2023

Witnessing Community Violence and its Consequences: Changes Across Middle School

Sarah Pittman
Virginia Commonwealth University

WITNESSING COMMUNITY VIOLENCE AND ITS CONSEQUENCES: CHANGES ACROSS MIDDLE SCHOOL

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

By: Sarah K. Pittman
Bachelor of Arts, University of North Carolina at Chapel Hill, 2016
Master of Science, Virginia Commonwealth University, 2020

Co-Charis: Albert D. Farrell, Ph.D.[1], Terri Sullivan, Ph.D.[2]

[1]Distinguished Career Professor, Department of Psychology
[2] Professor, Department of Psychology

Virginia Commonwealth University
Richmond, Virginia
Summer, 2023

Table of Contents

List of Tables

List of Figures

Acknowledgments

I would like to thank my graduate school advisor and committee co-chair, Dr. Albert Farrell, for his mentorship and guidance during my graduate training. I will be forever grateful that you accepted me into your team and to VCU and provided numerous hours of training and support on my projects and accomplishments. I would also like to express my gratitude to my committee co-chair, Dr. Terri Sullivan, and committee members, Drs. Wendy Kliewer, Rosalie Corona, Nicholas Thomson, and Patrick Curran, for their time and expertise throughout my dissertation project, and providing me with numerous additional training opportunities. I would like to thank my fellow Farrell team members, current and former, who have supported my projects and provided invaluable guidance throughout my training and career development. I would also like to thank my many supervisors and mentors throughout my training who have provided advice and support as I develop in my career. Finally, I offer my most sincere gratitude to the teachers, students, and school staff who participated and the study staff who implemented the project from which the data for this study were derived. I would also like to thank Al and Terri for graciously allowing me to use these data to address my research questions.

I would like to express my deepest gratitude to my support network that helped me get through my graduate training. My parents, Brenda and Carlton, my sister, Rebecca, and my grandmother, Susan, have supported me and cheered me on every step of the way. My cohort mates Jen, Caroline, Irene, Kristen, Emily, Nina, Lisa, and Sahar provided countless hours of unconditional support, guidance, laughter, and friendship throughout our studies. I truly cannot imagine going through this journey without you all, and I cannot wait to see all that you all accomplish and for many more years of friendship. A number of close friends, including Mary Tyler, Karissa, and Kaitlyn, also provided unconditional support, friendship, and countless hours

of laughter and distraction. You all cheered me on and celebrated my accomplishments and projects even when you had no idea what they meant. My dog, Moose, has been with me since almost the beginning of the program and provided unconditional love and comfort and helped me stay grounded in life beyond graduate school. And finally, to Cole, my partner, your continued love and support mean more to me than I can express. You have done so much to lift me up throughout my training, from making me laugh until I cry to staying up with me on late nights, making the best pizza I have ever had, and celebrating every accomplishment no matter how big or small. You are such an incredible person, and I am so grateful that I found you and have had you by my side throughout this journey. I am so excited for our future together.

This study was funded by the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (5U01CE001956), and National Institute of Justice (2014-CK-BX-0009), and the National Institute of Child Health and Human Development (1F31HD106695-01). The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, the National Institute of Justice, nor the National Institute of Child Health and Human Development.

Abstract

Community violence exposure is prevalent among youth residing in economically marginalized communities that have high rates of violence. Witnessing community violence has been concurrently associated with persistent adverse consequences. However, few studies have applied a developmental psychopathology framework and examined dynamic developmental processes between witnessing community violence and outcomes over time. Moreover, most prior studies have used analyses that assume that associations between witnessing violence and outcomes are the same for all adolescents, which is inconsistent with both developmental theories and theories specific to community violence exposure. The goal of this study was to apply a developmental psychopathological framework to (a) examine heterogeneity in changes in witnessing community violence across middle school, and (b) examine their associations with distress symptoms and aggression. I used three analyses that made different assumptions about the heterogeneity and functional form of change within a subgroup of adolescents residing in an economically marginalized community with high rates of violence. Participants were 1,323 youth (54.3% female, 17.5% Latine, 88.3% African American/Black) attending middle schools in neighborhoods with high percentages of residents below the federal poverty line and high rates of violence.

I used latent curve models to identify trajectories of witnessing community violence, distress symptoms, and physical aggression for the overall sample. For witnessing community violence, a piecewise model fit the data best and indicated that witnessing community violence decreased across middle school with the steepest decrease during the 6th grade. Additionally, there were significant drops in witnessing violence during the summer. For distress symptoms, a quadratic model fit the data best such that symptoms decreased across middle school and the rate

of change decreased (i.e., decelerated) over time. For aggression, a piecewise model fit the data best and indicated that the frequency of physical aggression was stable during each school year and decreased significantly during the summer. Results of a growth mixture model (GMM) analysis using the parameters of the witnessing violence trajectory as latent class indicators suggested that there was heterogeneity in trajectories of witnessing violence that could be modeled by three distinct subgroups. Latent profile analysis, which allowed the functional form of change in witnessing violence to vary over time by examining patterns in frequency, produced similar subgroups to the GMM. Thus, the GMM, which constrained the functional form to be the same across subgroups and allowed within-group variability in parameters, was further evaluated for subgroup differences in distress symptoms and physical aggression.

Overall, frequencies of witnessing violence differed across subgroups, and subgroups with higher overall frequencies had greater decreases (i.e., slopes) in witnessing over time. The subgroups also differed in their overall levels of distress and aggression, but not in their rates of change (i.e., slopes) in these constructs. A *rarely witnessing* subgroup (22%) had the lowest levels of distress symptoms and frequencies of aggression across middle school. The *frequent witnessing* subgroup (33%) had the highest levels of distress symptoms and frequencies of physical aggression across middle school. Additionally, this subgroup had the largest decreases in witnessing violence and physical aggression frequencies during the summer. Finally, the *moderate witnessing* subgroup (45%) consistently reported levels of distress symptoms and frequency of physical aggression in between those reported by the other two subgroups. These findings suggest that there is heterogeneity in adolescents' experiences of witnessing community violence exposure across time that can be modeled with the same functional form. These findings have implications for interventions and highlight the importance of early intervention.

Witnessing Community Violence and its Consequences: Changes Across Middle School

Community violence exposure is a prevalent and persistent problem among youth growing up in the United States. In a national study conducted from August 2013 to April 2014, 27% of youth ages 10 to 13 years had witnessed an assault in the community within the past year, which is an increase of 1.4 times since the same national survey was conducted 4 years prior (Finkelhor et al., 2015). Evidence suggests that adolescents who witness community violence experience concurrent and long-term negative consequences. A meta-analysis indicated that community violence exposure (i.e., both witnessing and victimization) is associated with both internalizing symptoms (e.g., distress, depression, anxiety) and externalizing symptoms (e.g., aggressive behavior) among adolescents (Fowler et al., 2009). Community violence exposure has also been associated with poor school performance, involvement in gang activity, and involvement in the juvenile justice system (Overstreet, 2000). Because community violence exposure is often the product of an individuals' environment, preventing exposure can be difficult and requires community-level interventions. Consequently, understanding the effects of community violence exposure on youth adjustment is imperative for developing and refining individual-level interventions.

Black and Latinx youth, compared with non-Hispanic White youth, are more likely to reside in economically marginalized neighborhoods, which often have high rates of violence (Akins, 2009; Borg et al., 2021; Zimmerman & Messner, 2013). Youth within neighborhoods with concentrated economic disadvantage experience multiple risk factors from their environment (e.g., residential stability, socioeconomic status, parental supervision) that increase their risk of experiencing violence within their community (Zimmerman & Messner, 2013). Consequently, as a group, youth of color report higher frequencies of witnessing community

violence and victimization by violence compared with their White peers (e.g., Borg et al., 2021; Chen et al., 2020; Zimmerman & Messner, 2013). Homicide is the leading cause of death among Black and Latinx youth, whereas homicide is the fifth leading cause of death among White youth (Sheats et al., 2018). A study of Black adolescents residing in an urban neighborhood that used a daily sampling method to record community violence exposure found that, on average, adolescents reported witnessing violence on half of the days (Richards et al., 2015). Further, youth of color residing in neighborhoods with concentrated economic disadvantage often have less access to mental health care and positive youth development services compared with White peers and peers residing in affluent neighborhoods (Zimmerman & Messner, 2013). Taken together, a large body of evidence suggests that adolescents residing in economically marginalized neighborhoods are at greater risk for witnessing community violence and its consequences compared with other youth. Thus, understanding the effects of witnessing community violence on adjustment is imperative to provide intervention services to promote positive youth development among this population of youth.

Many studies that have investigated the effects of witnessing community violence on adjustment have used methods that make several problematic assumptions about youth experiences. First, they generally assume that adolescents within economically marginalized neighborhoods are homogenous in their patterns of violence exposure over time. They also often assume that trajectories of exposure to violence through witnessing follow the same functional form (e.g., linear). These assumptions imply that adolescents do not differ in patterns of change in their experiences over time and that their experiences have consistent effects on adjustment. However, several studies have found that adolescents differ in their patterns of experiences of community violence, with some youth reporting high rates of witnessing violence, victimization,

or both (e.g., Gaylord-Harden et al., 2016; Pittman & Farrell, 2022). Findings from several recent studies suggest that experiences of witnessing violence change over time, and thus the form or direction of change varies among adolescents (e.g., Baskin & Sommers, 2015; Whipple et al., 2021). Consequently, there is a need to understand changes in experiences of witnessing community violence among youth at high risk of exposure in order to understand the effects of different patterns of witnessing violence on adjustment over time.

Early adolescence (i.e., ages 10 to 14 years) is a salient time to study the effects of witnessing community violence. Studies have shown that rates of exposure increase after youth enter middle school (Overstreet, 2000). This trend is likely due to increases in time spent away from home, unsupervised by adults, and in autonomy and control over where they go and with whom they interact (Crockett & Crouter, 1995). Early adolescence is also a period in which youth become increasingly susceptible to environmental, biological, cognitive, and emotional processes that increase their risk of psychopathology (Choukas-Bradley & Prinstein, 2014; Cicchetti & Rogosch, 2002). Consequently, witnessing community violence could have a particularly detrimental impact on youth development during adolescence. A meta-analysis that compared effects of community violence exposure on distress symptoms from 114 studies found that studies with adolescent samples demonstrated stronger effects of exposure on both internalizing and externalizing symptoms compared with studies with child samples (Fowler et al., 2009). The high frequency of exposure paired with stronger effects on adjustment underscores the need to understand how community violence exposure impacts development among urban adolescents.

Theory

Developmental psychopathology is a conceptual model of the development of mental disorders that informs theory and practice of youth psychology and psychiatry (Hinshaw & Beauchaine, 2017). It focuses on "the dynamic interplay of biology and context, genes and environments, and transactional processes linking multilevel influences to the development of healthy and atypical functioning" (Hinshaw & Beauchaine, 2017 p. 30). The developmental psychopathology framework differs from other conceptual models of psychopathology that focus on current symptoms because it recognizes dynamic, multilevel, and systemic processes that result in pathological changes in adjustment. Community violence is an example of an environmental factor that can impact adolescent adjustment because it can have a transactional relation with developmental processes and measures of adjustment (e.g., Lynch & Cicchetti, 1998), and can impact youth via multiple systems or levels. For example, a recent study found that bidirectional relations between community violence exposure and physical aggression were mediated by peer factors (Farrell et al., 2021). Thus, a developmental psychopathology framework is optimal for investigating associations between community violence exposure and adjustment.

One assumption of developmental psychopathological frameworks is that populations are heterogeneous in their developmental trajectories (i.e., their functional form or shape of change over time) over time. Hinshaw and Beauchaine (2017) maintains that subgroups within a population may have "unique developmental journeys" in adjustment over time. Subgroups can be distinguished by any number of factors, including risk factors for psychopathology, behaviors, or social-emotional variables. One well-known example of subgroup differences in developmental trajectories is Moffitt's (1993) model of antisocial behavior. According to this model, there are two distinct trajectories of antisocial behavior: adolescent-limited individuals

who only exhibit antisocial behavior during adolescence, and life-course-persistent individuals who engage in antisocial behavior starting in childhood and continuously throughout their lives. Multiple factors (e.g., parenting, peer influence, neurodevelopmental processes) are thought to contribute to differences in patterns of antisocial behavior for individuals following each trajectory. Similarly, witnessing community violence may be a factor on which subgroups of adolescents differ in trajectories over time. Adolescents within these subgroups would be homogenous in their patterns of witnessing community violence (i.e., the frequency of exposure at a particular time and the form of changes in frequency over time). As suggested by developmental psychopathological framework, different trajectories of exposure may be associated with different trajectories of adjustment over time.

Multiple theories have been proposed to explain associations between specific trajectories of witnessing community violence and their associations with adjustment. Stress process or traumatic stress theories suggest that trajectories of increasing or stable high frequencies of exposure to violence are associated with increases in internalizing and externalizing symptoms over time (i.e., maladaptation, Foster & Brooks-Gunn, 2009). The stress process theory also postulates that adolescents who reside in neighborhoods with concentrated economic disadvantage are particularly vulnerable to consequences of exposure to violence because they often concurrently experience other stressors (e.g., family stress, residential instability) and may lack protective factors (e.g., access to mental health care). Evidence of positive associations between witnessing violence and internalizing and externalizing symptoms (e.g., Fowler et al., 2009) aligns with stress process theories. Findings of studies examining risk and protective factors also support the stress process theory and suggest that youth of color, who disproportionately live in economically marginalized neighborhoods, experience more risk

factors for violence exposure and have less access to positive youth development services (Zimmerman & Messner, 2013). Consequently, adolescents residing in economically marginalized neighborhoods, compared with their affluent peers, are at a greater risk for maladjustment due to multiple risk factors.

In contrast, theories related to emotional desensitization, such as the pathological adaptation theory, state that adolescents residing in neighborhoods with concentrated economic disadvantage who experience chronic high levels of violence across multiple contexts (e.g., neighborhood, school, home) emotionally desensitize to violence (Ng-Mak et al., 2002). Emotional desensitization is a process by which internalizing symptoms decrease and externalizing symptoms increase simultaneously for youth with stable high or increasing trajectories of violence exposure. According to this theory, adolescents who desensitize to violence adopt attitudes that normalize violence, which increases their aggressive behavior (Ng-Mak et al., 2002). This theory might explain findings of negative or no associations between witnessing community violence and internalizing symptoms (e.g., Farrell & Bruce, 1997). Additionally, some studies have found positive relations between community violence exposure and aggressive behavior, and curvilinear (i.e., decelerating) relations between exposure and internalizing symptoms (e.g., Gaylord-Harden et al., 2017; Kennedy & Ceballo, 2016; Ng-Mak et al., 2004), which is thought to indicate desensitization. However, many studies that have examined theories related to community violence exposure, particularly chronic violence exposure, have limitations that do not provide an adequate test of the theories. Clarifying the extent to which adolescents differ in their patterns of witnessing community violence and associations with adjustment over time would help refine developmental psychopathology theories related to the impact of exposure.

Understanding the effects of witnessing community violence on youth mental health from developmental psychopathological frameworks requires longitudinal research designs that model patterns of exposure over time to examine chronicity and functional form of change. This approach requires repeated measures of variables across multiple timepoints. Further, theories related to exposure to violence, such as the stress process model and pathological adaptation model, postulate that there are differences in developmental processes over time such that trajectories of exposure, and their associations with adjustment, differ across adolescents (Foster & Brooks-Gunn, 2009; Ng-Mak et al., 2002). Consequently, identifying adolescents who differ in their trajectories of exposure, and investigating differences in their adjustment, could improve our understanding of differences in developmental processes among youth exposed to violence. Nonetheless, the majority of research to-date has focused on changes in adjustment based on a measure of exposure collected at a single timepoint. Few studies have investigated patterns of witnessing violence over time, and even fewer have investigated subgroup differences in trajectories of exposure and their associations with adjustment. The goal of this study was to address gaps in our understanding of chronic exposure to witnessing violence. Specifically, this study aims to (a) examine patterns of witnessing violence across middle school among adolescents residing in economically marginalized neighborhoods and (b) investigate their associations with adjustment (i.e., physical aggression and distress symptoms).

Associations Between Witnessing Community Violence and Adjustment

Witnessing community violence has been associated with numerous adjustment problems, including externalizing problems (e.g., aggressive behavior, delinquency), internalizing problems (e.g., anxiety, depression, posttraumatic stress), and poor outcomes (e.g., school failure) (for reviews see Foster & Brooks-Gunn, 2009; Fowler et al., 2009; Overstreet,

2000). There is substantial evidence to suggest that witnessing community violence is associated with concurrent adjustment problems. However, evidence of long-term consequences of witnessing violence is not conclusive, largely due to inadequate methodology for examining developmental processes over time. Understanding developmental processes such as the effect of chronic violence exposure on adjustment requires modeling changes in witnessing violence across multiple time points. However, many prior studies have exclusively focused on differences between adolescents with low and high frequencies of violence exposure at a single timepoint. In the following sections, I review the existing literature and the different approaches that have been used to investigate longitudinal associations between witnessing violence and adjustment and identify weaknesses and areas in need of further research.

Effects of Witnessing Violence Based on a Single Observation

Several studies have used a single timepoint of witnessing community violence to examine differences in subsequent changes in adjustment for adolescents reporting varying frequencies of exposure. This approach examines between-person differences in adjustment. For example, Mrug and Windle (2010) used hierarchical multiple regressions to examine the effects of past-year experiences of witnessing community violence on changes in anxiety, depression, delinquency, and aggression among a predominately Black (78%) sample of early adolescents participating in the Birmingham Youth Violence Study. Their results showed that past-year witnessing violence positively predicted changes in delinquency approximately one year later after controlling for baseline levels of delinquency. In contrast, witnessing violence did not predict subsequent changes in anxiety, depression, or aggression.

Elsaesser (2018) used regression analyses to model associations between past-year experiences of witnessing community violence and subsequent changes in adjustment (i.e.,

aggression, depression, and attention problems) in a sample of Black and Latino male adolescents residing in economically disadvantaged neighborhoods participating in the Chicago Youth Development Study (CYDS). After controlling for baseline levels of aggression, depression, and attention problems, they concluded that witnessing violence was not associated with changes in any measures of adjustment one year later. In another study of Black and Latinx male adolescents participating in the CYDS, Gaylord-Harden et al. (2017) found that past-year experiences of witnessing community violence had a significant positive association with changes in frequency of violent behavior one year later. Witnessing violence also had a significant curvilinear (i.e., negative quadratic) association with subsequent changes in depressive symptoms, indicating that the rate of change decreased for youth reporting higher levels of witnessing violence at the initial wave. Notably, studies by Mrug and Windle (2010), Elsaesser (2018), and Gaylord-Harden et al. (2017) only investigated the effects of experiences of witnessing community violence within the past year, which does not allow for conclusions to be made about the chronicity of adolescents' exposure or changes in exposure in between data collection periods. Moreover, these studies assumed that the form of associations between witnessing violence and adjustment was the same (linear or quadratic) for all adolescents, which might not be the case.

