entrance into a new life stage (Carstensen et al., 2011). In addition to completing the final stages of prefrontal development (Casey, Jones, & Hare, 2008), emerging adults increasingly have the opportunity to draw meaning from professional endeavors and romantic relationships (Arnett, 2000). Middle adults are becoming aware of their limited time remaining in life and may make more conscious and effortful pursuits of meaning and positivity (Carstensen et al., 2011, 2003). In addition, religiosity and spirituality tend to increase with the entrance into middle adulthood (Bergan & McConatha, 2001), a phenomenon particularly relevant to the strongly Protestant rural Appalachian population (Lewis

& Billings, 1997). Research has shown older adults to be more efficient and effective at regulation compared to younger adults (Carstensen et al., 2011, 2003). On the other hand, the finding that regulatory ability might stagnate or even decline during young adulthood, specifically in the late 20's and early 30's, is somewhat novel, perhaps because of the lack of research examining the trajectory within adulthood.

One potential source of these patterns is parenthood. Some studies have found the transition to parenthood is associated with increases in meaning and well-being for many (Ballas & Dorling, 2007), whereas others have found it to be associated with a decrease of well-being and relationship quality between partners as well as increases in stress and depression (Evenson & Simon, 2005; Stanca, 2012). Regardless of the net impact, early parenthood is undoubtedly a time in which parents' regulatory ability is tested (Rutherford, Wallace, Laurent, & Mayes, 2015), and certain risk factors might contribute to parents' temporary declines in well-being and difficulties in regulation. Such risk factors include financial strain (S. K. Nelson, Kushlev, & Lyubomirsky, 2014), single parenthood (Stavrova & Fetchenhauer, 2015), a shift in work hours (Keizer, Dykstra, & Poortman, 2010), blended families (Pace & Shafer, 2015), as well as pre-existing deficits in regulatory ability and executive functioning (Rutherford et al., 2015). Although we did not collect data specifically on parenthood, the socioeconomic environment of our rural, low-income sample likely exacerbated these risk factors and introduced others such as lack of access to health care, child care services, and enriching community activities (Burchinal, Vernon-Feagans, Cox & the Key Family Life Project Investigators, 2008).

Consistent with previous literature (Croyle & Waltz, 2002; Nolen-Hoeksema, 2012; Romer et al., 2011; Zahn-Waxler et al., 2008), females reported significantly higher emotional awareness, whereas males reported significantly better emotional regulation. Zimmer-Gembeck and Skinner (2011) attributed these gender differences to females' engagement in more effortful and emotion-focused strategies that could be maladaptive in some situations. Nolen-Hoeksema (2012) hypothesized that men might engage in more automatic forms of regulation that

researchers have not yet captured in current processes. However, the absence of a gender difference in coping is surprising; previous research has shown that women engage in more coping strategies (Nolen-Hoeksema, 2012) and use in all strategies at a greater frequency (Tamres et al., 2002). Previous research shows fewer gender differences in coping within rural population, perhaps because men and women in our sample had more similarities in stressors and contexts in their small, rural communities (Elgar et al., 2003).

Limitations

There are limitations to these data and analyses that should be addressed. First, the data are cross-sectional, so causal relationships between age and regulatory ability cannot be inferred, and cohort effects are potential confounding variables. However, the convenience and relative inexpensiveness of cross-sectional data allows for large sample across a wide age range, which is vital for an exploratory study of this nature. Further, our findings are consistent with previous longitudinal research (Charles & Pasupathi, 2003; Kirchner, Forns, Amador, & Muñoz, 2010; Larson et al., 2002). There are potential biases and inaccuracies that accompany all self-report survey research. However, these self-report items were validated with data from a close informant during a pilot study.

Further, the self-report items were designed to assess overall aptitude and abilities in terms of emotional regulation and awareness, anger management, coping, and psychological endurance. The data does not provide information on the specific mechanisms through which self-regulation is developed and achieved, which would have been prohibitively expensive and time-consuming for a survey of this scale. The examination of regulatory processes has been the focus of previous research (Mienaltowski, Corballis, Blanchard-Fields, Parks, & Hilimire, 2011; Skinner & Zimmer-Gembeck, 2007) and is an important area into which future research can expand. Finally, the sample is fairly homogeneous in terms of socioeconomic status and ethnicity. Although the sample's demographics are consistent with census data from this region of Southern Appalachia, caution should be taken when applying conclusions to other populations.

