

Factors associated with externalized anger among early adolescents in rural Appalachia: A conceptual proposition with implications for violence prevention

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ABSTRACT

Adolescent violence is understudied as a public health challenge for rural adolescents. Anger expression, also referred to as externalized anger, is a risk factor for adolescent violent behavior. Survey data from 1649 early adolescents in the Young Mountaineer Health Study (YMHS) cohort were used to identify correlates of externalized anger drawing on an adapted socioecological model. Correlates examined included: Relative family income; family affluence; neighborhood characteristics (safety, ties, collective efficacy); family living arrangements; social support from adults at home and school; and harsh parenting. Gender was utilized as an effect modifier. We employed two Poisson regression models for main effects and gender interaction effects. Parameter estimates were exponentiated and interpreted as Rate Ratios (RR). Significant main effects included perceived neighborhood safety (RR = 0.98, 95 % CI = 0.97–0.99), support from adults at home (RR = 0.98, 95 % CI = 0.97–0.99) and school (RR = 0.99, 95 % CI = 0.98–0.99), and harsh parenting (RR = 1.06, 95 % CI = 1.05–1.07). Several gender differences emerged in the interaction model. Boys reported significantly lower anger compared to girls (RR = 0.90, 95 % CI = 0.86–0.94). In the gender-based interaction model harsh parenting was more strongly associated with externalized anger among boys (RR = 1.03, 95 % CI = 1.01–1.06). Implications are discussed for future research on the relationship between externalized anger and violence prevention among rural adolescents.

Introduction

Adolescent violence, in the form of bullying, intimate partner violence, and fighting, is a public health problem in the United States (U.S.). A 2021–2022 survey found that 19 % of students aged 12–18 reported bully victimization during school (NCES, 2024). In 2021, 18.3 % of adolescents surveyed using the Youth Risk Behavior Surveillance System (YRBSS) reported engaging in physical fighting within the last 12 months (ODPHP, 2025a). Rates of adolescent dating violence in the U.S. are also high, with 15.7 % of adolescents reporting victimization of physical or sexual dating violence in 2021—an increase from 12.6 % in 2017 (ODPHP, 2025b). In 2020, youth homicides and physical assault

were estimated to cost \$122 billion in medical care, lost work, and quality of life (CDC, 2023; Peterson et al., 2023). Given the prevalence of violence among adolescents, violence prevention continues to be a goal of U.S. Healthy People 2030 for adolescents (Healthy People 2030).

Adolescent violence is far less studied in rural than in urban areas (Seo et al., 2022; Taylor & Xia, 2022; Weybright et al., 2024). Rural youth are twice as likely as urban youth to experience physical dating violence (Emezue et al., 2021; Martz et al., 2016; Sianko et al., 2019) and are more likely to carry a handgun (Schleimer et al., 2023). In addition, over the past decade, carrying a handgun has significantly increased among white, rural youth, more than among any other demographic group (Carey & Coley, 2022; Schleimer et al., 2023).

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Externalized anger, also known as anger expression, is a key risk factor for adolescent violence (Kerr & Schneider, 2008). Externalized anger, defined as the behavioral response to one's state of arousal due to feelings of threat or frustration (Kerr & Schneider, 2008), is positively associated with adolescent bullying, verbal and physical aggression, substance use, and homicide (Alaka Mani et al., 2018; Farzan-Kashani & Murphy, 2017; Fives et al., 2011; Gudlaugsdottir et al., 2004; Pullen et al., 2015; Shortt et al., 2010; Yang et al., 2021; Puskar et al., 2009; Puskar et al., 2008). Risk factors for adolescent externalized anger include male gender, authoritarian parenting styles, and lower social support from caregivers and peers (Jeong & Shim, 2022; Kerr & Schneider, 2008; Mahon et al., 2010; Rahman et al., 2014; Wong et al., 2018). Perceived social inequality and neighborhood safety are also linked to adolescent externalized anger (Coccia, 2018; Short, 2018).