Several studies have examined changes in adjustment based on a single observation of witnessing violence using latent growth curve modeling. These methods involve estimating an intercept (baseline level) and slope (change over time) of a variable of interest. In the context of understanding effects of community violence exposure, growth models often use a measure of witnessing violence collected at one timepoint as a predictor of the intercept and slope for repeated measures of youth adjustment. For example, Farrell and Sullivan (2004) examined

lifetime witnessing community violence and its relation to subsequent changes in problem behaviors across middle school using growth curve models in an urban predominately Black sample of adolescents and in a separate rural sample of White (63%), Latinx (21%), and Black (13%) adolescents. For both samples, changes in aggressive behavior were best represented by a negative quadratic trajectory such that aggressive behavior increased over time, but the rate of change decreased. Lifetime frequency of witnessing community violence assessed in the sixth grade was significantly associated with baseline levels of aggressive behavior for both samples, but not with changes in aggressive behavior in either sample.

Taylor et al. (2018) also used latent growth curve modeling to examine the impact of witnessing community violence on subsequent internalizing and externalizing symptomology in a diverse sample of adolescents (43% Black, 31% Latinx, 11% White) attending urban public schools. They found that changes in youth- and parent-reported internalizing and externalizing symptoms had a negative linear slope across three years. Notably, they did not test for non-linear changes over time. Lifetime experiences of witnessing community violence at baseline significantly predicted the intercept for youth- and parent-report of youths' externalizing symptoms, but not internalizing symptoms. Additionally, witnessing violence was not associated with changes in youth- or parent-reported internalizing or externalizing symptoms. Taken together, findings from Farrell and Sullivan (2004) and Taylor et al. (2018) suggest that measures of lifetime experiences of witnessing violence are associated with concurrent measures of aggressive behavior, but not with subsequent changes in aggressive behavior.

Cross-lagged panel models are another approach used to examine changes in measures of adjustment from observations of witnessing violence that represent single timepoints rather than patterns of change. Unlike regression models previously discussed, they replicate associations

between an observation of witnessing violence at a specific time and subsequent changes in adjustment by including repeated measures of all variables. Farrell and Bruce (1997) used cross-lagged models to examine repeated measures of witnessing violence and associations with emotional distress and violent behavior across three timepoints within one school year in a predominately Black sample of middle school-aged adolescents. Among male adolescents, lifetime frequency of witnessing violence assessed at each wave was not associated with subsequent changes in emotional distress or violent behavior when prior levels of these variables were accounted for. Among female adolescents, lifetime frequency of witnessing violence was significantly associated with subsequent changes in violent behavior, but not with changes in emotional distress. In a similar study, Farrell, Thompson, Curran, et al. (2020) used cross-lagged models of data from four time points in one year to examine associations between frequency of witnessing community violence within the past three months and subsequent changes in aggressive behavior in a predominately Black sample of early adolescents. They found that witnessing violence predicted subsequent changes in aggressive behavior after controlling for victimization by community violence and other negative life experiences that may impact adjustment. Taken together, these findings suggest that witnessing violence predicts changes in aggressive behavior even after prior experiences of witnessing violence are accounted for. However, this trend was not found for internalizing symptoms such as emotional distress.

Taken together, the results of longitudinal studies examining associations between one observation of witnessing violence and changes in adjustment, with the exception of Farrell and Sullivan (2004) and Taylor et al. (2018), suggest that witnessing violence is associated with subsequent changes in externalizing problems. Findings related to internalizing problems are less clear. Several studies (Elsaesser, 2018; Farrell & Bruce, 1997; Mrug & Windle, 2010; Taylor et

al., 2018) did not find significant associations between witnessing community violence and subsequent changes in internalizing problems. However, Gaylord-Harden et al. (2017) found a significant curvilinear association between witnessing community violence and changes in depressive symptoms, which suggests that other studies might have missed significant associations if they did not examine possible non-linear associations. Of the studies discussed previously, only Gaylord-Harden et al. and Farrell and Sullivan examined possible non-linear associations between witnessing violence and changes in adjustment.

Inconsistencies in findings across prior studies may be attributed to the approach of using a single observation of witnessing violence to predict subsequent changes in adjustment. Some evidence suggests that adolescents' frequency of witnessing violence changes over time, and that adolescents differ in their patterns of change over time (i.e., form of change). Further, developmental psychopathology frameworks emphasize that changes in adjustment result from dynamic processes that occur over time (Hinshaw & Beauchaine, 2017). Thus, one timepoint of past-year exposure may not adequately capture adolescents' experiences of witnessing violence over time, and one measure of lifetime exposure does not capture changes in frequency of exposure over time. For example, adolescents reporting high levels of lifetime exposure may have experienced chronic high levels of exposure, high levels initially that decreased over time, or recent experiences of high exposure. Therefore, studies that use a single observation of witnessing violence do not provide an appropriate basis to examine developmental processes among adolescents exposed to community violence. Moreover, it is possible that different patterns of witnessing violence are associated with differences in changes in adjustment over time, which could explain why measures that aggregate experiences together into a single observation have not been associated with changes in adjustment in prior studies.

Patterns of Witnessing Community Violence and Associations with Adjustment

Using a developmental psychopathological framework to understand associations between patterns of community violence exposure and adjustment requires the use of analytic approaches that model repeated measures of exposure. Moreover, theories related to witnessing community violence hypothesize that the associations between witnessing violence and adjustment differ based on the trajectory, or the chronicity and functional form of change, of exposure. Although many psychological processes are related to developmental processes within an individual over time, most studies have used cross-sectional methods or examined a single observation of a variable of interest to understand these processes (Curran & Bauer, 2011). These studies do not allow for examining changes in chronicity or frequency of witnessing violence over time. Methods that model frequencies of witnessing community violence at multiple timepoints are needed in order to identify patterns of exposure over time. Several studies have used advanced methodology to examine associations between patterns of witnessing violence and youth adjustment.

Latent growth curve models have been used to model changes across repeated measures of witnessing community violence over time. This approach involves estimating the mean intercept and slope of repeated measures of witnessing community violence in a sample. For example, Farrell and Sullivan (2004) used growth curve models to examine lifetime witnessing community violence across middle school in a rural sample of White (63%), Latinx (21%), and Black (13%) adolescents. They found that the slope of the model was linear, and a quadratic slope term was examined but not significant. Adolescents overall reported increases in the frequency of witnessing community violence over time. Adolescents who reported lower frequencies of witnessing violence at baseline had greater increases in witnessing violence across

middle school. Additionally, the intercept and slope of the model of witnessing violence was significantly associated with the intercept and slope of aggressive behavior. These findings indicate that adolescents who reported higher levels of witnessing violence at baseline also reported higher aggressive behavior at baseline, and adolescents who reported increasing levels of witnessing violence also tended to report increasing levels of aggressive behavior.

Findings from Farrell and Sullivan (2004) provide some evidence that changes in witnessing community violence are associated with subsequent changes in adjustment problems. However, gaps remain due to the limitations of their methodology. Although growth curves allow for slopes and intercepts to differ across individuals, they impose strict structure on change over time by constraining the functional form of change to be the same for all participants (e.g., linear). Consequently, they do not allow for examining differences in the form of trajectories of witnessing violence over time and their associations with adjustment. Developmental psychopathology frameworks imply that individuals differ in their developmental processes over time and thus likely differ in the functional form of their trajectories of witnessing violence and in their adjustment. More rigorous methodological approaches are needed that allow us to examine differences in trajectories of witnessing violence and their associations with adjustment.

Population Homogeneity or Heterogeneity?

Recent studies have used innovative methodology, such as mixture modeling, sometimes referred to as "person-oriented approaches," to examine subgroup difference in patterns of repeated measures of variables over time. Mixture modeling approaches assume that, within a given sample, there is heterogeneity in relations between variables, and that this heterogeneity can be modeled by a finite number of subgroups (Masyn, 2013). These approaches may enhance our understanding of the effects of community violence exposure on adjustment from a

developmental psychopathology framework. Moreover, these models can be used to model trajectories that differ in their functional form over time. Hinshaw specifically argues for person-centered methodology that examines heterogeneity in developmental processes and factors that may distinguish subgroups, including differences in trajectories and nonlinear trends (Hinshaw & Beauchaine, 2017). Additionally, they argue for examining moderator variables in developmental processes, such as sex. Mixture models have been used to investigate subgroup differences in repeated measures of community violence exposure over time, and in associations between patterns of violence exposure and measures of adjustment.

One study that investigated subgroup differences in trajectories of witnessing community violence over time was conducted by Spano et al. (2010) with a sample of Black adolescents from economically marginalized neighborhoods participating in the Mobile Youth Survey. Using a SAS macro for group-based modeling, they identified two subgroups of youth with different trajectories of past-year experiences of witnessing community violence across a 5-year period. One subgroup represented by 39.5% of the sample had a chronic high level of witnessing violence. The other group, which included 60.5% of the sample, had stable low levels of witnessing violence across five years. The authors also compared subgroup differences in violent behavior by calculating odds ratios to determine if trajectories of witnessing violence predicted trajectories of violent behavior. Youth who fell into the subgroup with chronic high levels of witnessing violence, compared with youth with stable low levels, were 10.8 times more likely to have a pattern of chronic violent behavior over five years. Moreover, while controlling for experiences of chronic victimization, youth with chronic experiences of witnessing violence were 5.78 times more likely to have patterns of chronic high violent behavior compared with youth with stable low levels of witnessing violence.

Baskin and Sommers (2015) used growth mixture modeling to investigate patterns in changes in the frequency of community violence exposure over 6 years in a large sample of adolescents who were incarcerated for serious offenses. The majority of their sample was male (86%), about 34% were Latinx, and 41% were Black. Their analysis revealed four subgroups with district trajectories of violence exposure across six annual measurement periods. A little over one-quarter of adolescents (28%) had stable low frequencies of violence exposure, 11% had initially low frequencies of exposure that increased over time, 27% reported initially moderate frequencies of exposure that decreased over time, and about 34% of the sample had stable high frequencies of exposure. The authors conducted negative binomial and OLS regression to examine trajectories of exposure as predictors of past-week mental illness symptoms (PTSD, depression, anxiety, hostility) at the final assessment. They found that adolescents in the stable low exposure subgroup reported significantly fewer symptoms of all measures compared with adolescents in the stable high exposure subgroup. The subgroup with initially moderate then decreasing frequency of exposure subgroup also reported significantly fewer symptoms of depression compared with the stable high exposure subgroup.

Lambert et al. (2010) used latent transition analysis to investigate changes in frequency of community violence exposure annually across sixth, seventh, and eighth grade in a sample of Black early adolescents. Latent transition analysis is used to examine subgroup differences over time by first identifying measurement models (i.e., subgroups) at each wave and then examining transition probabilities between subgroups across each wave. Lambert et al. identified two subgroups that were consistent in their patterns of exposure at each grade. The largest subgroup (80-85%) included adolescents who endorsed low frequencies on all violence exposure items. The second subgroup (15-20%) included adolescents who reported higher frequencies of

exposure (relative to the whole sample) on all items. When investigating transitions over time, they found that the largest trend (62%) was of adolescents remaining in the low exposure subgroup at all three waves of middle school. The next largest trend (16%) was of adolescents who remained in high exposure subgroup at all waves. A small subgroup (9%) transitioned from the low exposure subgroup in sixth and seventh grade into the high exposure subgroup in eighth grade, and another subgroup (6%) transitioned from the high exposure subgroup in sixth grade into the low exposure subgroup for seventh and eighth grade. Adolescents in the high violence exposure frequency subgroup, compared with the low exposure subgroup, reported more depressive symptoms in sixth grade but not in seventh and eighth grade. They did not investigate differences in aggressive behavior.

In a recent study, Whipple et al. (2021) also used latent transition analysis to investigate patterns of community violence exposure across four waves of data collected 6 months apart from a sample of African American/Black adolescents residing in urban, economically marginalized neighborhoods. They found three subgroups that were similar in their patterns of community violence exposure at each wave. The largest subgroup (about 50%) included adolescents who reported low levels of witnessing and experiencing violence. The next largest subgroup (29-35%) consisted of adolescents who reported high frequencies of witnessing violence and low frequencies of experiencing victimization. The third subgroup (6-16%) included adolescents who reported high frequencies of both witnessing and victimization by violence. There was a greater probability of remaining in one subgroup than transitioning to another subgroup at any given wave. However, only one-third of the sample remained in the same subgroup across all waves. Specifically, 26% of adolescents remained in the low exposure subgroup, and 7% remained in the subgroup with high levels of witnessing only. The extent to

which aggression and depressive symptoms were associated with concurrent subgroup membership was examined using odds ratios. Adolescents with more depressive symptoms were more likely to be in the subgroup with high levels of exposure compared with the other two subgroups at the second wave, and more likely to be in the high violence exposure subgroup compared with the low exposure subgroup at the fourth wave.

Taken together, findings from prior longitudinal mixture models suggest that adolescents differ in their patterns of witnessing violence over time, these patterns can be used to distinguish subgroups with different trajectories of exposure, and patterns are associated with some differences in adjustment. Overall, each study found that the majority of adolescents endorsed relatively low frequencies of violence exposure at any given timepoint, and that many adolescents consistently reported low frequencies of exposure over time. Additionally, findings indicated that a subset of adolescents, ranging from 16 to 40%, reported consistently high frequencies of violence exposure over time. High trajectories of violence exposure were associated with more aggressive behavior and mental illness symptoms compared with other trajectories of exposure (Baskin & Sommers, 2015; Spano et al. 2010). Additionally, subgroups of adolescents reporting higher frequencies of exposure at one wave relative to other waves reported higher concurrent internalizing symptoms (Lambert et al., 2010; Whipple et al., 2021). This finding suggests that patterns of adjustment might also vary as a function of differences in trajectories of exposure over time. All of the samples from these studies mostly included adolescents residing in neighborhoods that have concentrated economic disadvantage and/or high rates of violence. These findings underscore the importance of investigating heterogeneity in experiences of community violence within this population of adolescents in order to understand adolescents' adjustment and need for intervention services.

Despite their innovation, these studies have several limitations that have left gaps in the field of community violence exposure in need of further research. First, with the exception of Whipple et al. (2021), all studies measured violence exposure on an annual basis. Although they generally used measures that capture past-year exposure, there could be changes within a year that are associated with changes in adjustment. Findings from Whipple et al. indicate that adolescents' frequency of witnessing violence changed over sixth-month periods and suggest a need for more frequent measurement points to capture patterns over time. Second, studies that used latent transition analysis (Lambert et al., 2010; Whipple et al., 2021) identified subgroups by dichotomizing items of violence exposure, reflecting whether or not an individual experienced that act of violence. This approach, although common in mixture models, does not allow for variation in frequency of exposure. Third, with the exception of Spano et al. (2010), all of these studies used measures that combined witnessing violence and victimization by violence to identify patterns in exposure. Adolescents are more likely to witness community violence than to be victims of community violence (e.g., Farrell, Thompson, Curran, et al., 2020; Richards et al., 2015). Moreover, findings of subgroup differences in adjustment may conflate the effects of victimization and witnessing violence. Understanding unique effects of trajectories of witnessing violence on adjustment is particularly important because several prior studies have found cross-sectional and longitudinal differences between witnessing violence and victimization in their associations with adjustment (e.g., Farrell, Thompson, Curran, et al., 2020; Fowler et al., 2009; Pittman & Farrell, 2022).

One criticism of longitudinal mixture models is that they often result in an increasing (low intercept, positive linear slope), decreasing (high intercept, negative linear slope), stable high (high intercept, nonsignificant slope), and stable low (low intercept, nonsignificant slops)

patterns over time (i.e., “Cat’s Cradle” effect, see Sher et al., 2011 for discussion). This pattern raises a number of concerns, including the utility of the model and the interpretation of the intercepts and slopes of the different trajectories. Mixture models typically impose a linear trend which could oversimplify or misrepresent nonlinear trends (Sher et al., 2011). In reality, one experience of violence exposure would disrupt a stable low trajectory of exposure and consequently disrupt adjustment. Thus, experiences of violence may be associated with a discontinuous pattern of development. Disruptions in trajectories of violence exposure may be viewed as “developmental snares” or a factor that temporarily alters the current trajectory of development (Hussong et al., 2004). For example, Hussong et al. (2004) found that alcohol use at a given timepoint altered an individuals’ trajectory of antisocial behavior. Thus, patterns of community violence exposure over time, and their effects on development, may be viewed as either a continuous developmental process or a discontinuous process with disruptions or snares. Examining different approaches to modeling community violence exposure that make different assumptions about the continuity and form of change, and the heterogeneity of patterns over time will allow for examining different hypothesized pathways of developmental psychopathology.

Statement of the Problem

Adolescents who are most vulnerable to community violence exposure and its consequences are those who reside in neighborhoods with a high concentration of economic disadvantage which results from historic and systemic inequality. These adolescents also often encounter barriers to receiving mental and behavioral health care (Akins, 2009; Zimmerman & Messner, 2013). Therefore, it is imperative to understand how experiences of community violence affect their adjustment. Despite decades of research on the effects of community violence exposure and its impact on adjustment, gaps in the literature remain and limit our

understanding of development among youth exposed to violence. The goal of this study was to a) examine patterns of witnessing community violence across middle school and b) examine the extent to which patterns of witnessing violence are associated with differences in changes in adjustment throughout middle school. This study applied several analytic approaches to investigate patterns of witnessing violence over time and identify subgroup differences in trajectories of exposure and adjustment across middle school in a sample of adolescents residing in neighborhoods with high concentration of economic disadvantage.

The research on community violence exposure to date provides a solid foundation to suggest that exposure is associated with maladjustment among adolescents. Research has consistently shown that witnessing community violence is positively associated with subsequent changes in externalizing symptoms (e.g., Farrell, Thompson, Curran, et al., 2020; Spano et al., 2010). However, evidence of associations between witnessing violence and internalizing symptoms has been inconsistent. Some studies have found positive associations (Fowler et al., 2009), whereas others have found negative or no associations (e.g., Farrell & Bruce, 1997; Taylor et al., 2018). Many studies to date have used measures of community violence exposure that combine experiences of witnessing violence and victimization by violence into one measure of total violence exposure (e.g., Kennedy & Ceballo, 2016; Mrug et al., 2016; Whipple et al., 2021). There is a growing body of evidence to suggest that witnessing violence and victimization by violence are distinct constructs that have unique contributions to adolescent adjustment (e.g., Elsaesser, 2018; Farrell, Thompson, Curran, et al., 2020; Pittman & Farrell, 2022). Studies on prevalence of exposure suggest that rates of witnessing violence are higher than rates of victimization by violence among adolescents from economically marginalized neighborhoods (Farrell, Thompson, Curran, et al., 2020; Richards et al., 2015; Zimmerman & Messner, 2013).

Another limitation of the current literature on community violence exposure is that few studies have examined changes in frequencies of witnessing violence, differences in the functional form of change (i.e., patterns), and associations between changes in exposure and adjustment over time. Developmental psychopathology frameworks maintain that developmental processes differ between subgroups of individuals and follow distinct trajectories (Hinshaw & Beauchaine, 2017). As with many developmental processes, theories of community violence exposure postulate that consequences of exposure result from processes that occur over time in response to specific patterns of exposure (Foster & Brooks-Gunn, 2009; Ng-Mak et al., 2002). For example, the pathological adaptation model postulates that a trajectory of chronic high frequency of violence exposure result in an increasing frequency of aggressive behavior over time paired with stabilizing and then decreasing levels of internalizing symptoms (Ng-Mak et al., 2002). However, most studies examining the effects of witnessing community violence have been cross-sectional (e.g., Chen et al., 2020; Ng-Mak et al., 2004). Of the longitudinal studies, many have used only a single timepoint of witnessing violence to predict subsequent changes in adjustment (e.g., Mrug & Windle, 2010; Taylor et al., 2018). These approaches do not examine changes in witnessing violence or their association with changes in adjustment over time. Moreover, they make assumptions about homogeneity and stability in adolescents' experiences based on a single observation of exposure. Other studies have included as few as two timepoints of witnessing, often collected years apart (e.g., Gaylord-Harden et al., 2017). Such studies could miss changes that occur during the year between observations.