Finally, our reported results of statistical significance do not necessarily equate to clinical or practical significance. Our scales are not intended to define clinical thresholds of dysregulation, and our regression models of age, gender, and interactional effects were able to account for a small percentage of the overall variance in regulatory outcomes. This is unsurprising, given that there are a multitude of individual and cultural determinants of regulatory abilities beyond age and gender (Gross, 2002). Still, in some cases scale scores display twofold gender differences (e.g., emotional regulation) or increases from adolescence to middle adulthood, suggesting deficits, differences, and gains of practical significance.

Research Implications

The current study makes notable contributions to the literature on the development of regulatory ability while also highlighting opportunities for future research. Most existing literature examines regulatory ability within a particular age period or compares overall group differences. Although our cross-sectional data has interpretative limitations noted above, we were able to trace the development of regulatory abilities from ages 12 to 45 in a large sample. Linear relationships are more easily understood and widely discussed, but it is equally important to examine curvilinear effects. Overall, our findings highlight important gains that occur during emerging adulthood and the entrance into middle adulthood while identifying risk periods during adolescence as well as the late 20's to early 30's, the latter of which has received little attention.

Future research might use longitudinal methods to provide more rigorous evidence of these periods of growth and vulnerability. Investigation into the causes of growth and decline as well as the mechanisms through which they occur might be conducted through quasi-experimental design and analysis of moderating and mediating factors. Research also might utilize alternative forms of measurement, such as performance-based tools, experience sampling, reports from close informants, and neuroimaging. The age range also could be expanded on both ends to include younger children and older adults.

To our knowledge, this is the first study to the trajectory of regulatory ability in a large rural sample. In light of notable cultural and socioeconomic differences in Appalachia and its underrepresentation in psychological research (Elgar et al., 2003), it is essential to test previous research findings from the general population before drawing conclusions about the Appalachian subpopulation.

Clinical and Policy Implications

Given the importance of regulatory ability to professional, social, and health outcomes, this research has implications for intervention and prevention efforts. Although adolescents are becoming increasingly independent and even resistant to parental influence, they have not yet fully developed the ability to self-regulate, increasing the risk of depression, anxiety, and substance abuse (Jager, Yuen, Putnick, Hendricks, & Bornstein, 2014). Positive relationships with parents as well as other caring adults can provide emotional support and model positive regulatory strategies during this vulnerable age. This is of particular relevance in rural populations, in which individuals either cannot and/or do not want to access external resources but instead turn to informal networks of familial and communal support (Ali & McWhirter, 2006; Behringer & Friedell, 2006). Further, interventions might look different for each gender. Boys show deficits in emotional awareness and might benefit from training in empathy and emotional intelligence; girls might be taught more active coping strategies.

Our data also revealed a potential risk period during the late 20's and early 30's, during which increases in regulatory ability appear to stagnate. We hypothesize that this might be partially attributable to the transition to parenthood for those with certain risk factors. This relationship between parenthood and self-regulation has implications for the well-being of parents and children. Deficits in regulation in parents, particularly during a child's infancy and toddlerhood, might be transmitted to the child via parental insensitivity and insecure attachment (Rutherford et al., 2015). Certain interventions, such as parent sensitivity training, activities to enhance parent-child relationship, and resources to address parenting stress including financial and material assistance for improv-

erished and single parents, might help ensure that the transition to parenthood is a period of happiness and meaning rather than stress and deficits in regulatory ability. Further, existing informal caregiving networks, which provide vital lifelines for rural mothers (M. K. Nelson, 2000), should be supported and strengthened.

Research on self-regulation may be particularly relevant to a rural Appalachian population. With fewer external resources (e.g., access to mental and physical health care), as well as a cultural emphasis on self-reliance and reluctance to access outside help, rural Appalachians especially might rely on personal maintenance of health and well-being. Alternatively, more extensive networks of kinships and religion might serve supplementary or compensatory roles in regulatory ability. Further, rural Appalachians also might be at elevated risk of developing problems during periods of risk, compounded by elevated poverty and lack of access. For example, rural communities are less likely to have structured extracurricular activities and recreational facilities for adolescents (Quine et al., 2003), and rural parents might not be able to afford or access pediatricians and child care (Evans, 2003). The findings of the current study provide support for greater attention to the allocation of resources to promote well-being in different ways across the life span for rural communities.

Conclusions

Our goal was to develop a more holistic understanding of the development of regulatory ability from adolescence to adulthood. Using cross-sectional data without age gaps in a rural sample, we replicated previous research findings, such as vulnerability during adolescence. We also produced somewhat novel findings that provide a foundation for future research, such as the regulatory gains in emerging adulthood and the stagnation during childbearing years. Prevention efforts aimed at improving regulation might provide people with more positive emotional experiences, better interpersonal relationships, and higher goal-directed behavior, allowing them to live more successful, happy, and meaningful lives.

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