The current study

A critical gap in the literature is the dearth of research on externalized anger in rural adolescents. Most studies of anger of any kind among rural U.S. adolescents are about two decades old (e.g., Kerr & Schneider, 2008; Lamb et al., 2003), with more recent studies focusing on urban or international samples (Anjanappa et al., 2020; Asgeirsdottir & Sigfusdottir, 2015; Edwards et al., 2019; Dey et al., 2014; Jeong & Shim, 2022; Wong et al., 2018). Recent research has also identified a need for a proposed conceptual framework for examining and preventing rural adolescent anger (Mills et al., 2024). The current study addresses these gaps by (1) presenting a conceptual model that organizes known and suspected risk and protective factors for adolescent externalized anger; and (2) empirically testing the model with data from a large sample of rural middle school adolescents. Additionally, given that male gender has been found to be a key risk factor for externalized anger in the U.S.

(Ali et al., 2016; Devereux et al., 1969; Leaper & Friedman, 2007; Levant, 2022; Malhi et al., 2020), the current study seeks to examine differential risk factors of externalized anger by gender.

Conceptual model

In our conceptual model (Fig. 1), we adapt Bronfenbrenner's (1977) socioecological model drawing on recent adaptations by (CDC) (2023) and Brooks et al. (2022). The model specifies concentric developmental and contextual influences on individual behavior. Drawing on previous research summarized above on adolescent externalized anger and adolescent violence, we specify risk factors at societal, community, familial/interpersonal, and individual socioecological levels. Specifically, these include risk factors (low vs. high) for externalized anger: a) at the macrosystem/societal level – low socioeconomic status and high inequality (Greitemeyer & Sagioglou, 2017; Jeong & Shim, 2022; Kunst & Obaidi, 2020; Mills et al., 2024; Power, 2018); b) at the exosystem/community level – low neighborhood safety, low collective efficacy, and low neighborhood ties (Browning et al., 2015; Carlson, 2006; Mahon et al., 2010); c) at the mesosystem/interpersonal level – high harsh parenting (Dickson et al., 2019; la Torre-Cruz et al., 2014; Pinquart, 2017; Zhou et al., 2004), low parental/caregiver social support (Houlberg et al., 2016; Muris et al., 2004), and low social support from adults at school (Mahon et al., 2010); and d) at the microsystem/individual level – male gender (Im et al., 2018; Österman et al., 1998).

We hypothesize that externalized anger among rural adolescents will be correlated with male gender and harsh parenting, two factors identified as risk factors in previous research. Other factors will be assessed as exploratory risk factor correlates of externalized anger or in interaction with male gender.