Consistent with developmental psychopathology frameworks, a growing body of evidence suggests that adolescents differ in changes in experiences of community violence, even among those who reside in the same neighborhood. There are likely subgroup differences in

patterns of witnessing violence over time (e.g., stable high, stable low, increasing, decreasing, etc.), and different patterns may be associated with differences in adjustment. However, few prior studies have investigated differences in patterns of witnessing violence between subgroups of adolescents. Although variable-centered approaches (e.g., latent growth curve modeling) can be used to identify trajectories of exposure over time, they assume homogeneity in the functional form of trajectories among all individuals in a sample. Some studies have used mixture modeling (e.g., latent transition analysis) to identify subgroups of adolescents that differ in their patterns of community violence exposure (e.g., Baskin & Sommers, 2015; Lambert et al., 2010; Spano et al., 2010; Whipple et al., 2021). Findings from these studies suggest that subgroups of adolescents differ in their patterns of community violence exposure, and that subgroups with different trajectories of exposure differed in their internalizing and externalizing symptoms. However, all of these studies, with the exception of Spano et al., combined victimization and witnessing into a single measure of exposure. Consequently, there is a need for a more rigorous examination of patterns of witnessing community violence and relations with adjustment over time.

Differences Across Sex

Some research has found that rates of community violence exposure differ across sex. For example, a study by Richards et al. (2015) used a daily sampling method to track the daily community violence experiences of Black adolescents residing in economically marginalized neighborhoods. They found that female adolescents reported more daily experiences of witnessing community violence and victimization by community violence compared with male adolescents. Farrell and Sullivan (2004) investigated sex differences in a latent growth curve model of witnessing community violence and found that male adolescents reported higher baseline frequencies of witnessing violence and greater increases in witnessing violence

frequency during middle school. However, a study by Finkelhor et al. (2015) conducted in 2013 examined frequency of past-year and lifetime violence exposure in a nationally representative sample of youth in the United States. They found that the frequency of witnessing community violence did not differ between female and male youth. Their study included youth from birth to seventeen years of age, so it is possible that sex differences in exposure vary throughout childhood and adolescence. Among the studies that examined the subgroup differences in patterns of exposure over time, only two studies examined associations between sex and subgroup membership. Both found no sex differences in subgroup membership (Lambert et al., 2010; Whipple et al., 2021). There is a need for more research that examines sex differences in patterns of exposure over time.

The Current Study

To address limitations of prior work, the current study used data from a rich dataset that collected 12 waves of data every three months across all three grades of middle school. This dataset provided the unique opportunity to model witnessing community violence across multiple timepoints each year for multiple years, which was used to model patterns of witnessing violence and investigate the extent to which subgroups differ in their trajectories. Additionally, the multitude of datapoints made it possible to examine and compare models that made different assumptions about the variability in patterns of witnessing violence over time. These data were collected from adolescents attending school in neighborhoods with concentrated economic disadvantage and high rates of violent crime. Thus, this sample is optimal for examining the impact of environmental factors, such as exposure to community violence, on adjustment. The present study addressed several gaps in the literature on witnessing community violence and its relation to youth adjustment. Prior studies provide limited understanding of changes in

adolescents' experiences of witnessing community violence over time. Most studies have only used a few timepoints of data collected a year or more apart. Further, studies that have investigated associations between witnessing community violence and measures of adjustment have either examined changes in adjustment based on one timepoint of exposure, assumed that the form and function of changes in exposure and associations with adjustment were the same for all individuals, or confounded effects of witnessing violence and victimization by violence. This study had two aims designed to address the limitations of prior studies.

Aim 1. My first aim was to examine patterns of change in witnessing community violence during middle school and determined the extent to which there is heterogeneity in patterns within the sample that can be represented by distinct subgroups of adolescents. Specifically, I applied three different analytic approaches that made different assumptions about heterogeneity in the form of change in order to examine the extent to which subgroups differed in trajectories of witnessing violence. I also investigated sex differences in patterns of exposure. This was examined using the following longitudinal methods that are increasingly flexible in the degree of structure of change they impose:

Aim 1a: I used latent growth curve models (LCM; Bollen & Curran, 2006) to test a series of competing models to identify trajectories of witnessing violence across middle school for the overall sample. This approach constrains the functional form of change over time to be the same for all individuals but allows for variability in the intercept and slope parameters.

***Aim 1b*:** I used growth mixture modeling (GMM) to determine if variability in trajectories of witnessing community violence across middle school could be represented by homogeneous subgroups. This approach assumed that there is heterogeneity in trajectories within the overall sample that can be modeled by unobserved (i.e., latent) subgroups. Once the final

model was determined in Aim 1a, I used latent class enumeration following the recommendations of Masyn (2013) to identify the optimal number of subgroups with different trajectories of exposure. Trajectories had the same functional form of change (i.e., same parameters). Subgroup indicators were the parameters of the final model identified in Aim 1a.

Aim 1c: I used all 12 waves of data across all grades to conduct repeated-measures latent profile analysis (LPA). LPA is one approach to modeling heterogeneity within a sample that is more flexible than GMM because it does not constrain trajectories for the subgroups to have the same functional forms in their patterns of change over time. Instead, in repeated measures LPA, latent subgroups within a sample are indicated by the indicator mean at each timepoint. Thus, the form of the trajectory is allowed to vary across subgroup based on weighted subgroup means at each wave. Indicators were adolescents' frequency of witnessing community violence at each wave.

Aim 1 Hypotheses. For Aim 1, I anticipated that the data would favor a piecewise model (i.e., slopes would change over time). Farrell, Goncy, et al. (2018) used LCMs to examine trajectories of adolescent problem behavior and peer victimization across 12 waves of data using this same dataset and found that a piecewise model that allowed slopes to vary at each grade best fit the data. I hypothesized that witnessing violence would be best represented by a model that has an intercept and slope parameter for each of the three grades. Because GMM and LPA are exploratory analyses, the number of subgroups and their patterns of witnessing violence were not known in advance. However, I anticipated that witnessing community violence would be best represented by two or more subgroups that differ in their trajectories of change over time.

Aim 2. My second aim was to understand how changes in community violence exposure across middle school were associated with changes in distress symptoms and physical

aggression. I examined longitudinal relations between longitudinal models of witnessing community violence identified in Aim 1 and trajectories of distress and physical aggression. First, I examined a series of LCMs to establish the trajectories of aggression and distress symptoms following the steps in Aim 1a.

Aim 2a: I used multivariate parallel growth models (Bollen & Curran, 2006) to examine relations between latent curve parameters (i.e., slopes, intercepts) of witnessing community violence identified in Aim 1a and trajectories of physical aggression and distress symptoms. This approach allowed me to examine associations between latent curve parameters of trajectories of exposure and physical aggression and distress for the overall sample.

Aims 2b and 2c: I compared trajectories of physical aggression and distress symptoms across latent subgroups identified in Aims 1b and 1c. I estimated the latent curve parameters for physical aggression and distress (i.e., intercepts and slopes) for each subgroup identified in Aim 1b. I also conducted follow-up pairwise comparisons for subgroups that significantly differed. This allowed me to examine the extent to which subgroups with different trajectories of witnessing violence differed in their trajectories of aggression and distress.

Aim 2 Hypotheses. Because trajectories of exposure and subgroups were not known prior to conducting analysis I could not make predictions of relations beforehand. However, after identifying subgroups in Aim 1, I generated hypotheses specifying relations between exposure and aggression and distress based on theories of community violence exposure before I conducted Aim 2 analyses.

Final models were determined based on fit with theories related to witnessing violence and developmental psychopathology, and by the models' ability to demonstrate differences in changes in adjustment for different patterns of exposure. Models that indicated subgroup

differences in trajectories of witnessing violence and changes in adjustment were regarded as more consistent with developmental theories compared with other models. This approach provided a rigorous examination of relations between witnessing community violence and internalizing and externalizing symptoms over time. Ultimately, the goal was not to identify one "final" model of witnessing community violence and adjustment, but rather examine models that make different assumptions about change over time in order to examine different possible pathways of development.

Method

Participants and Study Setting

This study used data from middle school students collected four times each year for all 3 years of middle school, resulting in a total of 12 waves of data. Data were collected as part of a larger project conducted at three urban middle schools in the Southeastern United States (see Farrell, Sullivan, Sutherland et al., 2018 and Sullivan et al., 2021 for details and findings). The schools were selected based on their high rates of truancy and location in neighborhoods with high rates of violence. Data were collected each year in 3-month intervals between February 2011 and June 2018 from random samples of 10 cohorts of students in each grade. For the current project, data were only included from students who provided at least three waves of data. Of the 2,755 adolescents included in the evaluation study, 1,323 (47.7%) were included in the current study (see "Procedures" for more information). Students had a mean age of 11.3 years at the start of the sixth grade. A little over half the sample was female based on school records (54.3%). Students self-reported their ethnicity and race. Data on ethnicity was missing from 6.7% of participants in this sample. Of the 17.5% students who identified their ethnicity as Hispanic or Latino/a, 20.8% identified as White, 6.5% identified as African American/Black,

6.1% identified as American Indian or Alaskan Native, 3.5% identified as Native Hawaiian or Pacific Islander, 2.6% identified multiple races, 1.3% identified as Asian, and 59.3% did not identify their race. Of the 75.8% who identified as not Hispanic or Latino/a, 88.3% identified their race as African American/Black, 2.6% identified as White, 4.6% identified as multiracial, and less than 1% identified as Asian, American Indian or Alaskan Native, or Native Hawaiian or Pacific Islander. Data on racial identity was missing from a total of 13.6% of participants. Most participants (i.e., 74% to 85%) were of lower socio-economic status as measured by federal free or reduced lunch program eligibility.

Procedures

This study used data from a larger project designed to evaluate the Olweus Bullying Prevention Program (OBPP; Olweus et al., 2010) at three urban middle schools. The OBPP aims to reduce bullying behavior and enhance school climate. The evaluation project used a multiple baseline design whereby each school provided data at baseline during the first year of the project, and the intervention was initiated in a random order at each of the participating schools during subsequent years. Intervention activities continued at each school once initiated until the end of the project. The project used a missing-by-design approach. Each year, data were collected from a sample of students at each participating school. A random sample of students was recruited from school rosters from all grades during the first year of the project. In subsequent years, a random sample of students was selected from sixth grade cohorts and new seventh and eighth grade students to replace those who had left the school. Students who agreed to participate in the study were randomly assigned to complete project measures at two of the four data collection points (fall, winter, spring, summer) during each year they attended the participating middle school unless they withdrew from the study. Thus, each student selected to participate in the

study provided data at a maximum of two waves each year and were missing from the other waves.

The evaluation project collected data every 3 months between 2010 and 2018 with several exceptions. In the first year of the project, data collection began in the winter wave. Additionally, data were not collected during the fall of the sixth year due to a change in the funding source. In the final year of the project, the last wave of data was collected in the spring. Students completed measures via a computer-assisted interview at school during the school year and either in their homes or another community location during the summer. Participants received $10 gift cards at each wave for completing any part of the survey. Parents provided consent and students provided assent for participation. The principal investigator's university institutional review board approved all procedures for the larger intervention project and approved the use of anonymized data for secondary analysis.

Attrition occurred over the course of the larger study. Of the students who participated in the larger study, data were missing from one or more wave from students who failed data checks (3.9%), did not complete the survey (2.7%), could not be scheduled to take the survey (7.0%), would not be located (1.9%), refused (5.7%), or for another reason (0.1%). Additionally, data were missing from students who became ineligible because they left the school (31.7%), withdrew from the study (1.4%), or became ineligible for another reason (1.9%). Of the ten cohorts that participated in the larger project, only six cohorts could have attended the schools during all three grades (i.e., four cohorts were in the seventh or eighth grade during Year 1 or the sixth or seventh grade in Year 8). Due to the planned missing design, students could provide a maximum of six waves of data. The current study used data from participants who provided data during at least three waves (N = 1,323) in order to increase the estimation power of methods

designed to address missing data. Based on chi-square tests, the students who were included in the current study, compared with those excluded, included more female students, $\chi^2(1, 2929) = 6.98$, $p = .008$. The two samples did not differ in makeup of racial or ethnic identities.

Measures

Witnessed Community Violence

The Survey of Children's Exposure to Community Violence (SECV; Richters & Saltzman, 1990) in its various forms is perhaps the most commonly used self-report measure of youth's levels of witnessing community violence and victimization by community violence (Fowler et al., 2009). The current study used a modified 13-item witnessing violence subscale on which adolescents reported past 3-month experiences of witnessing community violence on a 6-point scale, with 1 = "Never," 2 = "1–2 times," 3 = "3–5 times," 4 = "6–9 times," 5 = "10–19 times," 6 = "20 or more times". A sample item is "How many times have you seen someone else being attacked or stabbed with a knife?" Due to low endorsement of high frequencies of exposure, items were recoded into a 4-point scale by collapsing the three highest response options. Responses across items are average to produce a total score of witnessing violence. Previous studies have demonstrated that the SECV has good test-retest reliability, internal consistency, and construct validity (Richters & Martinez, 1993). Preliminary analysis with the current sample indicated that the witnessing violence subscale had good reliability at each wave (Cronbach's α = .80 to .86, see Table 1 for all alphas).

Distress

The Checklist of Children's Distress Symptoms (CCDS; Richters & Martinez, 1990) is a self-report measure used to assess adolescent symptoms of distress. The CCDS has 28 items that are based on diagnostic criteria for Post-Traumatic Stress Disorder (PTSD) described in the

Diagnostic and Statistical Manual of Mental Disorders, third edition, revised (DSM-III-R; American Psychiatric Association, 1987). The scale was designed to assess symptoms of traumatic stress experienced by youth who live with chronic exposure to community violence (Richters & Martinez, 1990). The scale has three subscales that represent clusters of PTSD symptoms including hyperarousal (difficulty with attention and sleep), reexperiencing the event (reenactment of the precipitating event), and avoidance. Participants rated their frequency of symptoms within the past six months on a 5-point scale, 1 = "Never," 2 = "Seldom," 3 = "Once in a while," 4 = "A lot of the time", 5 = "Most of the time". A sample item is "How often do you worry about being safe?" Responses across items are averaged to create a total score, with higher scores indicating higher levels of distress. The CCDS had good reliability across all 12 waves of data in the current sample (Cronbach's α = .94 to .95, see Table 1 for all alphas).

Self-Report Physical Aggression

The Problem Behavior Frequency Scale-Adolescent Report (PBFS-AR; Farrell et al., 2016) is a self-report measure that assesses the frequency of problem behaviors and peer victimization. This study used the 5-item Physical Aggression subscale. Adolescents rated their past 30-day frequency of each behavior on a 6-point scale, with 0 = "Never," 1 = "1–2 times," 2 = "3–5 times," 3 = "6–9 times," 4 = "10–19 times," 5 = "20 or more times". A sample item is "shoved or pushed someone." Responses across items are averaged to produce a total score of physical aggression. The PBFS-AR has demonstrated concurrent validity with teacher- and self-report ratings of adolescents' behavior and strong measurement invariance over sex, grade, intervention condition, and time (Farrell, Thompson, Mehari, et al., 2020). Following the recommendations of findings from an item response theory analysis of this measure (Farrell, Thompson, Mehari, et al., 2020), the items were recoded into a 4-point scale by collapsing the

three highest response options. Additionally, item means were log transformed and rescaled to the same mean and standard deviation of the original item to account for skewness. For this study, the Physical Aggression subscale had good reliability across all 12 waves of data (Cronbach's α = .67 to .81, see Table 1 for all alphas).

Covariates

Sex from school records and variables for intervention phase during each grade were dummy-coded and incorporated into final growth curve models as covariates. The intervention phase variable for each grade represented whether, during that grade in which the student provided data, the student was attending a school at which the intervention had been implemented (e.g., attending a school during the 7th grade that had the intervention). Age at the beginning of the sixth grade was also incorporated into final models as a covariate.

Table 1

Cronbach's Alpha, Model Estimated Means, and Model Estimated Standard Deviations for Each Measure at Each Wave of Data Collection

	6F	6W	6SP	6SU	7F	7W	7SP	7SU	8F	8W	8SP	8SU
Witnessing community violence												
N	356	531	510	518	543	631	660	526	477	508	458	294
Alpha	0.85	0.86	0.85	0.82	0.85	0.83	0.82	0.83	0.83	0.85	0.85	0.80
Mean	1.65	1.61	1.57	1.38	1.48	1.47	1.45	1.37	1.42	1.37	1.37	1.30
SD	0.56	0.53	0.51	0.39	0.48	0.46	0.45	0.43	0.47	0.46	0.46	0.34
Symptoms of distress												
N	275	452	432	428	450	553	569	444	402	491	446	289
Cronbach's α	0.94	0.94	0.95	0.94	0.95	0.95	0.95	0.94	0.95	0.95	0.95	0.95
Mean	2.17	1.98	2.01	1.95	1.9	1.86	1.82	1.81	1.84	1.81	1.85	1.76
SD	0.80	0.76	0.81	0.75	0.77	0.75	0.75	0.71	0.78	0.77	0.80	0.72
Physical aggression												
N	358	537	513	518	546	637	662	528	482	513	460	292
Cronbach's α	0.74	0.74	0.75	0.75	0.78	0.77	0.76	0.76	0.78	0.80	0.81	0.67
Mean	1.36	1.34	1.38	1.29	1.37	1.37	1.38	1.32	1.39	1.38	1.38	1.26
SD	0.50	0.48	0.50	0.46	0.52	0.54	0.54	0.49	0.56	0.59	0.56	0.41

Note: Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer. SD = Standard deviation. *N* = number of participants providing data at each wave. Means and standard deviations were estimated using full information maximum likelihood (FIML) using all available data from the full sample (*N* = 1,323).

Data Analyses

All analyses were conducted in Mplus version 8 statistical software (Muthén & Muthén, 2017) using full information maximum likelihood estimation, which uses all available observed responses to address missing data.

Aim 1

To address Aim 1, I identified patterns of witnessing community violence across middle school and examined the extent to which subgroups of adolescents differed in their patterns using the following longitudinal methods that are increasingly flexible in the degree of structure they impose and the functional form of change:

Aim 1a. I used latent growth curve models (LCM; Bollen & Curran, 2006) to test a series of competing models to identify a trajectory of witnessing violence across middle school for the overall sample. Models with increasing complexity were examined. Different parameters in models included grade factors that allowed means to differ across each grade, a summer factor that allowed means to differ in the summer compared with the other three seasons, and knots that represented points at which linear slopes were allowed to change. Specifically I examined models that included only an intercept (Model 1), an intercept and grade factor (Model 2), an intercept with a summer factor (Model 3), a simple linear slope (Model 4), a linear slope with a grade factor (Model 5), a piecewise model with knots at the fall timepoint in each grade (Model 6), a piecewise model with knots in the fall and a summer factor (Model 7), a linear slope with a knot in the fall of the sixth grade (Model 8), and a linear slope with a knot at the sixth grade and a summer factor (Model 9). This approach was used by Farrell, Goncy, et al. (2018) to model trajectories of problem behaviors across middle school using data from all participants from the larger study. I also compared two specifications of the final model: one where residual variances

for each variable were allowed to vary across waves (i.e., heteroscedastic residuals) and one where residual variances for each variable were constrained to equality over time (i.e., homoscedastic residuals).