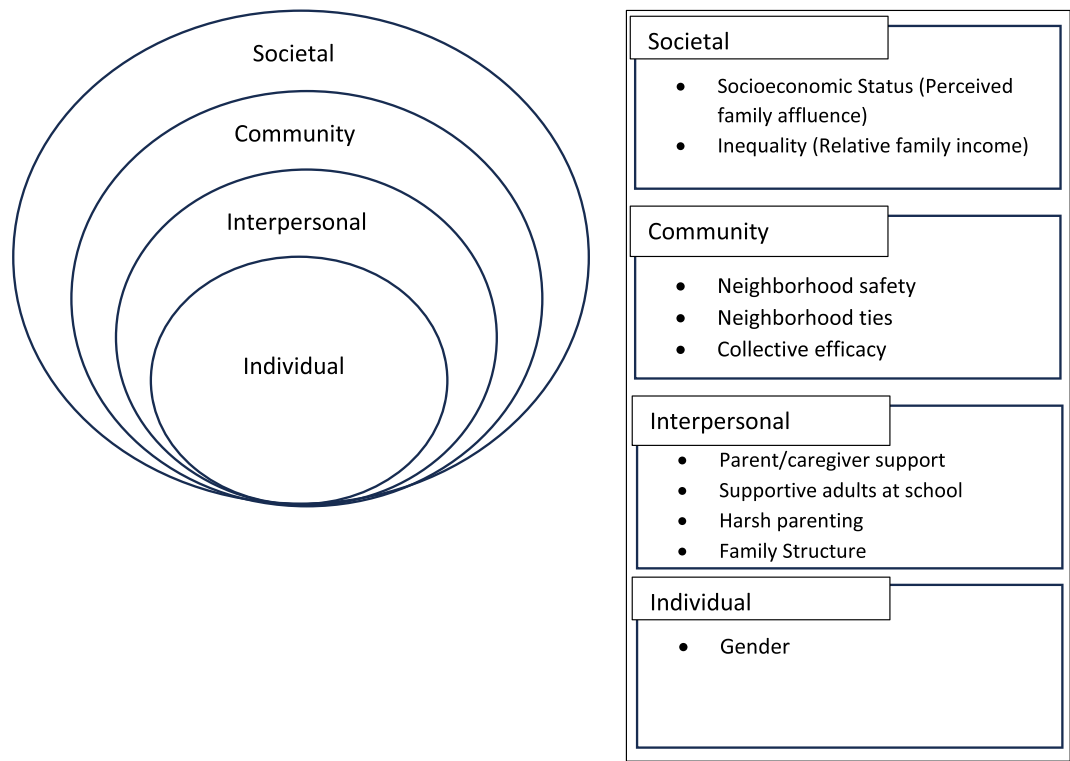


Fig. 1. Conceptual model of socioecological contextual and developmental factors associated with adolescent externalized anger (non-exhaustive). Adapted from: (1) Centers for Disease Control (CDC). (2024). The Social-Ecological Model. A Framework for Prevention: Violence Prevention: Injury Center. [Internet]. [accessed 2024 Nov 23]. Available from: https://www.cdc.gov/violence-prevention/about/?CDC_AAref_Val=https://www.cdc.gov/violenceprevention/publichealthissue/social-ecologicalmodel.html; and (2) Brooks, M. A., Meinhart, M., Samawi, L., Mukherjee, T., Jaber, R., Alhomsh, H., ... & Dasgupta, A. (2022). Mental health of clinic-attending Syrian refugee women in Jordan: Associations between social ecological risks factors and mental health symptoms. BMC Women's Health, 22, 1–17.

Methods

Participants

As part of the Young Mountaineer Health Study (YMHS), early adolescents self-reported survey data twice yearly for five years. Baseline surveys occurred in Fall 2020 when students began their sixth grade year, with the second wave occurring in Spring 2021 at the end of their sixth grade year (Kristjansson et al., 2022). Students across five West Virginia counties and 20 middle schools participated (Kristjansson et al., 2022). The present analyses utilize data from Wave 2 of the study. Of the 1895 students attending school in the Spring of 2021, 1649 (87.0 %) completed the Wave 2 survey.

Exclusion criteria

A total of 81 students (4.9 %) selected either “Gender non-conforming” or “Other” as a response to a question asking for respondent gender. Given that this study focuses on gender differences in identifying factors associated with externalized anger, the gender non-conforming and “other” respondents were excluded from the analysis as the sample size for this group was particularly small. The final N for respondents included in this study was 1564 respondents.

Procedure

The YMHS and its corresponding study protocols were approved by West Virginia University Institutional Review Board (IRB), #1903499093A001. The YMHS research team consists of the investigative team, study manager, three county data collection leaders (DCLs), and 20 supervising contact agents (SCAs, one in each school), to organize all data collection efforts (Kristjansson et al., 2022, 2023). The YMHS team administered an anonymous, confidential, web-based survey using Qualtrics software that ensured anonymity and confidentiality for all participants; per study protocols, no identifying data were collected (Kristjansson et al., 2022, 2023).

Measures

Dependent variable

Externalized anger was measured using three items from the Symptom Checklist 90 (SCL-90) scale (Derogatis et al., 1973, 1976; Schmitz et al., 2000). Students reported the frequencies of externalized anger experiences throughout the past week. The SCL-90 is a validated and widely used measure within clinical and behavioral health settings, as well as within population-based and public health research (Asgeirsdottir & Sigfusdottir, 2015; Halldorsdottir et al., 2021). Items from the SCL-90 included: “I experienced outbursts of anger that I could not control.”; “I had an argument with someone.”; “I yelled at somebody or threw things.” Response options ranged from 1 = “Never” to 4 = “Often.” Scores from each item were summed to produce a scale ranging from 3 (lowest externalized anger) to 12 (highest externalized anger) (with this sample, $\alpha = 0.89$).

Independent variables

Systemic factors. Individual socioeconomic status (SES) was measured through the Family Affluence Scale (FAS) (Boyce et al., 2006; Corell et al., 2021; Hobza et al., 2017). The FAS contains six items: “Does your family own a car or another motorized vehicle?”; “Do you have your own bedroom?”; “How many computers does your family own?”; “How many bedrooms (room with a bath/shower or both) are there in your home?”; “Does your family have a dishwasher?”; and “How many times did you and your family travel out of West Virginia for holiday/vacation last year?”. Some response options were measured with 0 = “No” and 1

= “Yes”, while others ranged from 0 = “None/Never” to 3 = “Three/More than two”. Items were summed to produce a scale ranging from 0 (low SES) to 13 (high SES). This scale was developed for the World Health Organization Health Behavior in School-aged Children (HBSC) Study (Boyce et al., 2006) and has been shown to have good criterion validity (Boyce et al., 2006; Hobza et al., 2017). The FAS has been identified as an adequate self-reported measure of socioeconomic status among adolescents and as a possible alternative measure of parental earned income (Corell et al., 2021).

Perceived financial inequality was measured using Relative Family Income (RFI), a scale used in prior studies on adolescents (Kristjansson et al., 2013; Quon & McGrath, 2015). The single-item RFI measure reads “How well off financially do you think your family is in comparison to other families in West Virginia?”. Response options ranged from 1 = “Much better off” to 7 = “Much worse off”.

Community factors. Neighborhood characteristics were measured with three constructs: neighborhood safety, collective efficacy, and neighborhood ties.

Neighborhood safety was measured with the “Safety from Crime” scale (Echeverria et al., 2004), consisting of two items asking respondents to rank their agreement/disagreement with each statement: “I feel safe walking in my neighborhood/community during the evening”; and “My neighborhood/community is safe from crime”. Response options ranged from 1 = Strongly agree to 5 = Strongly disagree. Each item was scored and summed, creating a scale ranging from 2 (high neighborhood safety) to 10 (low neighborhood safety) ($\alpha = 0.83$).

A five-item collective efficacy scale was used to measure the collective efficacy concept (Sampson et al., 1997). The scale was headed with the question “How likely or unlikely is it that your neighbors would do something about it if...?”. Items included “the youths in the neighborhood were skipping school and hanging around”; “the youths were putting graffiti on houses in the area”; “the youths disrespected the adults”; “if a fight broke out in front of your house”; “somebody was breaking into a car or a house on your street”. Response options ranged from 1 (Very unlikely) to 5 = (Very likely) and were summed to form a scale ranging from 5 (low collective efficacy) to 25 (high collective efficacy) ($\alpha = 0.95$).

Neighborhood ties were measured as part of the “Community Protective Factor” scale utilized in previous studies (Bernburg et al., 2009). This scale included six items headed with the question “How much does the following apply to your situation?”. Each question carried response options ranging from 1 (Strongly disagree) to 5 (Strongly agree). Items included: “My parents/caregivers have friends that live close to our home”; “My parents/caregivers know many of our neighbors by name”; “My parents/caregivers sometimes visit some of our neighbors”; “My neighbors sometimes visit my parents/caregivers”; “Sometimes we borrow things from our neighbors (e.g. cup of milk or tools)”; “Our neighbors sometimes borrow things from us (e.g. cup of milk or tools)”. Responses were summed to produce a scale ranging from 6 (weak neighborhood ties) to 30 (strong neighborhood ties) ($\alpha = 0.90$).

Interpersonal factors

The first subscale from the ‘school as protective factor’ instrument was utilized to measure social support from adults at school (Lilly et al., 2024). The subscale contained five questions, headed with the statement: “The following questions ask you to think about your school. Please select the response that best captures your experience.” These items included: “The adults at my school care about me”; “The adults at my school are fair and kind to me”; “The adults at my school are safe to be around”; “The adults at my school notice when I’m having a hard time and offer to help me”; “The adults at my school believe I can make the world a better place.” Each response option ranged from 1 (strongly disagree) to 5 (strongly agree) and was summed to form a scale ranging from 5 (low social support from adults at school) to 25 (high social

support from adults at school) ($\alpha = 0.89$).

The five-item Harsh Parenting scale (Arnold et al., 1993) was used to measure harsh parenting experienced by adolescents. This scale is headed with the question: “When you do something wrong, do any of your parents/caregivers do the following things?” and the five items included: “spank you”; “hit you with a belt, a paddle or something else?”; “Tell you to get out or lock you out of the house?”; “Raise their voice or yell”; and “insult or say mean things to you”. Response options ranged from 1 = “Never” to 4 = “Always”. Responses were summed to produce a scale ranging from 4 (low perceived harsh parenting) to 20 (high perceived harsh parenting) ($\alpha = 0.75$).