Models were evaluated using root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis Index (TLI) based on guidance from Hu and Bentler (1999). CFI and TLI values above .95, and RMSEA values less than .05 indicated good fit. Nested models were compared using a difference test based on the Satorra–Bentler scaled chi-squared test (Satorra & Bentler, 1994). I compared non-nested models on differences in BIC. The BIC is a measure of absolute model fit and can be used to compare non-nested models with the same variables (Raftery, 1995). Based on guidelines from Raftery (1995), BIC differences of greater than 10 provide "very strong" evidence that the model with the smaller BIC has better absolute fit. In the final model, intercept and growth parameters were regressed on the dummy-coded sex variable, three dummy-coded variables representing intervention status during each grade, and a continuous variable representing age in the sixth grade to examine possible differences across sex, intervention status, and age. I repeated this process to examine a series of LCM to establish the trajectories of distress symptoms and physical aggression.

Aim 1b. I used growth mixture modeling (GMM) to determine if variability in trajectories of witnessing community violence across middle school could be represented by homogeneous subgroups. Once the final model in Aim 1a was determined, I followed the procedures outlined by Jung and Wickrama (2008). This procedure involves comparing models that specified the same structure (i.e., parameters) based on the final model from Aim 1a in each class and made different assumptions about the covariance and variance of model parameters (i.e., intercepts and slopes) within and across subgroups to determine the optimal mixture model

specification. Specifically, I examined a null homoscedastic variance/covariance matrix model (i.e., diagonal class-invariant model), which constrained the variance and covariance of growth parameters to zero and constrained residual variance to be equal across class; a linear homoscedastic (i.e., nondiagonal class-invariant) model which constrained the variance, covariance, and time-specific residuals of model parameters to equality across classes but allowed growth parameter means to vary across classes; a linear heteroscedastic (i.e., nondiagonal class-varying) model in which the growth parameter means, residual variances, variances, and covariances were allowed to vary across classes. For each model, residual variances were constrained to be equal across time within each class to avoid problems with model estimation. I used latent class enumeration following the recommendations of Masyn (2013) to identify the optimal number of subgroups across models with different (co)variance specifications.

The final model was determined by comparing models with increasing numbers of subgroups and that differed in their variance and covariance structure based on their fit, classification quality, subgroup size, and interpretability (Masyn, 2013). Model fit statistics used to determine the optimal number of classes included the log likelihood, the Akaike information criterion (AIC; Akaike, 1974), Bayesian information criterion (BIC; Schwarz, 1978), Bayes factor (BF; Masyn, 2013), and the approximate correct model probability (cmP; Masyn, 2013). Likelihood ratio tests, including the bootstrap likelihood ratio test (BLRT; Nylund et al., 2007), and the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLMR-LRT), were also used to determine the optimal number of classes. I placed stronger weight on the BIC and measures of fit calculated from the BIC (i.e., cmP, BF) in deciding the optimal number of subgroups because simulation studies have found that it is the best performing information criterion (Nylund et al.,

2007). Lower AIC and BIC values indicated better fit, and non-significant *p*-values on the BLRT and the VLMR-LRT indicated that adding an additional did not improve the fit of the model (Masyn, 2013). BF represents the probability that Model A is the correct model compared with the probability that Model B is the correct model when Models A and B are competing models. BF values greater than 10 provided strong evidence that Model A is the correct model (Masyn, 2013). For this analysis, BF was calculated by comparing Model *k* to Model *k*+1. The cmP allows for a relative comparison of all models under consideration, and all cmP values sum to 1.00 for a set of models. The model with the highest cmP value is considered to be the best fitting model (Masyn, 2013). Additionally, observed and model-predicted cell proportions and standardized residuals were examined indicate how well a model fits the data (Feldman et al., 2009) and were used to compare the fit of each model.

Aim 1c. I conducted repeated-measures latent profile analysis (LPA) to identify subgroups that differed in their patterns of witnessing violence across all three grades. LPA is an approach to modeling sample heterogeneity that is more flexible than GMM because it does not constrain subgroups to have similar functional forms in their patterns of change over time. Indicators were adolescents' scores of witnessing community violence at each wave. I followed Masyn's (2013) recommendations outlined in Aim 1b to determine the optimal number of subgroups. LPA allows indicator variables to covary or be constrained to be equal and covariances and variances to differ or be equal across profiles. Therefore, I compared models that made different assumptions about the indicator variables across class (i.e., profile-varying versus profile invariant) and variance and covariance structure of witnessing community violence (i.e., diagonal versus nondiagonal).

Aim 2

I investigated relations between patterns of witnessing violence identified in Aim 1 and trajectories of distress and physical aggression.

Aim 2a. I used multivariate parallel growth models (Bollen & Curran, 2006) to examine relations between latent curve parameters of witnessing community violence identified in Aim 1a and trajectories of physical aggression and distress symptoms. This approach allowed me to examine correlations between latent curve parameters for exposure and physical aggression and distress across waves for the overall sample and determine whether the correlations are significant which would indicate that changes in variables are significantly related to each other.

Aim 2b and 2c. I used the manual three-step approach (Asparouhov & Muthén, 2014; Bakk et al., 2016) to compare trajectories of physical aggression and distress symptoms across latent subgroups identified in the final model selected in Aim 1b. The manual three-step approach involves first saving a dataset that includes latent variables that represent most likely class membership and weights that account for uncertainty in class membership, as well as "auxiliary" variables relevant for outcomes analysis. Then, I specified a three-class model where class-specific logits of class membership probabilities were used to group individuals into subgroups while taking into account uncertainty in class membership. This approach addresses model enumeration problems that arise with very small or no variance estimates. I specified an overall model of distress symptoms using the best-fitting distress LCM from Aim 1a, and specified class-specific means of latent curve parameters. Intercept and slope variances were constrained to be equal across subgroup to address model convergence errors. I used the model constraint command to conduct a Wald test to investigate differences in distress latent curve parameters across subgroups defined by trajectories of witnessing community violence. I also conducted follow-up pairwise comparisons for subgroups that significantly differed. This process

was repeated for aggression. This allowed me to examine the extent to which subgroups with different trajectories of witnessing violence differed in their trajectories of aggression and distress.

Results

Descriptive Statistics

Means and standard deviations of all study variables are presented in Table 1. The number of participants who provided data for one or more variables at each timepoint ranged from n = 275 to 665. Range in sample size is partly due to seasonal variation, such that fall data were collected during 6 years of the project and summer data were collected during 7 years rather than 8 years. Data were collected from all other waves for all 8 years of the project. Additionally, the inclusion criteria of at least three waves of data for the current study resulted in larger sample sizes in the 7th grade because students who participated in the study during only two grades likely participated during the 7th grade (i.e., 6th and 7th or 7th and 8th). Frequency of witnessing violence means ranged from 1.30 to 1.65, indicating that, on average across all items, students reported witnessing different acts of community violence one to two times or less within the past 3 months. Average frequency of distress symptoms ranged from 1.81 to 2.17, indicating that the average endorsement of each item representing distress symptoms across middle school was low. The average frequency of physical aggression within the past 30 days ranged from 1.26 to 1.39, indicating that, on average, students reported engaging in each act of physical aggression one to two times or less across middle school.

Cross-variable correlations within each time point (i.e., cross-sectional correlations between study variables) are reported in Table 2. For the full correlation table see Appendix 1. Cross-variable correlations within each wave ranged from medium to large between witnessing

violence and distress (*rs* = .32 to .51, *p*s < .001) and between witnessing violence and aggression (*rs* = .30 to .51, *p*s < .001). Cross-sectional correlations between distress and aggression also ranged from medium to large (*rs* = .32 to .50, *p*s < .001). Correlations for the same variable at each wave were all significant, with the exception of the correlation between 6th grade fall and 8th grade summer aggression, and ranged from small to large for witnessing community violence (*r*s = .22 to .66, *p*s < .01), small to large for distress symptoms (*r*s = .26 to .67, *p*s < .001), and small to large for physical aggression (*r*s = .19 to .67, *p*s < .01). Correlations between measures of the same variable across 3-month intervals (i.e., witnessing violence fall to winter 6th grade) ranged from medium to large for witnessing violence (*r*s = .36 to .66, *p*s < .001), were large for distress symptoms (*r*s = .54 to .67, *p*s < .001), and ranged from medium to large for physical aggression (*r*s = .46 to .63, *p*s < .001). Correlations between measures of the same variable across 1-year intervals (i.e., witnessing violence 6th grade fall to 7th grade fall) ranged from medium to large for witnessing violence (*r*s = .33 to .59, *p*s < .001), medium to large for distress symptoms (*r*s = .39 to .62, *p*s < .001), and small to medium for physical aggression (*r*s = .28 to .45, *p*s < .001).

Table 2

Cross-Variable Correlations Among Witnessing Violence, Distress and Aggression Within Each Wave (i.e., Cross-Sectional Correlations)

	6F	6W	6SP	6SU	7F	7W	7SP	7SU	8F	8W	8SP	8SU
	Correlations with witnessing community violence											
Distress	.51***	.44***	.42***	.38***	.48***	.45***	.38***	.42***	.47***	.37***	.41***	.32***
Aggression	.35***	.46***	.40***	.41***	.51***	.35***	.48***	.34***	.40***	.50***	.58***	.30***
	Correlations with distress											
Aggression	.32***	.40***	.37***	.47***	.41***	.42***	.38***	.43***	.48***	.46***	.50***	.39***

Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

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

Aim 1a: Latent Curve Models

Witnessing Community Violence

Fit indices and difference tests for LCM models of the trajectory of witnessing community violence across middle school for the entire sample are reported in Table 3. Comparison of fit indices and difference testing indicated that the fit of the intercept-only model was significantly improved by the addition of a grade factor, a summer factor, and a single linear slope across all 12 waves (Models 2-4). The fit of the single linear slope model (Model 4) was significantly improved by the addition of either a summer factor, separate linear slopes for each grade, or a 6th grade and separate 7th/8th grade slope (Models 5-9). The addition of either separate linear slopes for each grade (i.e., 6th grade slope, 7th grade slope, 8th grade slope; Model 7) or only for the 6th grade (i.e., 6th grade slope, 7th and 8th grade slope; Model 9) significantly improved the fit of the model with a single linear slope and summer factor (Model 5). Models 7 and 9 both fit the data equally well (RMSEAs = .022, CFIs = .96, TLIs = .955). Model 9 was selected as the final model because it was more parsimonious (i.e., had one less parameter) and had a smaller BIC by more than 10 (i.e., BIC = 6081.79 compared with Model 7 BIC = 6092.37). The heteroscedastic specification of Model 9, which allowed time-specific residual variances to vary across time, fit significantly better than the homoscedastic specification ($\chi^2(15) = 37.36$, $p = .001$).

Model 9 included a 6th grade linear slope factor to represent changes in witnessing community violence across 6th grade waves, a single linear slope factor for the 7th and 8th grades (7th/8th grade slope) to represent change across waves within grades 7 and 8, and a summer factor that represented changes in witnessing community violence reported during the summer beyond the value predicted by the linear slopes (see Figure 1 for the analytic model and

Figure 2 for the observed and model estimated mean frequencies across time). The 6th grade and 7th/8th grade linear slope means were significant and negative (Table 4), indicating that witnessing violence decreased within and across all grades. The 6th grade slope was significantly more negative than the 7th/8th grade slope ($p < .001$). This indicated a larger decrease in witnessing violence during the 6th grade than during the 7th and 8th grades. The variances for the intercept and the 6th grade and 7th/8th grade slopes were significant (ps $< .05$), indicating that the overall frequency and rates of linear change in witnessing community violence over time varied among students in the sample. However, the variance for the summer factor was not significant ($p = .18$), indicating that students did not differ in the extent to which their reported exposure during the summer differed from the other times of year. The intercept was negatively correlated with the 6th grade slope ($r = -.63$, $p < .001$) and with the 7th/8th grade slope ($r = -.45$, $p = .016$), which indicated that students reporting higher overall frequencies of witnessing community violence reported greater decreases in frequency of exposure over time. The 6th grade and 7th/8th grade slope were not significantly correlated ($r = .25$, $p = .506$), indicating that the degree of linear changes in witnessing violence frequency during the 6th grade were unrelated to the degree of changes in witnessing violence frequency during the 7th and 8th grades. The summer factor was not significantly correlated with any of the growth curve parameters because its variance was not significantly different from zero.

Regarding covariate effects, there were no sex differences in the intercept ($d = .01$, $p = .94$), 6th or 7th/8th grade slopes ($d = .12$, $p = .42$ and $d = -.10$, $p = .40$ respectively), or summer factor ($d = .06$, $p = .72$). This result indicated that male and female adolescents had similar overall frequencies of witnessing community violence and similar rates of changes in their frequency of exposure across middle school. Age at the start of the sixth grade was not

significantly associated with the intercept (d = .06, p =.52) or summer factor (d = -.15, p =.29). However, age did significantly predict the 6th grade slope (d = .30, p =.04) and 7th/8th grade slope (d = -.22, p =.02) such that students who were older at the beginning of the 6th grade reported smaller decreases in witnessing violence during the 6th grade (i.e., slopes were less negative), but showed larger subsequent decreases across the 7th and 8th grades. In the model with intervention phase, the 6th grade slope was only regressed on 6th grade intervention phase because the 7th and 8th grade interventions would not impact 6th grade witnessing violence. The 7th/8th grade slope was regressed on both the 7th and 8th grade intervention phase variables. Intervention phase did not significantly predict any of the latent curve parameters (ds = -.13 to .12, ps = .07 to .67), indicating that attending a school during a year in which the intervention was being implemented did not impact overall reported frequency of witnessing violence or changes in reported frequency of witnessing violence during middle school.

Table 3

Fit Indices and Difference Tests for All Witnessing Community Violence Latent Curve Models Considered

Model	χ^{2a}	*df*	RMSEA	CFI	TLI	Comp	$\chi^2\Delta^b$	*df*
1. Intercept only	354.43***	76	.053	.712	.749			
2. Intercept with grade factor	243.84***	69	.044	.819	.827	1	96.95***	7
3. Intercept with summer factor	299.52***	75	.048	.767	.795	1	48.86***	1
4. Linear	201.18***	73	.036	.867	.880	1	91.11***	3
5. Linear with summer factor	128.80***	69	.026	.938	.941	4	63.97***	4
6. Piecewise linear knot at fall	139.10***	64	.030	.922	.920	4	61.74***	9
7. Piecewise with summer factor	104.47***	63	.022	.957	.955	4	98.88***	10
Model 7						5	26.59***	6
8. Linear with 6th and 7th/8th grade knots	165.63***	69	.033	.900	.904	4	34.87***	4
9. Linear with 6th, 7th/8th grade knots and summer factor	**106.27*** **	**64**	**.022**	**.956**	**.955**	**4**	**80.11*** **	**9**
Model 9						5	19.24**	5

Note: RMSEA = root mean-square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis Index; Comp = comparison model. Models have a heteroscedastic residual specification.

[a]Test of overall model fit. [b]Difference test comparing fit of each model to the comparison model.

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

Table 4

Means, Variances (Diagonal), and Correlations Between Parameters From Final Unconditional Latent Curve Model of Witnessing Community Violence (Model 9)

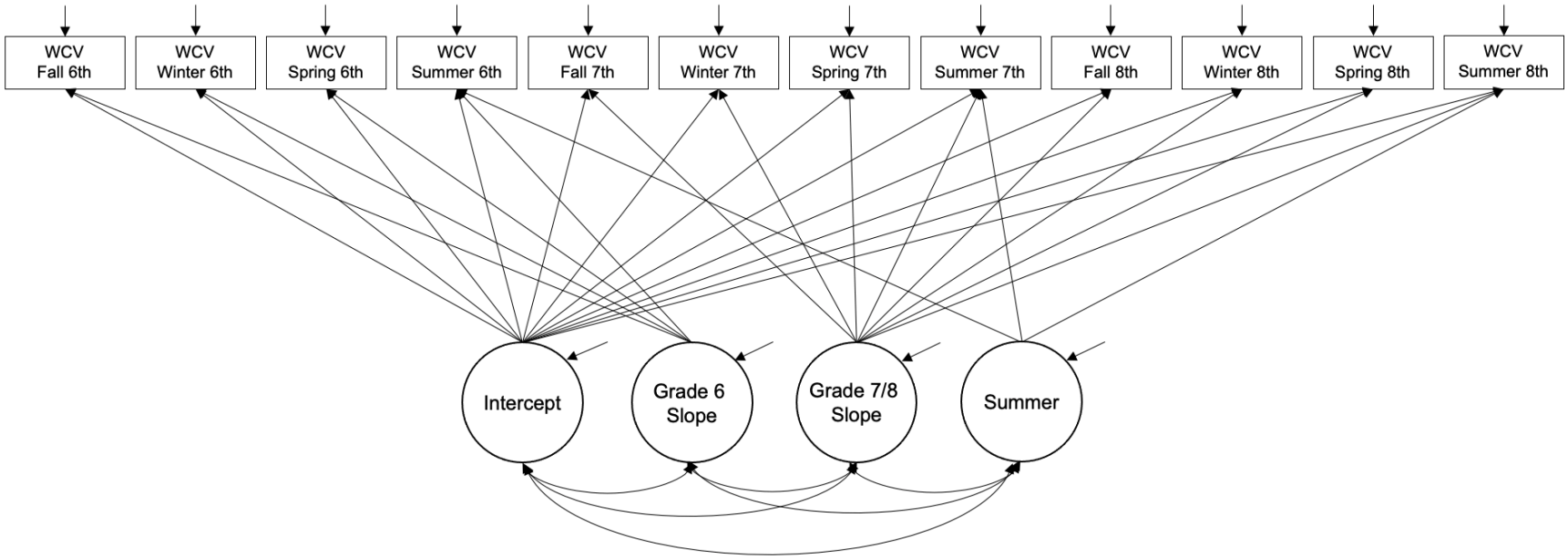
Parameter	Mean	Intercept	6th grade slope	7th/8th grade slope	Summer factor
Intercept	1.67***	.22**			
6th grade slope	-0.06***	-.63***	.01*		
7th/8th grade slope	-0.02***	-.45*	.25	.001**	
Summer factor	-0.08***	-.21	-.41	.00	.02

Note. $N = 1323$.