Primary caregiver support was measured utilizing a five-item parental behavior inventory (Schaefer, 1965). The headlining question asked “Are the following statements not like your [insert primary caregiver], like your [insert primary caregiver], or a lot like your [insert primary caregiver]?”. The five items included “My [primary caregiver] is able to make me feel better when I am upset”; “my [primary caregiver] enjoys doing things with me”; “my [primary caregiver] cheers me up when I am sad”; “my [primary caregiver] gives me a lot of care and attention”; “my [primary caregiver] is easy to talk to.” Response options ranged from 1 = “not like” to 3 = “a lot like” and were summed to form a scale ranging from 5 (low parent/caregiver support) to 15 (high parent/caregiver support) ($\alpha = 0.90$).

Langton and Berger (2011) suggest family structure may carry a relevant association with adolescent behavioral health outcomes. Therefore, we included family structure as a covariate in this analysis. Family structure was categorized as “1: Lives with both biological parents” and “0: Other living arrangements”.

Effect modifier. Gender was measured with a binary variable and categorized as “Boy” or “Girl”.

Analysis

Data were analyzed using SPSS Version 28. Descriptive statistics (frequencies, means, valid percentages, and standard deviations) by the full sample and also stratified by gender are shown in Table 1. Bivariate *t*-tests, Mann Whitney *U* tests, and Chi Square when applicable, were used to assess to each variable by gender. Next, due to a floor and ceiling effect within the dependent variable (i.e., particularly a grouping of responses at the low end of the anger scale), a series of count distribution regressions were tested, and a Poisson distribution fit best with the lowest AIC value. We then ran a series of models, including a main effects model (shown in Table 2) and a gender interaction model (shown in Table 3). Alpha is set to 0.05 unless otherwise stated. Interaction terms were included if there was a statistically significant main effect; and included harsh parenting, neighborhood safety, social support from adults at school, and primary caregiver support. The parameter estimates were exponentiated and interpreted as Rate Ratios (RR).

Results

Table 1 shows descriptive results for all study variables. The overall sample included 49.2 % boys ($n = 770$) and 50.8 % girls ($n = 794$). The mean score for externalized anger was 5.58 (SD = 2.78) for boys and 5.88 (SD = 2.86) for girls ($p < 0.001$). Table 2 includes model results for main effects. Girls reported significantly higher externalized anger levels (0.899 (95 % CI = 0.858–0.942) than boys. Variables with significant relationships to externalized anger include harsh parenting (1.055 (95 % CI = 1.047 to 1.073)), primary caregiver support (0.981 (95 % CI = 0.971–0.992)), perceived neighborhood safety (0.979 (95 % CI = 0.968–0.989)), and supportive adults at school (0.987, (95 % CI = 0.981–0.994). Table 3 includes model results for gender interaction terms for the significant independent variable related to anger: Harsh parenting (1.032, 95 % CI = 1.006–1.055). Gender has a significant

Table 1
Descriptive characteristics by gender of Appalachian middle school students in Wave 2 of the Young Mountaineer Health Study ($N = 1564$).

Variables	Total 100 % (1564)	Boy 49.2 % (770)	Girl 50.8 % (794)	P-value
Externalized anger	5.58 (2.78)	5.26 (2.65)	5.88 (2.86)	$U =$ (329,294.00, P < 0.001)
Relative family income	5.02 (1.37)	5.01 (1.38)	5.03 (1.36)	$U =$ (287,393.50, P $= 0.94$)
Family affluence	9.43 (2.32)	9.50 (2.27)	9.36 (2.38)	$T_{11542} = (1.11,$ $P = 0.29)$
Neighborhood ties	19.79 (6.61)	19.25 (6.69)	20.31 (6.49)	$U =$ (254,955.50, P $= 0.01$)
Community safety	9.52 (2.40)	7.71 (2.38)	7.40 (2.47)	$U =$ (255,768.50, P $= 0.002$)
Collective efficacy	12.40 (7.36)	11.78 (7.22)	13.01 (7.45)	$U =$ (246,511.50, P $= 0.001$)
Supportive adults at school	20.35 (4.37)	19.98 (4.54)	20.71 (4.18)	$U =$ (270,476.00, P $= 0.002$)
Primary caregiver support	12.93 (2.65)	13.03 (2.63)	12.84 (2.68)	$U =$ (275,938.50, P $= 0.14$)
Harsh parenting	7.24 (2.29)	7.21 (2.16)	7.27 (2.42)	$U =$ (280,858.50, P $= 0.53$)
Family structure (lives with both biological parents)	50.0 % (782)	50.3 % (393)	49.7 % (389)	$\chi^2 = 0.66, P =$ 0.42

Table 2
Poisson regression for main effects of independent variables associated with externalized anger scores for Appalachian middle school students ($N = 1564$).