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

Figure 1

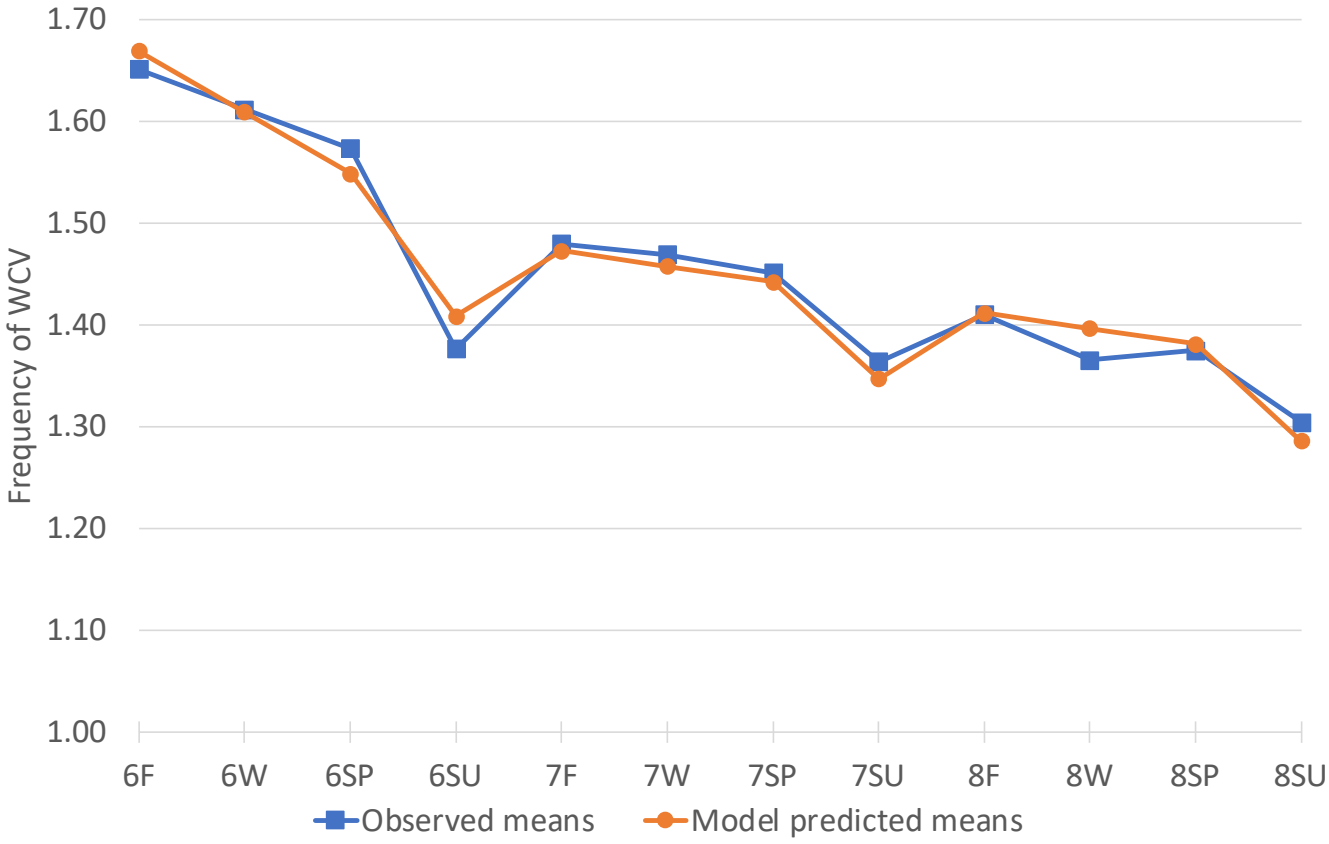
Analytic Model for the Final Latent Curve Model (Model 9) Representing Changes Within and Across Middle School for Past 3-Month Witnessing Community Violence (WCV) for the Entire Sample



Note. Time-specific residual variances of observed variables were allowed to vary over time (heteroscedastic residuals).

Figure 2

Estimated and Observed Means Based on Final Latent Curve Model (Model 9) Representing Changes Within and Across Middle School for Past 3-Month Witnessing Community Violence (WCV) for the Entire Sample



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer. WCV = Witnessing community violence.

Distress Symptoms

Fit indices and difference tests for the LCM of distress symptoms are reported in Table 5. Comparison of fit indices and difference testing indicated that models that included grade factors (Model 2) or a single linear slope across all 12 waves (Model 4) improved the fit over the intercept-only model. In contrast, the addition of a summer factor (Models 3 and 5) did not significantly improve the fit of either the intercept only model (Model 1) or the single linear slope model (Model 4). The addition of unique linear slopes for change across waves within each grade (Model 6) did not significantly improve fit over the model with a single linear slope across all 12 waves (Model 4). Models specifying separate linear slopes within each grade and a summer factor (Model 7), a 6th grade and 7th/8th grade linear slope (Model 8), and a 6th grade and 7th/8th grade slope with a summer factor (Model 9) all significantly improved fit over the single linear slope model (Model 4). A plot of the observed trajectories suggested adding a quadratic parameter. A model with a linear and quadratic slope representing change across all 12 waves (Model 10) significantly improved fit and had the best fit based on fit indices (RMSEA = .013, CFI = .987, TLI = .988). On this basis, it was selected as the final model. The heteroscedastic specification of Model 10 did not significantly improve fit over the homoscedastic specification (Model 10.1; $\chi^2(11) = 15.03$, $p = .181$). Accordingly, the homoscedastic specification of the quadratic model (Model 10.1) was selected as the final model.

Model 10.1 included linear and quadratic slope factors to represent changes in distress symptoms across all 12 waves of middle school (see Figure 3 for the analytic model and Figure 4 for the observed and model estimated mean frequencies across time). The linear slope mean was significant and negative, and the quadratic slope mean was significant and positive (see Table 6). This result indicated that distress symptoms decreased across middle school, and that the rate of

decrease slowed over time. The variance for the intercept was significant, indicating that the baseline levels of distress symptoms varied among adolescents in the sample. The variance for the linear slope was significant (p = .003), indicating that there were also individual differences in rate of linear change in distress symptoms. However, the variance for the quadratic slope was not significant (p = .051), indicating that the change in the rate of decrease was similar among all adolescents. The intercept was significantly inversely correlated with the linear slope (r = -.44, p < .001), which indicated that adolescents with higher baseline levels of distress symptoms had greater decreases in distress over time. Additionally, the linear and quadratic slopes were significantly correlated (r = -.91, p < .001), indicating that greater decreases in distress symptoms (linear slope) were associated with smaller changes in the rate of decrease (quadratic slope) over time. The intercept and the quadratic slope were not significantly correlated (p = .057), indicating that the change in the rate of decrease was similar among students regardless of their baseline levels of reported distress symptoms.

Sex had a medium effect on the intercept (d = -.43, p < .001), indicating that female adolescents reported higher levels of distress symptoms at baseline compared with male adolescents. There were no sex differences in the linear slope (d = .00, p =1.00) or quadratic slope (d = -.18, p =.359). This indicated that male and female adolescents reported similar rates of change in distress symptoms across middle school. The model in which curve parameters were regressed on age in the 6th grade had convergence issues. This was addressed by constraining the covariance between age and the intercept to 0. Within this model age significantly predicted the linear slope (d = .12, p =.034), indicating that older adolescents had less negative slopes. Age was not significantly associated with the quadratic slope (d = -.15, p =.068). Intervention phase did not significantly predict any of the latent curve parameters (ds = -

.02 to .23, *p*s = .160 to .880), indicating that attending a school in a year when the intervention was being implemented did not impact overall levels or changes in distress symptoms across middle school.

Table 5

Fit Indices and Difference Tests for All Distress Symptoms Latent Curve Models Considered

Model	$\chi^{2\alpha}$	*df*	RMSEA	CFI	TLI	Comp	$\chi^2\Delta^{\beta}$	*df*
1. Intercept only	210.37***	76	.037	.892	.906			
2. Intercept with grade factor	115.17***	69	.023	.963	.964	1	92.14***	7
3. Intercept with summer factor	207.58***	75	.038	.892	.902	1	2.33	3
4. Linear	112.66***	73	.020	.968	.971	1	85.75***	3
5. Linear with summer factor	111.09***	69	.022	.966	.968	4	1.49	4
6. Piecewise linear knot at fall	105.68***	64	.021	.970	.971	4	6.84	5
7. Piecewise with summer factor	81.37***	63	.015	.985	.985	4	33.71***	10
8. Linear with 6th and 7th/8th grade knots	92.46***	69	.016	.981	.982	4	22.01***	4
9. Linear with 6th, 7th/8th grade knots and summer factor	88.17***	64	.017	.981	.980	4	24.90**	9
10. Quadratic	**84.71*** **	**69**	**.013**	**.987**	**.988**	**4**	**28.87*** **	**4**

Note: RMSEA = root mean-square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis Index; Comp = comparison model. Models have a heteroscedastic residual specification.

[a]Test of overall model fit. [b]Difference test comparing fit of each model to the comparison model.

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

Table 6

Means, Variances (Diagonal), and Correlations Between Parameters From Final Unconditional Latent Curve Model of Distress Symptoms (Model 10)

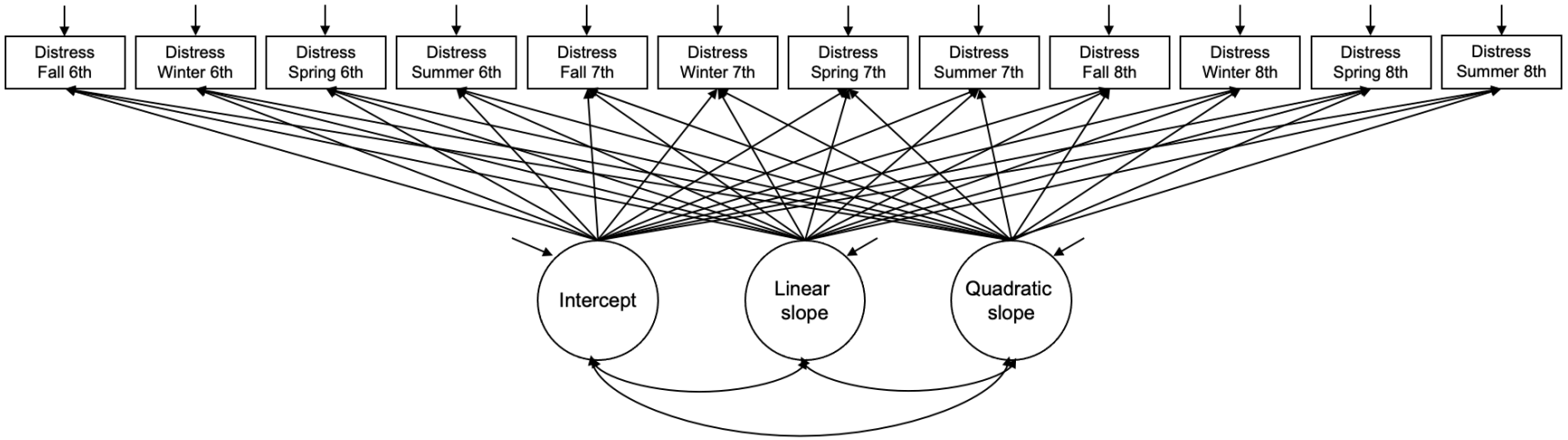
Parameter	Mean	Intercept	Slope	Quadratic factor
Intercept	2.11***	.42***		
Linear slope	-0.07***	-.44***	.02**	
Quadratic slope	0.004***	.27	-.91***	.00

Note. $N = 1307$.

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

Figure 3

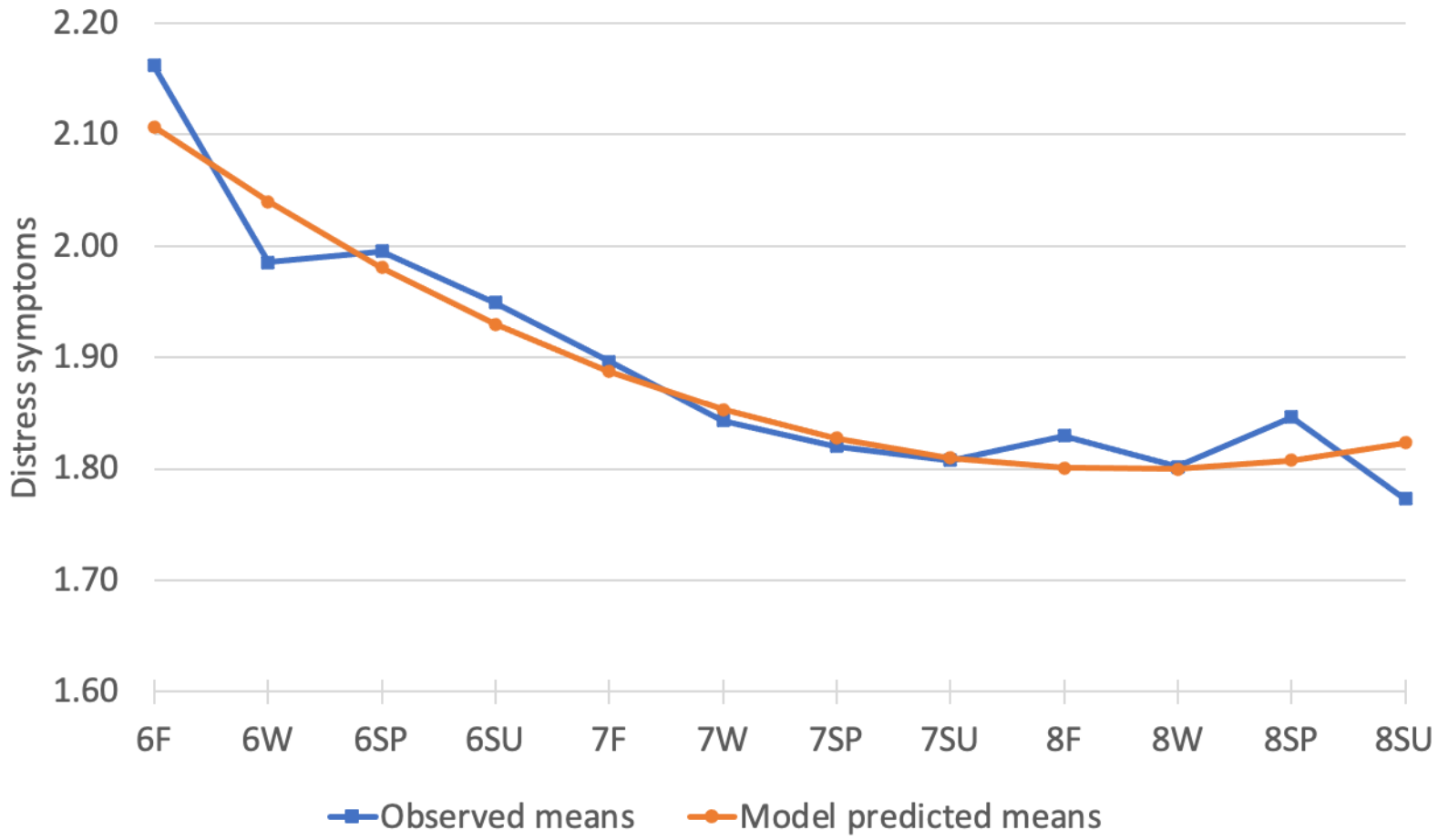
Analytic Model for the Final Latent Curve Model (Model 10) Representing Changes Within and Across Middle School for Past 6-Month Distress Symptoms for the Entire Sample



Note. Time-specific residual variances of observed variables were constrained to equality over time (homoscedastic residuals).

Figure 4

Estimated and Observed Means Based on Final Latent Curve Model (Model 10) Representing Changes Within and Across Middle School for Past 6-Month Distress Symptoms for the Entire Sample



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

Physical Aggression

Fit indices and difference tests for the LCM of physical aggression are reported in Table 7. Comparison of fit indices and difference testing indicated that models that included a grade factor (Model 2), a summer factor (Model 3), or a single linear slope across all 12 waves of data (Models 4), improved model fit over the intercept-only model. The fit of the single linear slope model was significantly improved by models that added a summer factor (Model 5), separate linear grade slopes representing changes across waves within each grade (Model 6), or both linear grade slopes and summer factors (Model 7), but not by the addition of a 6th grade and 7th/8th grade slope (Model 8). The linear model with the summer factor was significantly improved by models that added either separate linear slopes for each grade (Model 7) or a 6th grade and 7th/8th grade linear slope (Model 9). Model 7 was selected as the final model because it had the best fit based on fit indices (RMSEA = .022, CFI = .959, TLI = .953) and lowest BIC. The heteroscedastic specification of Model 7 that allowed time-specific residual variances to vary across time fit significantly better than the homoscedastic specification ($\chi^2(20) = 40.06$, $p = .005$).

Model 7 included separate 6th, 7th, and 8th grade linear slope factors to represent differences in linear slopes in physical aggression across waves within each grade, and a summer factor that represents changes in physical aggression frequency during the summer beyond what was predicted by the linear slopes (see Figure 5 for the analytic model and Figure 6 for the observed and model estimated mean frequencies across time). The 7th and 8th grade slopes were significantly different from each other ($p = .046$) but not from the 6th grade slope ($ps > .05$). The mean linear slopes within each grade were not significant ($ps > .05$), indicating that on average the frequency of physical aggression did not change across wave within each grade (Table 8).

Significance tests on factor variances revealed individual differences in the intercept and 6th and 7th grade slopes (*p*s < .05). However, the variances for the 8th grade slope and the summer factor were not significant (*p*s > .05), indicating that students did not show variability in changes in aggression during the summer or across waves within the 8th grade. The intercept was significantly negatively correlated with the 8th grade slope (r = -.45, p = .008), which indicated that students with higher overall frequencies of physical aggressions had greater decreases in aggression during grade 8. Additionally, the 6th and 7th grade slopes were negatively correlated (r = -.51, p =.001). This result indicated that there were between-person differences in rate of change such that individuals with greater decreases in one grade had smaller decreases in the other grade. Similarly, the 7th and 8th grade slopes were negatively correlated (r = -.50, p =.002), indicating that as rate of change during the 7th grade increased, rate of change during the 8th grade decreased. There were no other significant correlations between growth curve parameters. Taken together, these findings indicated that rates of changes in physical aggression vary among students, and that changes in physical aggression frequency differed during the 7th and 8th grades and over the summer.

Regarding covariate effects, sex significantly predicted the 7th grade slope (d = -.21, p = .031). Whereas male adolescents had a slightly negative, but nonsignificant linear slope (B = -.004, p = .620), female adolescents had a slightly positive, but nonsignificant linear slope (B = .009, p = .088). There were no sex differences in 6th or 8th grade slopes (d = -.22 and .23 respectively, *p*s > .05), intercept (d = .15, p =.133), or summer factor (d = -.05, p =.750). This indicated that male and female adolescents had similar rates of changes in aggression across the 6th and 8th grades and had similar overall levels of physical aggression. Age did not significantly predict any latent curve parameters (*d*s = -.02 to .05, *p*s > .05). The 7th grade

intervention phase was significantly associated with the 7th grade slope (d = .15, p = .031) such that adolescents who were attending a school at which the intervention had been implemented during their 7th grade had greater increases (i.e., steeper slope) in physical aggression during the 7th grade. Intervention phase was not associated with other latent curve parameters.

Table 7

Fit Indices and Difference Tests for All Physical Aggression Latent Curve Models Considered

Model	$\chi^{2\alpha}$	*df*	RMSEA	CFI	TLI	Comp	$\chi^2\Delta^{\beta}$	*df*
1. Intercept only	214.85***	76	.037	.839	.860			
2. Intercept with grade factor	153.35***	69	.030	.902	.906	1	55.41***	7
3. Intercept with summer factor	199.41***	75	.035	.856	.873	1	24.06***	1
4. Linear	159.43***	73	.030	.900	.909	1	44.05***	3
5. Linear with summer factor	140.71***	72	.027	.920	.927	4	29.87***	1
6. Piecewise linear knot at fall	123.38***	64	.026	.931	.929	4	34.74***	9
7. Piecewise with summer factor	**93.50*** **	**58**	**.022**	**.959**	**.953**	**4**	**64.84*** **	**15**
Model 7						5	46.00***	14
8. Linear with 6th and 7th/8th grade knots	158.25***	69	.031	.896	.901	4	1.72	4
9. Linear with 6th, 7th/8th grade knots and summer factor	138.20***	68	.028	.918	.921	4	21.58***	5
Model 9						5	2.80	4

Note: RMSEA = root mean-square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis Index; Comp = comparison model. Models have a heteroscedastic residual specification.

[a]Test of overall model fit. [b]Difference test comparing fit of each model to the comparison model.

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

Table 8

Means, Variances (Diagonal), and Correlations Between Parameters From Final Unconditional Latent Curve Model of Physical Aggression (Model 7)

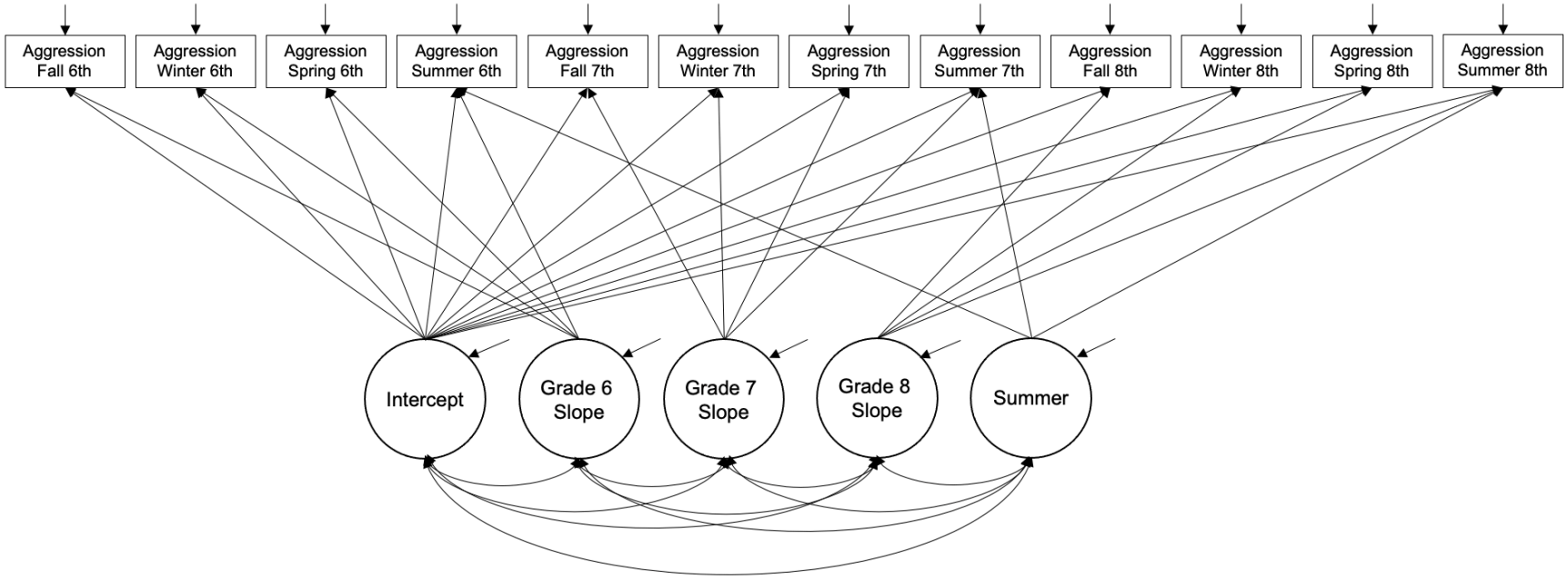
Parameter	Mean	Intercept	6th grade slope	7th grade slope	8th grade slope	Summer factor
Intercept	1.35	.14***				
6th grade slope	0.01	-.34	.01*			
7th grade slope	0.01	.04	-.51**	.01***		
8th grade slope	-0.01	-.45**	.47	-.50**	.01	
Summer factor	-0.07	-.07	-.38	-.02	-.12	.02

Note. $N = 1323$.

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

Figure 5

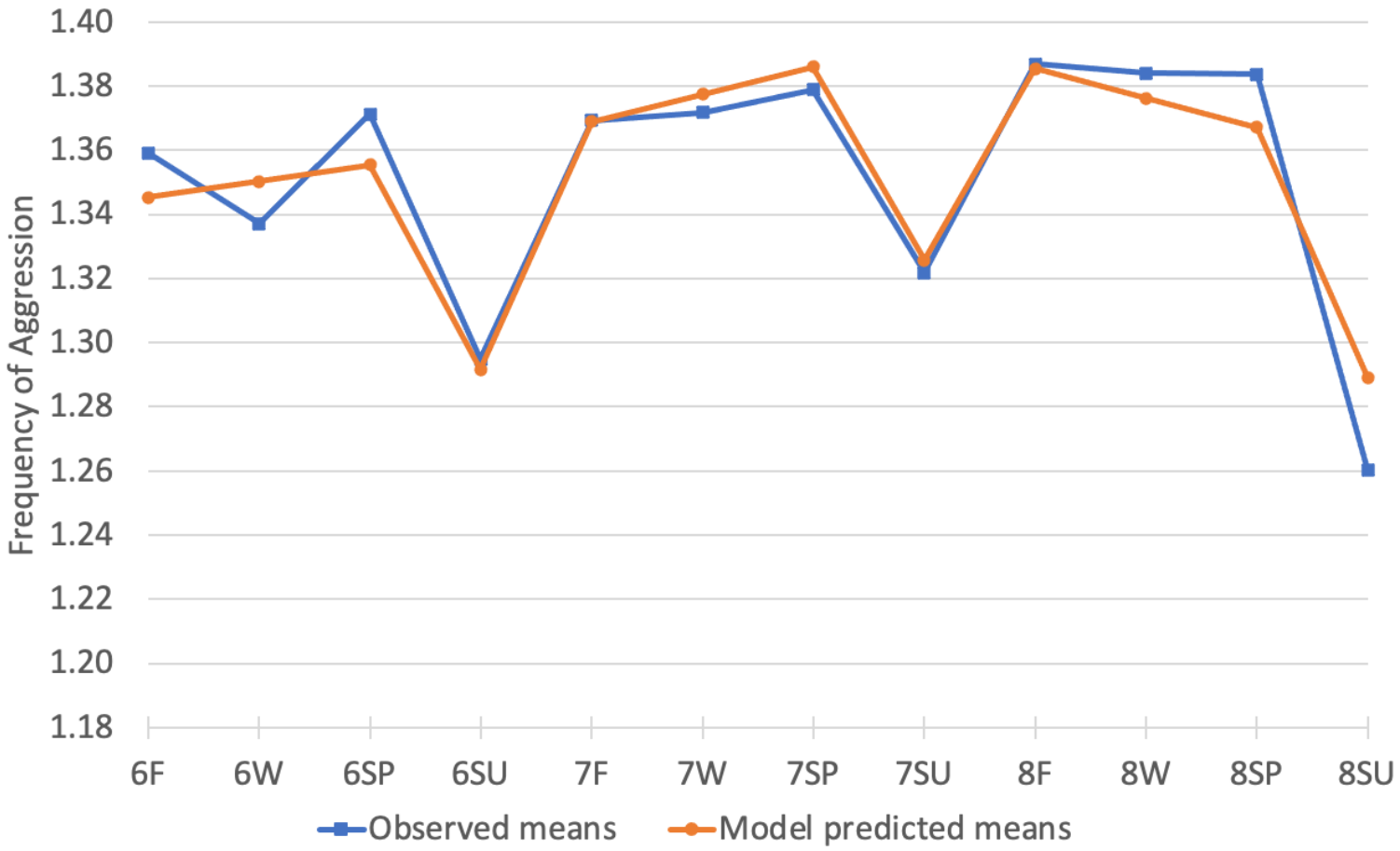
Analytic Model for the Final Latent Curve Model (Model 7) Representing Changes Within and Across Middle School for Past 3-Month Physical Aggression Frequency for the Entire Sample



Note. Time-specific residual variances of observed variables were allowed to vary over time (heteroscedastic residuals).

Figure 6

Estimated and Observed Means Based on Final Latent Curve Model (Model 7) Representing Changes Within and Across Middle School for Past 3-Month Physical Aggression Frequency for the Entire Sample



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

Aim 1b: Growth Mixture Models

A growth mixture modeling analysis examined heterogeneity in frequency of witnessing community violence based on the final model identified in the latent curve analysis for the overall sample. The intercept, 6th grade slope, 7th/8th grade slope, and summer factor were the latent class indicators. First, I examined a series of diagonal, class-invariant (co)variance matrix models that specified the same functional form (growth curve parameters) in each class and constrained the variances and covariances of the latent growth curve parameters to zero and time-specific residual variances of observed variable to the same value within and across class. These models specify no within-class variance and assume that all variations between individuals (i.e., between-person differences) are accounted for by the latent class variable. Next, I examined a series of models with a nondiagonal, class-invariant specification that specified the same functional form in each class but allowed for within-class variance and covariance in latent growth curve parameters. Variance and covariance for latent growth curve parameters, including time-specific residual variances, were constrained to equality across class (i.e., a single variance/covariance matrix for latent growth curve parameters across class). Additionally, for this specification the 7th/8th grade slope variance within each class had to be constrained to zero to avoid problems with model estimation. Finally, I examined a series of models with nondiagonal, class-varying specifications, in which classes had the same functional form and allowed for within-class variance and covariance parameters to vary across class (i.e., a separate variance/covariance matrix for latent growth curve parameters for each class). For all models, time-specific residual variances were constrained to equality within class. I examined models that specified one to a maximum of five classes for each specification.

Indicators of model fit for each specification are reported in Table 9. Among all models examined, the information criterion (AIC, BIC, adjusted-BIC) and fit indices based on the BIC (e.g., the BF and cmP) all continued to decrease as number of classes increased and thus favored models with more classes. Among the models that specified no within-subgroup variability (i.e., diagonal, class-invariant [co]variance matrices), the VLMR-LRT test indicated that adding additional classes significantly improved fit up to the 2-class model. For the model that constrained within-class variability across classes (i.e., nondiagonal, class-invariant specification), the VLMR-LRT indicated that adding additional classes significantly improved fit up to the 3-class model. For the model that allowed within-class variability to differ across class (i.e., nondiagonal, class-varying specification), the VLMR-LRT indicated that adding additional classes significantly improved fit up to the 3-class model. The 3-class nondiagonal, class-varying model had the lowest BIC out of all GMM models examined, indicating that it had the best absolute fit. Accordingly, the 3-class nondiagonal, class-varying model was selected as the final model.

Parameter estimates for the 3-class nondiagonal, class-varying model are reported in Table 10. Within this model, the odds of correct classification ratios ranged from 9.69 to 35.42, indicating good classification separation and high assignment accuracy. Entropy was acceptable (entropy = .79), indicating adequate precision in classification across all classes. Class-specific trajectories are depicted in Figure 7. The smallest class, labeled, *rarely witnessing* (22%), was comprised of adolescents who consistently reported the lowest frequency of witnessing community violence across middle school. The next largest subgroup, labeled, *frequent witnessing with summer dips* (*frequent witnessing*, 33%), was comprised of adolescents who consistently reported the highest frequencies of witnessing violence. The largest subgroup,

labeled *moderate frequency of witnessing* (*moderate witnessing*, 45%), was comprised of adolescents who consistently reported frequencies of violence exposure between those reported by adolescents in the other two subgroups.

All subgroups had significant negative 6th grade and 7th/8th grade linear slopes, indicating that witnessing violence decreased significantly across middle school. The summer factor mean was significant for the *frequent witnessing* and the *moderate witnessing* subgroup, indicating that adolescents' reports of witnessing violence decreased more during the summer relative to the degree of change across the school year. The summer factor mean was not significant for the *rarely witnessing* subgroup, indicating that within this class, adolescents' reports of witnessing violence did not differ from values predicted by the other latent growth curve parameters (i.e., intercept, linear slopes). The variances for the intercept and 6th grade slope were significant for all subgroups, indicating that within each subgroup, adolescents varied in their overall level of witnessing community violence and their rate of change during the 6th grade. The variance for the 7th/8th grade slope was significant for *frequent witnessing* subgroup, indicating that within this subgroup, adolescents varied in rate of change across the middle school. For the *moderately witnessing* subgroup, the variance for the 7th/8th grade slope was not significant, indicating that decreases in witnessing violence across the 7th and 8th grades was similar across adolescents in this subgroup. The variance for the 7th/8th grade slope was constrained to zero for the *rarely witnessing* subgroup, and the variance of the summer factor for all subgroups was constrained to zero due to model convergence issues.

For all subgroups, the intercept was significantly negatively correlated with the 6th grade slope (rs =-.98 to -.98, ps < .001), indicating that adolescents within each subgroup who had higher overall levels of witnessing violence had smaller decreases (i.e., smaller slopes) in

witnessing violence during the 6th grade. These correlations were large due to the small within-group variability in slopes (i.e., standard deviations). For the *frequent witnessing* and *moderate witnessing* subgroups, the intercept was significantly negatively correlated with 7th/8th grade slope (r = -.49 and -.60 respectively, ps < .001), indicating that within these subgroups, higher overall levels of witnessing violence were associated with smaller decreases (i.e., less negative slopes) in witnessing violence across middle school. The 6th grade and 7th/8th grade slopes for the *frequent witnessing* and *moderate witnessing* subgroups were not significantly correlated (r =.14, p = .105 and r =.51, p = .146 respectively). Correlations with the 7th/8th grade slope for the *rarely witnessing* subgroup and with the summer factor for all subgroups could not be calculated because the variance was constrained to zero.

Next, I compared differences in growth curve factor means across subgroups based on Cohen's d, which was calculated by dividing differences in factor means for each pair of subgroups by the standard deviation of the factor mean for the whole sample (i.e., [M_{c1} – M_{c2}]/SD). The *rarely witnessing* subgroup had the lowest overall frequency (intercept) of witnessing violence compared with the *frequent witnessing* (d = -1.84) and *moderate witnessing* subgroups (d = -.81), and less negative slopes (i.e., smaller decreases) of witnessing violence frequency across the 6th grade (ds = .14 and .36 compared with the *frequent* and *moderate* witnessing subgroups respectively), and across the 7th and 8th grades (ds = .60 and .35 compared with the *frequent* and *moderate* witnessing subgroups respectively). The *frequent witnessing* subgroup had the highest overall frequency (i.e., intercept) of witnessing violence (d = 1.03 compared with the *moderate witnessing* subgroup). Compared with the *frequent witnessing* subgroup, the *moderate witnessing* subgroup had more negative 6th grade slope (d = .22), indicating that adolescents in the *moderate witnessing* subgroup had greater decreases in

witnessing violence frequency during the 6th grade. In contrast, the *frequent witnessing* subgroup had a more negative 7th/8th grade slope compared with the *moderate witnessing* subgroup (d = .25), indicating that the *frequent witnessing* subgroup had greater decreases in their frequency of witnessing violence across the later part of middle school. The *frequent witnessing* subgroup had the highest drop in witnessing violence over the summer (ds = 1.41 and 1.08 compared with the *rarely* and *moderate* witnessing subgroups respectively).

Table 9

Fit Indices for All Witnessing Violence Growth Mixture Models (GMM) Examined

k	Par	LL	AIC	BIC	Adj. BIC	VLMR-LRT (*p*)	BLRT (*p*)	Entropy	Smallest class (%)	BF (K, K+1)	cmP
Diagonal, class-invariant											
1	5	-3905.54	7821.07	7847.01	-7802.36	NA	NA	NA	100%	<.001	<.001
2	10	-3081.25	6182.50	6234.37	-6145.08	<.001	<.001	.860	22%	<.001	<.001
3	15	-2898.63	5827.26	5905.07	-5771.13	.159	<.001	.831	7%	<.001	<.001
4	20	-2762.25	5564.50	5668.25	-5489.66	.208	<.001	.814	5%	<.001	<.001
5	25	-2682.31	5414.62	5544.31	-5321.07	.056	<.001	.806	3%	NA	1.000
Nondiagonal, class-invariant											
1	11	-3001.00	6024.01	6081.07	-5982.85	NA	NA	NA	100%	<.001	<.001
2	13	-2849.68	5725.37	5792.81	-5676.72	<.001	<.001	.884	18%	<.001	<.001
3	18	-2721.31	5478.62	5571.99	-5411.26	.005	<.001	.868	7%	<.001	<.001
4	23	-2659.63	5365.25	5484.57	-5279.18	.128	<.001	.890	1%	NA	1.000
5	nonconvergence										
Nondiagonal, class-varying											
1	11	-3001.00	6024.01	6081.07	-5982.85	NA	NA	NA	100%	<.001	<.001
2	22	-1864.76	3773.52	3887.65	-3691.20	<.001	<.001	.782	46%	<.001	<.001
3	**31**	**-1532.09**	**3126.19**	**3287.01**	**-3010.19**	**<.001**	**<.001**	**.787**	**22%**	**NA**	**1.000**
4	nonconvergence										

Note. $N = 1323$. *k* = Number of classes, Par = number of parameters, LL = log likelihood, BIC = Bayesian information criterion, VLMR-LRT = Vuong–Lo–Mendell–Rubin likelihood ratio test, BLRT = Bootstrap Likelihood Ratio Test, BF = Bayes Factor, cmP = approximate correct model probability, NA = Not Applicable. VLMR-LRT, BLRT, and Entropy not applicable for one-class models.