Outcome: Adolescent externalized anger	RR	Sig	Lower 95 % CI	Upper 95 % CI
Gender (boys)	0.90	<0.001	0.858	0.942
Relative family income	0.99	0.424	0.973	1.011
Family affluence	1.00	0.453	0.986	1.006
Neighborhood ties	1.00	0.219	0.999	1.007
Collective efficacy	1.00	0.247	0.999	1.005
Neighborhood safety	0.98	<0.001	0.968	0.989
Family structure (does not live with both bio parents)	1.05	0.056	0.999	1.100
Primary caregiver support	0.98	<0.001	0.971	0.992
Supportive adults at school	0.99	<0.001	0.981	0.994
Harsh parenting	1.06	<0.001	1.047	1.073

modifying effect on the relationship between harsh parenting and anger.

Discussion

This study assessed key concepts associated with externalized anger in a sample of rural adolescent boys and girls and presented a conceptual model to assess adolescent externalized anger. Incorporating levels of the socioecological model (Bronfenbrenner, 1977), existing literature, and the proposed conceptual model in this study, we identified key constructs and tested their relationship to externalized anger in adolescents. We also tested for gender differences in reported levels of externalized anger.

We found significant gender differences in externalized anger levels and its correlates. In contrast to expectations, boys reported significantly lower externalized anger than girls ($p < 0.001$). This unexpected finding differs from reports in several previous studies that have shown higher anger expression among boys compared to girls (Anjanappa et al., 2020; Kerr & Schneider, 2008; Rahman et al., 2014). This finding could be due

Table 3
Poisson regression with gender interaction terms for all statistically significant main effects of associations with externalized anger scores for Appalachian middle school students (N = 1564).

Outcome: Adolescent externalized anger	RR	Sig	Lower 95 % CI	Upper 95 % CI
Gender (boys)	0.52	<0.001	0.346	0.772
Relative family income	0.99	0.403	0.973	1.011
Family affluence	1.00	0.418	0.985	1.006
Neighborhood ties	1.00	0.229	0.998	1.006
Collective efficacy	1.00	0.231	0.999	1.005
Neighborhood safety	0.98	0.020	0.971	0.998
Family structure (does not live with both bio parents)	1.05	0.072	0.996	1.110
Primary caregiver support	0.97	<0.001	0.957	0.986
Harsh parenting	1.05	<0.001	1.028	1.062
Gender (boys) × harsh parenting	1.03	0.014	1.006	1.055
Gender (boys) × primary caregiver support	1.02	0.088	0.997	1.041
Gender (boys) × supportive adults at school	1.01	0.152	0.997	1.022
Gender (boys) × neighborhood safety	0.99	0.210	0.967	1.008

to the limited studies conducted with rural youth in the U.S. This lack of current literature highlights the need for more robust research on adolescent anger development among rural U.S. populations. Ideally, future research should utilize multiple measures of anger, including state/trait anger (Lievaart et al., 2016), to assess significant gender differences.

Several measures were associated with adolescent externalized anger in this study. At the community level, perceived neighborhood safety was negatively associated with adolescent anger for both boys and girls ($p < 0.001$). Elevated externalized anger and delinquency levels may result from unsafe or unsupportive built environments and communities, as well as home and school environments (Bowen & Bowen, 1999; Fram & Dickmann, 2012). At the interpersonal level, caregiver support and supportive adults at school were also negatively associated with externalized anger for both genders ($p < 0.001$). This is consistent with literature from previous studies in international and urban populations: Strong support from primary caregivers and adults at school have previously been found to be protective factors for anger in adolescents (Houlterberg et al., 2016; Muris et al., 2004). Finally, harsh parenting was positively associated with externalized anger ($p < 0.001$). Harsh and authoritarian parenting styles are established contributing factors to adolescent aggression (Kawabata et al., 2011; Milevsky et al., 2007). With the exception of relatively higher externalized anger reported by early adolescent girls, these findings of rural Appalachian adolescents are consistent with those observed of urban and metropolitan adolescents.