Table 10

Means (M), Variances (Diagonals), and Correlations of Witnessing Community Violence Growth Curve Parameters for the Final Growth Mixture Model, 3-Class Nondiagonal, Class-Varying Specification

	M	1.	2.	3.
Rarely witnessing (22%)				
1. Intercept	1.219***	.036**		
2. 6th grade slope	-.043***	-.979***	.004**	
3. 7th/8th grade slope	-.004**	-[a]	-[a]	.000
4. Summer factor	.002	-[a]	-[a]	-[a]
Frequently witnessing (33%)				
1. Intercept	2.079***	.208***		
2. 6th grade slope	-.057**	-.783***	.014*	
3. 7th/8th grade slope	-.023***	-.491***	.137	.004***
4. Summer factor	-.176***	-[a]	-[a]	-[a]
Moderate witnessing (45%)				
1. Intercept	1.597***	.128***		
2. 6th grade slope	-.079***	-.967***	.013***	
3. 7th/8th grade slope	-.015***	-.596*	.506	.000
4. Summer factor	-.040**	-[a]	-[a]	-[a]

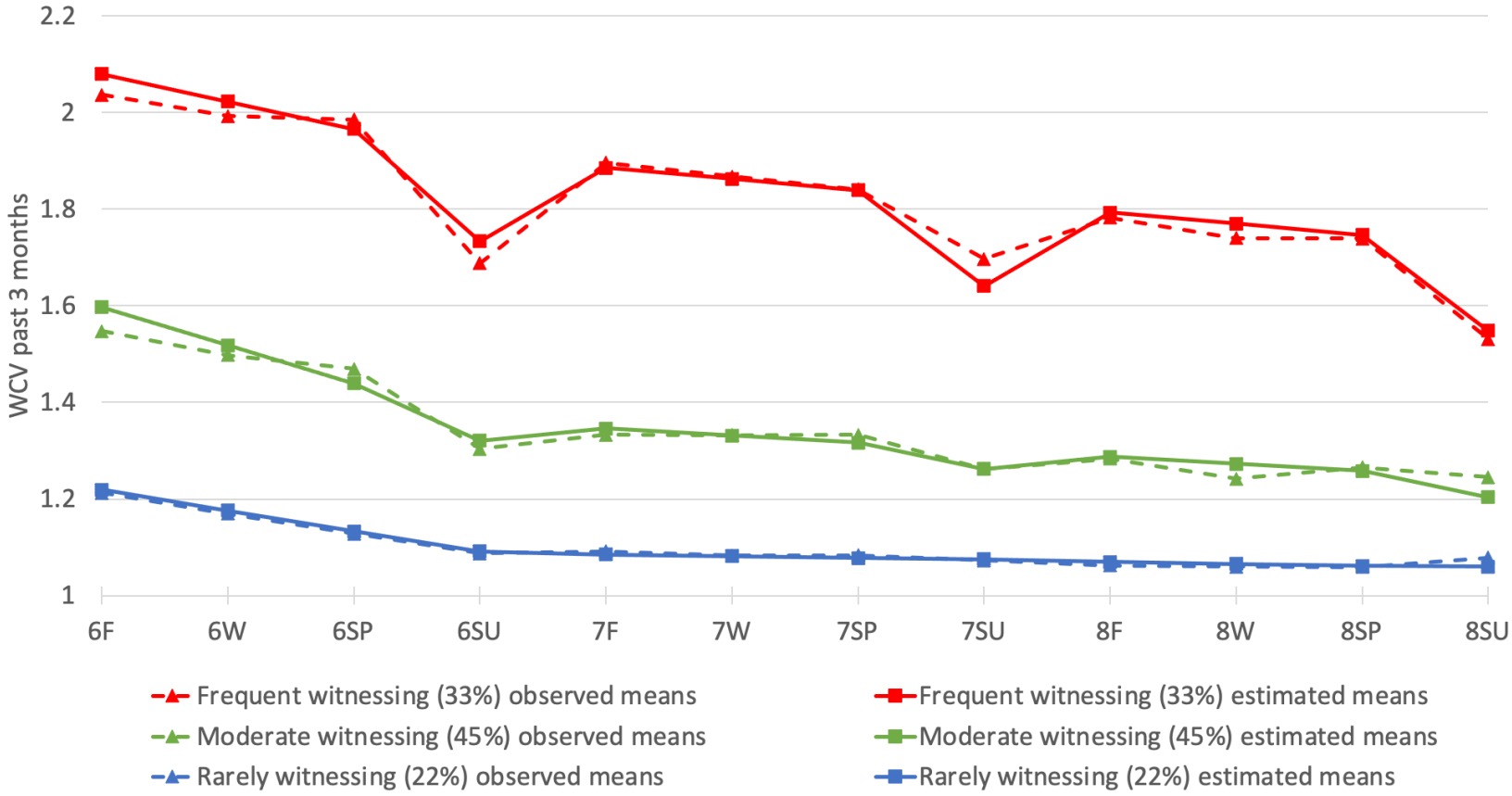
Note. N = 1323. Summer factor variance was constrained to 0 in each subgroup.

[a]Correlations were not estimated because the variance for at least one parameter was constrained to 0.

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

Figure 7

Estimated and Observed Means of Past 3-Month Witnessing Community Violence (WCV) for Each Subgroup Based on Final Growth Mixture Mode, 3-Class Nondiagonal, Class-Varying Specification Representing Changes Within and Across Middle School



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer. WCV = Witnessing community violence.

Aim 1c: Latent Profile Analysis

Next, I conducted repeated-measures latent profile analysis (LPA) to identify subgroups that differed in their patterns of witnessing violence frequency across all three grades. I examined models that made different assumptions about the variance and covariance structure of observed variables. Indicator variables were adolescents' frequency of witnessing community violence at each wave. Models can either have a diagonal covariance structure, in which variances of variables are freely estimated but covariance between variables are constrained to zero, or a non-diagonal or unrestricted covariance structure, in which variable variances and covariances between variables are freely estimated. Additionally, the covariance structure can also be either allowed to vary across subgroups (i.e., class-varying) or constrained to the same values across subgroups (e.g., class-invariant). For each of these specifications, I examined models with an increasing number of classes up to five classes, or until models failed to converge.

Indicators of model fit for each specification are reported in Table 11. Models that specified the nondiagonal class-varying variance/covariance matrices failed to converge at two classes, so no models with this specification were considered. Failure to converge was likely due to the large number of parameters in the model. Among all models examined, the information criterion (AIC, BIC, adjusted-BIC) all continued to decrease as number of classes increased. Thus, fit indices that are based on the BIC (e.g., the BF and cmP) favored models with more classes. The VLMR-LRT suggested either a 2-class diagonal class-invariant variance/covariance model, or a 3-class diagonal class-varying variance/covariance model. Among the models that specified the nondiagonal class-invariant variance/covariance matrices, the VLMR-LRT indicated that the addition of a second class did not significantly improve the fit of the model

over the 1-class solution. The 3-class and 4-class diagonal class-varying models had the lowest BIC out of all LPA models examined, indicating that they had the best absolute fit. Because the addition of the fourth class did not significantly improve fit over the 3-class solution based on the LM-LRT and VLMR-LRT, the 3-class diagonal class-varying model was selected as the final model. Within this model, the odds of correct class ratios ranged from 14.39 to 45.55, indicating good classification separation and high assignment accuracy. Entropy was acceptable (entropy = .840), indicating adequate precision in classification across all classes. Standardized mean differences in observed variables across class indicated that there was an acceptable degree of profile separation between all three classes (*d*s = .88 to 2.05).

Class-specific means in frequency of witnessing community violence (i.e., patterns over time) are depicted in Figure 8. Classes in the final solution were qualitatively similar and similar in proportion of students within each class to the final GMM model (3-class nondiagonal, class-varying specification). In the LPA 3-class diagonal class-varying model, the smallest class, labeled, *stable low witnessing* (23%), consistently reported relatively low frequencies of community violence exposure at all timepoints (*M*s = 1.04 to 1.24), with the highest mean frequencies during the 6th grade. The next largest subgroup, labeled, *high witnessing with summer dips* (32%), consistently reported the highest frequencies of community violence exposure at all timepoints (*M*s = 1.56 to 2.07), with the highest mean frequencies during the 6th grade. This subgroup also had drops in reported frequencies in exposure during the summer waves of data collection. The largest subgroup, labeled *medium decreasing witnessing* (45%), consistently had mean frequencies of exposure between the *low* and *high witnessing* subgroups (*M*s = 1.23 to 1.55). This subgroup also had drops in reported frequencies in exposure during the summer waves. Because the subgroups of the final LPA and GMM models were similar, the

BICs were compared across models. The BIC for the final 3-class GMM model (BIC = 3287.01) was smaller than the BIC of the final 3-class LPA model (3540.56). Additionally, the GMM model had fewer parameters (31 compared to 74 in the LPA model), indicating that it was the more parsimonious model. Thus, the 3-class nondiagonal, class-varying specification was advanced to Aim 2 analysis and none of the LPA models were considered further.

Table 11

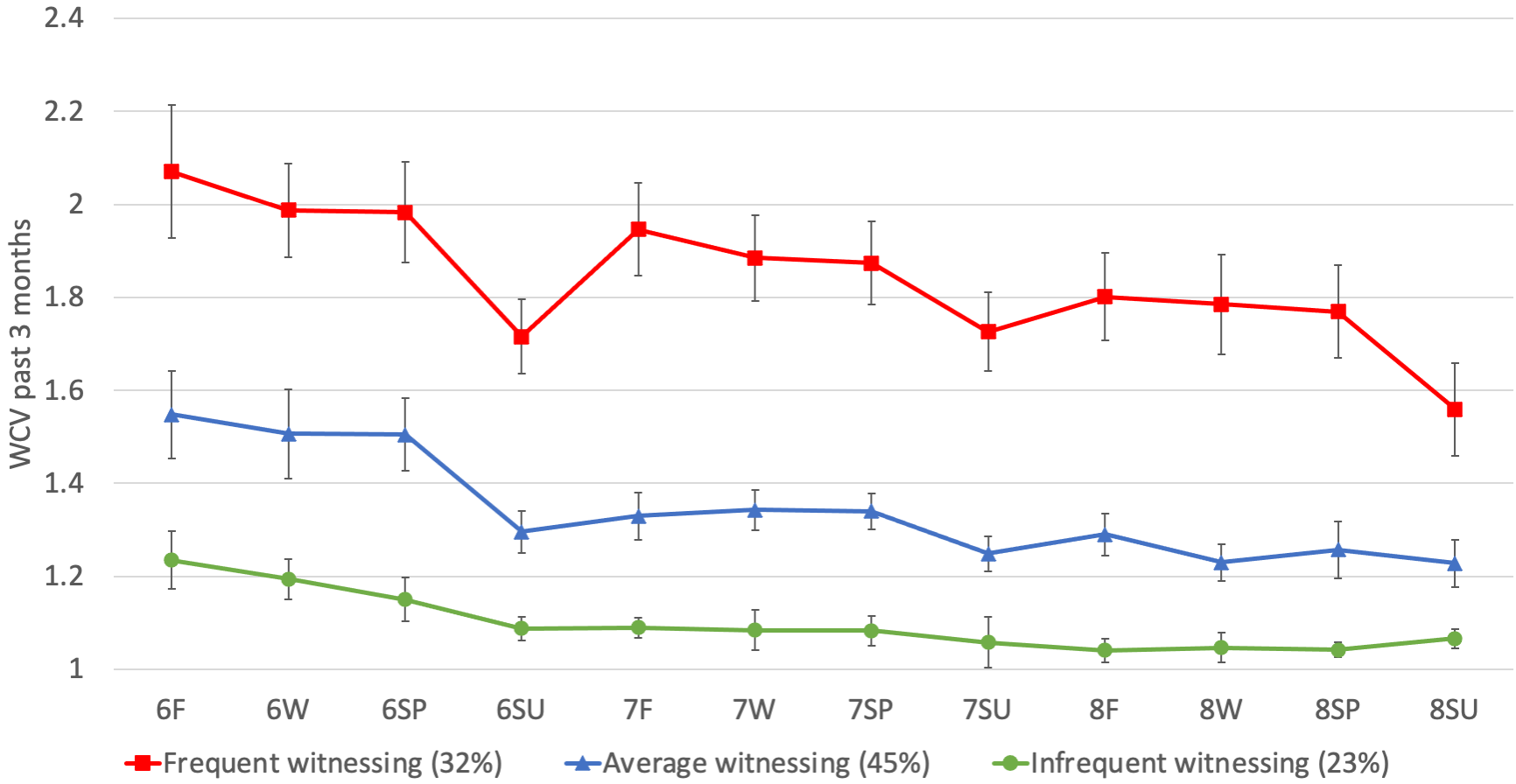
Fit Indices for All Witnessing Violence Latent Profile Analysis (LPA) Examined

k	Par	LL	AIC	BIC	Adj. BIC	VLMR-LRT (*p*)	BLRT (*p*)	Entropy	Smallest class (%)	BF (K, K+1)	cmP
Diagonal, class-invariant											
1	24	-3822.91	7693.81	7818.31	-7604.00	NA	NA	NA	100%	<.001	<.001
2	37	-2992.98	6059.96	6251.90	-5921.50	.000	.000	.880	20%	<.001	<.001
3	50	-2788.32	5676.65	5936.03	-5489.55	.611	.000	.875	4%	<.001	<.001
4	63	-2635.32	5396.64	5723.47	-5160.90	.202	.000	.866	3%	<.001	<.001
5	76	-2523.68	5199.36	5593.62	-4914.97	.697	.000	.852	2%	<.001	<.001
Diagonal, class-varying											
1	24	-3822.91	7693.81	7818.31	-7604.00	NA	NA		100%	<.001	<.001
2	49	-2041.26	4180.52	4434.72	-3997.16	.000	.000	.859	49%	<.001	<.001
3	**74**	**-1504.34**	**3156.67**	**3540.56**	**-2879.76**	**.000**	**.000**	**.840**	**23%**	**<.001**	**<.001**
4	99	-1365.55	2929.09	3442.67	-2558.64	.726	.000	.762	19%	NA	1.00
5	nonconvergence										
Non-diagonal, class-invariant											
1	90	-2861.16	5902.32	6369.21	-5565.54	NA	NA	NA	100%	<.001	<.001
2	103	-2647.44	5500.89	6035.22	-5115.46	.426	.000	.902	7%	<.001	<.001
3	116	-2492.45	5216.89	5818.66	-4782.82	.061	.000	.918	4%	NA	1.00
4	nonconvergence										
Non-diagonal, class-varying											
1	90	-2861.16	5902.32	6369.21	-5565.54	NA	NA	NA	100%	NA	NA
2	nonconvergence										

Note. $N = 1323$. k = Number of classes, Par = number of parameters, LL = log likelihood, BIC = Bayesian information criterion, VLMR-LRT = Vuong–Lo–Mendell–Rubin likelihood ratio test, BLRT = Bootstrap Likelihood Ratio Test, BF = Bayes Factor, cmP = approximate correct model probability, NA = Not Applicable. VLMR-LRT, BLRT, and Entropy not applicable for one-class models.

Figure 8

Time-Specific Means of Witnessing Community Violence (WCV) Frequency for Each Latent Subgroup Across Middle School From the Final LPA Model (3-Class Diagonal, Class-Varying) With 95% Confidence Intervals



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

Aim 2a: Multivariate Relations for the Overall Sample

The goal of aim 2 analyses was to examine associations between changes in witnessing community violence and changes in distress and physical aggression across middle school. Prior to running Aim 2 analyses for the parallel growth models, I generated hypotheses regarding how I expected witnessing community violence to be related to distress and physical aggression across middle school. Theories specifying maladjustment would predict that witnessing violence would be associated with maladjustment. This would be supported by positive correlations between intercepts of witnessing violence and distress (i.e., higher frequency of witnessing associated with higher levels of distress symptoms) and positive correlations between the linear slopes of witnessing violence and distress such that decreases in witnessing over time would be correlated with decreases in distress. In contrast, pathologic adaptation theory would be supported by a weak positive correlation or no correlation between the intercepts of witnessing violence and distress, and a negative correlation between their linear slopes such that increases in witnessing violence would be associated with decreases in distress, or no correlation between the two. Theories of maladjustment and pathological adaptation would both predict positive correlations between the intercepts of witnessing community violence and physical aggression (i.e., more frequent witnessing is associated with more frequent aggression) and between linear slopes of witnessing violence and aggression such that decreases in witnessing violence over time are correlated with decreases in aggression. I also predicted that the correlation between the intercept of witnessing violence and the slopes of distress and aggression would be negative such that individuals who start out high in witnessing (and presumably distress and aggression) would have greater decrease in distress and aggression over time.

I used parallel growth models to estimate associations between witnessing community violence latent curve parameters with latent curve parameters for distress and aggression for the overall sample (see Table 12). Models also included correlations between the residual variances of the observed constructs within each wave (i.e., witnessing violence at Wave 6-fall and distress at Wave 6-fall). In the model examining associations between curve parameters of witnessing violence and distress, several findings were consistent with maladaptation. As hypothesized, the intercepts for witnessing community violence and distress, which represent overall frequencies of witnessing and distress, were positively correlated ($r = .42, p < .001$), and the linear 7th/8th grade slope of witnessing violence, which represents changes in witnessing violence across the 7th and 8th grades, was positively correlated with the linear slope of distress symptoms ($r = .49$, $p = .03$). The intercept for distress symptoms was negatively correlated with the 7th/8th grade slope of witnessing violence ($r = -.42, p < .001$), indicating that adolescents with higher overall levels of distress symptoms had greater decreases in witnessing violence during the 7th and 8th grades. In contrast, several findings were inconsistent with both maladaptation and pathologic adaptation theories. Overall frequency of witnessing violence (i.e., intercept) was not significantly correlated with the slope of distress, and the 6th grade slope and summer factor of witnessing violence were not associated with any of the parameters of distress.

In the model examining associations between witnessing violence and aggression, several findings were consistent with both maladaptation and pathologic adaptation. Intercepts representing overall frequencies of witnessing violence and aggression were positively correlated ($r = .53, p < .001$). The 6th grade slopes of witnessing violence and aggression, which represent changes in frequencies across waves during the 6th grade, were positively correlated ($r = .46, p = .02$), and the 7th/8th grade slope of witnessing violence was positively correlated with the 7th

grade slope of aggression ($r = .63, p < .001$), but not with the 8th grade slope of aggression. Taken together, these findings suggest that changes in witnessing community violence was associated with concurrent changes aggressive behavior in the 6th and 7th grades. In contrast, several findings were not consistent with maladaptation or pathologic adaptation. The overall frequency of witnessing violence was not associated with changes in aggression, and the 6th grade slope of witnessing violence was not associated with 7th and 8th grade slopes of aggression.

Table 12

Correlations Between Witnessing Violence Latent Curve Parameters With Latent Curve Parameters for Distress and Aggression

	Witnessing community violence			
	Intercept	6th grade slope	7th/8th grade slope	Summer factor
Distress				
Intercept	.42***	-.12	-.42***	-.04
Linear slope	-.06	-.04	.49*	-.40
Quadratic slope	-.06	.15	-.38	.40
Aggression				
Intercept	.52***	-.30	-.11	-.09
6th grade slope	-.08	.46*	-.18	-.44
7th grade slope	-.06	-.16	.63***	.13
8th grade slope	-.19	.31	.07	-.02
Summer factor	.03	-.39	-.39	.47

Note. $N = 1323$.

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

Aim 2b: Subgroup Differences in Trajectories of Adjustment

The goal of aim 2b was to examine differences in trajectories of distress and physical aggression between subgroups defined based on their changes in witnessing community violence across middle school. Prior to running aim 2b analysis, I generated hypotheses for subgroup differences in trajectories of distress symptoms and physical aggression. Theories specifying maladjustment would predict that the *frequent witnessing* subgroup would have the highest intercept for distress and the least steep negative slope of distress, followed by the *moderate witnessing* subgroup and then the *rarely witnessing* subgroup, indicating that distress symptoms persist over time. Theories specifying pathologic adaptation would predict that the mean intercept of distress for the *frequent witnessing* subgroup would be slightly higher or not significantly different from that of the *moderate witnessing* subgroup, and that the *rarely witnessing* subgroup would have the smallest mean intercept. Pathological adaptation theory would also predict that the *frequent witnessing* subgroup would have the steepest negative linear slope of distress, indicating that distress symptoms decrease more than the overall sample, followed by the *moderate witnessing* and *rarely witnessing* subgroups. Theories of maladjustment and pathological adaptation would both predict that aggression persists over time, which would be reflected by the highest intercept mean for the *frequent witnessing* subgroup, followed by the *moderate witnessing* subgroup and the *rarely witnessing* subgroup, and that the *frequent witnessing* subgroup would have the steepest positive aggression slope, or the least steep negative aggression slope, followed by the *moderate witnessing* and the *rarely witnessing* subgroup. Findings that intercepts and slopes do not differ across subgroup may indicate that youth have similar adjustment across middle school regardless of frequency of witnessing community violence.