Significant gender differences were found regarding harsh parenting as a correlate of externalized anger among adolescent boys and girls. Although the main effects of harsh parenting with anger was significant across gender, harsh parenting was a stronger correlate of anger among adolescent boys compared to girls as shown in interaction analyses. Previous studies have shown that boys may receive less parental monitoring and less emotional support from their caregivers than girls (Hickman et al., 1995; Kristjánsson & Sigfúsdóttir, 2009). Adolescent boys also experience higher levels of harsh and physical discipline than girls (Erath et al., 2009; Mahoney et al., 2000; McKee et al., 2007; Simons et al., 1991), although this was not assessed in our study. Also, harsh parenting has been shown to be associated with higher levels of physical and social aggression among boys (Kingsbury et al., 2020). This finding suggests that harsh discipline in adolescence may be particularly harmful for boys. These gender differences suggest that boys and girls may be socialized differently in rural Appalachia, even though socialization processes in Appalachia are similar to those in the rest of the U.S. (Rogers et al., 2021; Thomassin et al., 2019). Future research should

examine externalized anger as it relates to boys' and girls' socialization processes (Brody, 2013; Chaplin et al., 2005; Zeman et al., 2010).

This study has several limitations as well as strengths. It is possible that our measurement of externalized anger resulted in the unexpected finding of higher externalized anger in girls. However, the scale we used, the SCL-90, has been shown to be a reliable and valid indicator of self-reported anger (Derogatis et al., 1973, 1976). Nevertheless, alternative questions relating to externalized anger, such as distinguishing between state versus trait anger (Lievaart et al., 2016; Spielberger, 2010; Spielberger et al., 2013), may generate different results. In addition, our survey used cross-sectional data and did not track externalized anger over time. Gender differences in externalized anger may change as adolescents age throughout middle and high school. However, the large sample of adolescents surveyed partially mitigates this concern.

Third, our data collection approach was based on self-report, which can be subject to recall and social desirability biases. Future research should incorporate teacher or caregiver perceptions of adolescent externalized anger in addition to self-reported anger expression. Our findings, however, are consistent with other studies suggesting that subjective measures of some concepts in adolescent studies may be just as relevant for health and behavioral outcomes as objective measures (Bauer, 1966, p. 11); Casas, 2011; Quon & McGrath, 2014).

Curbing downstream violence is a public health priority. One important avenue for addressing violence at the primary prevention level is externalized anger in adolescents. Given that anger is a risk factor for violence, it is vital to address key predictors of externalized anger, particularly for boys, as they are more likely than girls to demonstrate direct physical aggression and violence (Fives et al., 2011; Nivette et al., 2019). Further study of gendered socialization processes and their relationship to adolescent externalized anger are critical if we are to develop tailored interventions to prevent violence among rural adolescents.

Implications for nursing

The current findings and conceptual model carry several implications for psychiatric nurses and other healthcare professionals when working with rural adolescents. It is important for nurses and other healthcare professionals to be aware of the correlates of externalized adolescent anger when intervening with or treating rural adolescents. Even though externalized anger was higher among girls in this rural adolescent sample, the interaction of externalized anger and harsh parenting among boys has potential implications for parenting education. Parents who use alternatives to harsh parenting with boys, such as authoritative parenting approaches (Morris et al., 2021), may mitigate longer-term consequences of harsh parenting noted in the literature, such as downstream violence and problem behaviors in later adolescence. Further research on the temporal sequence of harsh parenting and adolescent anger is warranted, especially among boys, in order to better inform possible parenting interventions. Another implication of this study for psychiatric nursing is how it situates adolescent externalized anger within a broader conceptual model that encompasses areas in which nurses practice, such as directly with patients in clinical healthcare settings, but also in the school and the community. Increased awareness of correlates of adolescent anger in these contexts, especially among rural adolescents, may help inform interventions or treatments that takes these developmental contexts into account.

CRedit authorship contribution statement

Rosalina Mills: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Christa L. Lilly:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Robin A. Pollini:** Writing – review & editing, Conceptualization. **Keith J. Zullig:** Writing – review & editing, Conceptualization. **Traci Jarrett:** Writing – review & editing, Conceptualization. **Jacob K. Tebes:** Writing – review & editing,

Conceptualization. **Alfgeir L. Kristjansson:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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