Results of the manual three-step approach comparing subgroup-specific growth curve parameters for distress and aggression are reported in Table 13, and trajectories by subgroup are depicted in Figure 9 and Figure 10 respectively. In the model for distress symptoms, results of a Wald test indicated that intercepts of distress symptoms differed across all three subgroups ($\chi^2(2) = 68.95$, $p < .001$). The *frequent witnessing* subgroup had the highest mean intercept for distress symptoms ($d = .45$ compared with *moderate witnessing* and $d = 1.01$ compared with *rarely witnessing*). Compared with the *rarely witnessing* subgroup, the *moderate witnessing* subgroup had higher mean intercepts ($d = .56$). Contrary to hypotheses, the linear and quadratic slopes did not differ between subgroups ($\chi^2(2) = 0.08$, $p = .961$ and $\chi^2(2) = 0.45$, $p = .795$ respectively), indicating adolescents in all three subgroups reported similar decreases across middle school. The intercept and slope variances within each subgroup were significant, indicating that adolescents within each subgroup varied in their trajectories of distress. Taken together, these findings indicated that subgroups of adolescents with different trajectories of witnessing community violence differed in their overall levels of distress symptoms, but not in their rate of change of distress symptoms.

In the model for physical aggression, as hypothesized, results of a Wald test indicated that intercepts of physical aggression differed across all three subgroups ($\chi^2(2) = 90.42$, $p < .001$). The *frequent witnessing* subgroup had a higher intercept mean for physical aggression compared with *moderate witnessing* ($d = .99$) and *rarely witnessing* ($d = 1.33$) subgroups, and the *rarely witnessing* subgroup had higher intercept mean than the *moderate witnessing* subgroup ($d = .34$). The summer factor mean, which accounted for the decrease in physical aggression in the summer not accounted for by the linear slope, was significant in all three subgroups, but differed across subgroups ($\chi^2(2) = 6.80$, $p = .033$). Compared with the *rarely witnessing*

subgroup, the *frequent witnessing* subgroup had a larger decrease in physical aggression during the summer (d = .59), but neither differed from the *moderate witnessing* subgroup. Contrary to my hypothesis, the subgroups did not differ on any slope parameters ($\chi^2(2) = 0.74$, p = .692; $\chi^2(2) = 1.64$, p = .440; $\chi^2(2) = 3.43$, p = .180 for 6th, 7th, and 8th grade slopes respectively). The slope factor for each grade across each subgroup was nonsignificant, with the exception of the 8th grade slope for the *frequent witnessing* subgroup. This result indicated that, for the *frequent witnessing* subgroup, the mean frequency of physical aggression decreased during the 8th grade, likely due to the large drop in frequency during the summer. Taken together, these findings indicated that subgroups of adolescents with different trajectories of witnessing community violence differed in their overall frequency of physical aggression, but not in their rate of change across middle school.

Table 13

Means for Subgroup-Specific Growth Curves Parameters of Distress Symptoms and Aggression

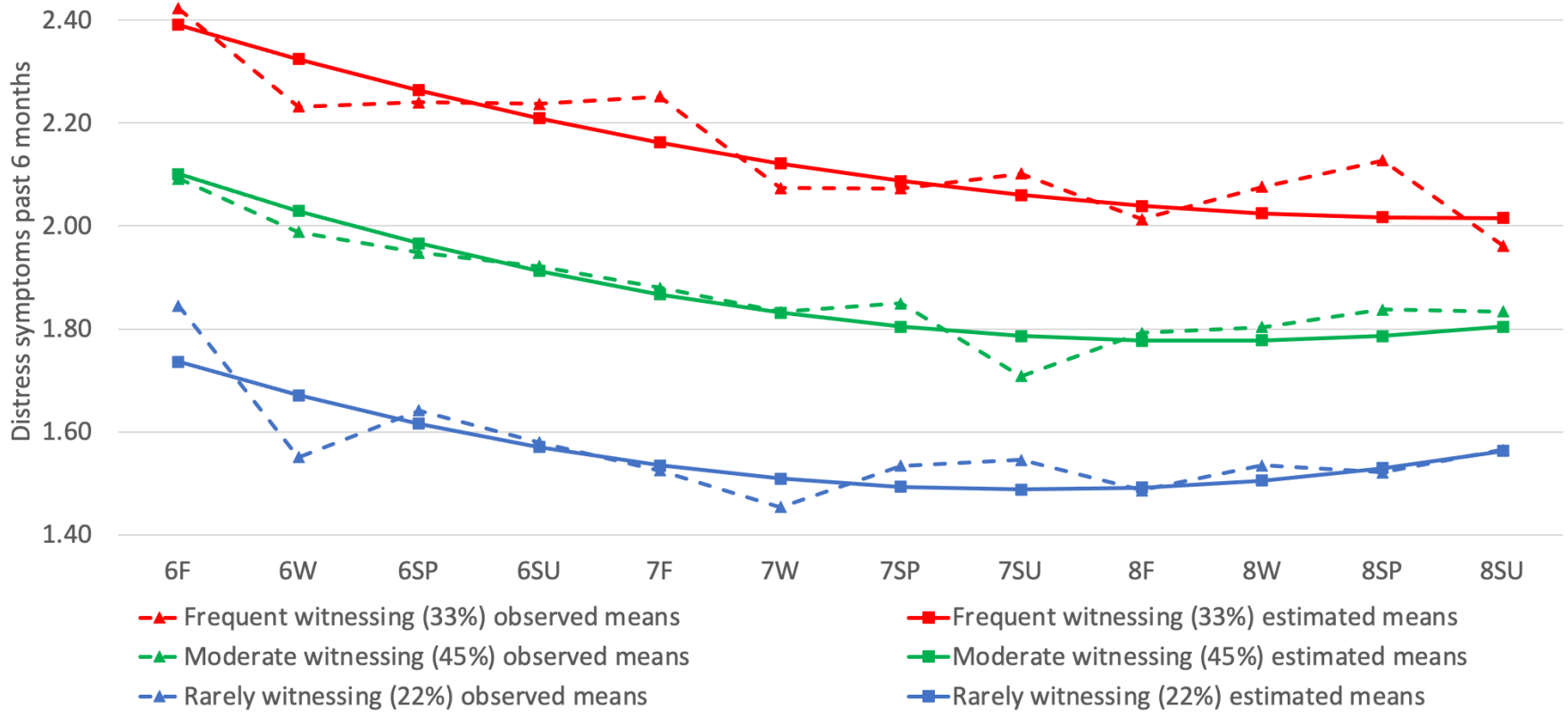
	Rarely witnessing (22%)	Moderate witnessing (45%)	Frequent witnessing (33%)
Distress			
Intercept	1.736_{a}***	2.101_{c}***	2.391_{b}***
Linear slope	-.070***	-.077***	-.070**
Quadratic slope	.005***	.005***	.003
Aggression			
Intercept	1.127_{a}***	1.257_{c}***	1.631_{b}***
6th grade slope	-.006	.001	.011
7th grade slope	.004	.000	.023
8th grade slope	.000	.000	-.027*
Summer factor	$-.035_{a}$***	-.044*	$-.124_{b}$***

Note. $N = 1323$. Subgroups with different subscripts significantly differ from each other.

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

Figure 9

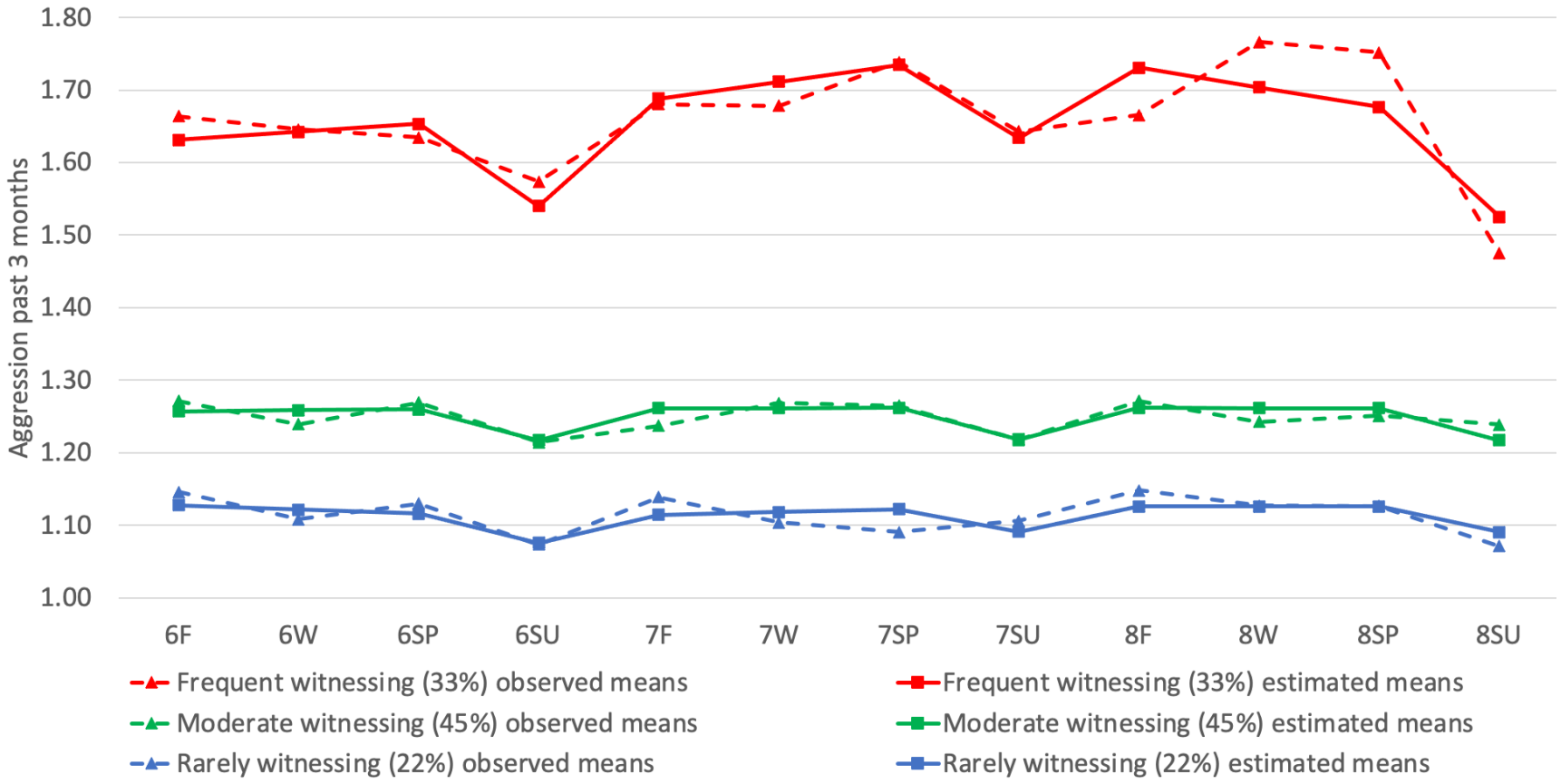
Subgroup-Specific Estimated and Observed Means for Distress Symptoms Across Middle School



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

Figure 10

Subgroup-Specific Estimated and Observed Means for Physical Aggression Across Middle School



Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

Discussion

Community violence has persisted in the United States despite intervention and prevention efforts. Youth growing up in communities with high rates of violence have an increased risk of exposure to violence, which in turn increases risk of developing psychopathology. Gaps persist in our understanding of the impact of community violence exposure on adolescent adjustment due to limitations of prior studies, including the use of only a few timepoints of data collected years apart and methods that assume that the form and function of change in exposure is the same for all adolescents. The goal of this study was to address gaps in the literature regarding associations between changes in early adolescents' experiences of witnessing community violence and their adjustment during middle school. Data were collected four times each year in 3-month intervals, which made it possible to model changes within and across each grade. I used three different analytic approaches that modeled change over time, but that differed in their underlying assumptions about the functional form of change and how they accounted for individual differences in change over time. Specifically, I used an LCM approach that specified the same functional form of change across all adolescents, but allowed variability in individuals' level and rate of change over time; a GMM approach that assumed the same functional form of change but grouped individuals into subgroups based on their level and rates of change; and an LPA approach that did not specify a functional form and instead identified subgroups based on differences in patterns of frequency over time. I examined these trends in a sample of early adolescents residing in economically marginalized neighborhoods, who may lack access to mental health care and other protective factors.

Patterns of Witnessing Community Violence

My first aim was to examine patterns of changes in witnessing community violence during middle school. Results from this aim establish the basis for examining heterogeneity and associations with adjustment. Findings from analyses of the overall pattern of change (i.e., within-person change) within the sample indicated that, on average, adolescents' reported frequency of recent experiences of witnessing community violence showed a linear decrease across middle school, with the greatest decreases occurring during the 6th grade. This finding is inconsistent with prior studies that have found evidence that individuals' frequency of witnessing violence increases as they age. For example, Farrell and Sullivan (2004) found that witnessing community violence increased during middle school among a predominately White sample of rural adolescents, which may differ from the experiences of adolescents residing in higher density neighborhoods where residents are economically marginalized. Moreover, their measure of witnessing community violence assessed reported lifetime experiences of witness violence at each data collection point and their growth curve models represent increases in lifetime frequency of violence exposure. The finding of a decrease in frequency of exposure may be less apparent from study designs in which there are larger gaps (i.e., 6 months or more) in between data collection periods (e.g., Baskin & Sommers, 2015; Spano et al., 2010) such that more experiences of violence are captured at one timepoint. The difference in decreases in exposure between the 7th and 8th grades was small (i.e., $d = .2$), which is easier to detect with large samples such as the sample in the current study. Overall, frequency of reported exposure at any one time point was low (i.e., one or two times or less).

Findings from the current study indicated that adolescents who were older at the start of the 6th grade differed from younger adolescents in changes of reported witnessing violence

frequency over time (i.e., between-person differences in within-person change), but not in overall reported frequency. This finding of differences between older and younger adolescents in change in exposure may partially explain the notion that adolescents report higher frequencies of exposure as they age. Prior studies have found evidence that older adolescents report higher rates of violence exposure compared with younger adolescents and children by comparing reported frequency of exposure at one timepoint, often reflecting exposure over a broad period of time (e.g., one or more years) (e.g., Borg et al., 2021; Finkelhor et al., 2015; Zimmerman & Messner, 2013). However, these studies did not examine the extent to which individuals' frequency of violence exposure changes as they age. Consequently, at any given timepoint, older adolescents' reported frequency of witnessing violence, particularly over broad periods of time, may be greater than the frequency reported by younger adolescents but lower compared with their own prior reported frequency. Additionally, Finkelhor et al. (2015) examined frequency of exposure in a nationally representative sample of youth, so findings of between-person differences in frequency may be different in urban samples of youth. Lifetime frequency of violence exposure can only increase over time, so studies that use lifetime measures of witnessing violence (e.g., Farrell & Sullivan, 2004; Taylor et al., 2018) fail to capture frequency during periods of increased vulnerability to adverse effects of exposure.

Theories grounded in ecological systems framework (Bronfenbrenner, 1979) may be relevant in understanding decreases in witnessing community violence during middle school. For example, routine activity/lifestyles theory (Antunes & Ahlin, 2017) is grounded in ecological systems theory and posits that adolescents' susceptibility to community violence exposure is determined by a number of interconnected risk factors related to their environment (e.g., family, peers, neighborhood) and individual characteristics. Both theory and evidence suggest that

adolescents' risk for violence exposure increases as they age due to increased risk factors for exposure, such as increased autonomy and unsupervised time outside of the home (Antunes & Ahlin, 2017; Crockett & Crouter, 1995), and exposure to larger peer networks and more deviant peers (Lambert et al., 2013; Prinstein & Giletta, 2016). For example, Lambert et al. (2013) found that deviant peer affiliation during the 6th grade was associated with witnessing community violence in subsequent grades among a predominately African American sample of adolescents attending urban middle schools. Conversely, reducing risk factors for violence exposure may contribute to decreases in adolescents' frequency of exposure over time. For example, adolescents may stop affiliating with peers who engage in risky behavior that increases their risk of violence exposure, or they may gain knowledge about where violence often occurs and avoid those areas. Future research should examine the extent to which risk and protective factors (i.e., moderators) are associated with within-person changes in frequency of violence exposure among adolescents.

Heterogeneity in Patterns of Witnessing Community Violence

Aim 1 also explored heterogeneity in changes in reported frequency of witnessing community violence during middle school. Findings of variability across individuals in their intercepts and slopes indicated that adolescents were heterogenous in their overall levels of witnessing violence and in their rate of change over time, which is consistent with developmental psychopathology theories (e.g., Hinshaw & Beauchaine, 2017) and theories specific to community violence exposure (e.g., Ng, Mak et al., 2002). Variability in slopes and intercepts also allowed for calculating correlations between the two. The mean intercept for witnessing violence was negatively correlated with mean slopes, which indicated that adolescents with higher overall levels of witnessing violence reported greater decreases in exposure over time.

This difference reflects between-person differences in within-person change and establishes the foundation for examining subgroup differences in patterns of change over time.

Mixture modeling analysis provided further insight into the heterogeneity of changes in adolescents' experiences. Analyses revealed that heterogeneity could be modeled by distinct subgroups with within-subgroup variability in overall frequency of exposure and change over time, which is consistent with prior longitudinal mixture modeling studies (e.g., Baskin and Sommers, 2015; Lambert et al., 2010; Spano et al., 2010). Findings from the GMM analysis confirmed that subgroups of adolescents differ in their overall levels of reported witnessing violence frequency across time, however, their rate of change was not significantly different, evident by lack of subgroup differences in slopes. The LPA, which did not impose the same functional form of change across subgroups, did not identify any subgroups of adolescents with patterns of witnessing violence frequency that were different from the functional form identified in the piecewise trajectory. Taken together, findings from the current study indicated that the functional form and rate of change in witnessing violence over time was similar across subgroups of adolescents, but subgroups differed in overall frequency of reported exposure.

Functional form of change only differed among adolescents when comparing differences in the summer factor among subgroups. Adolescents reported significantly lower frequencies of witnessing community violence during the summer beyond what was predicted by linear slopes, but this trend was only evident for adolescents in the *frequent witnessing* and *moderate witnessing* subgroups. This finding was inconsistent with findings that overall crime rates typically increase during the summer months (McDowall et al., 2012). This trend may not have been found among adolescents in the *rarely witnessing* subgroup because they reported consistently low frequencies of exposure over time and were at the "floor" of witnessing

violence. Consistent with the routine activity/lifestyles theory (Antunes & Ahlin, 2017), decreases in the reported frequency of exposure over the summer for the *frequent* and *moderate witnessing* subgroups could be due to protective factors, such as involvement in summer youth programs, that protect against exposure, or a change/move from the environment in which they are experiencing violence. For example, adolescents may travel out of town on vacation or to visit relatives or friends, or adolescents who typically witnessing violence around their schools may be near their school less often during the summer. Whereas the summer months may be associated with overall higher rates of violence within communities, they may offer an opportunity for youth to avoid risk factors for violence exposure and promote protective factors. Consequently, understanding factors that influenced decreases in exposure over the summer could inform intervention efforts.

Trajectories of heterogeneity in witnessing community violence in the current study were inconsistent with common patterns of developmental trajectories, such as trajectories that follow a "Cat's Cradle" pattern (i.e., stable low, stable high, increasing, decreasing; Sher et al., 2011) or trajectories with disruptions in development (i.e., "developmental snares"; Hussong et al., 2004). Studies have found differences in both functional form of change and in direction or rate of change in similar constructs, such as alcohol use (Sher et al., 2011) or antisocial behavior (Hussong et al., 2004; Moffitt, 2003). In contrast, adverse experiences such, as witnessing community violence, may not follow a developmental trajectory to the same extent as youth behavior, which are frequently the constructs modeled in developmental trajectories. In the current study, an experience of witnessing violence may be a disruption in an otherwise stable pattern of exposure with little change over time but, due to degree of heterogeneity in the timing of exposure among individuals, may have been averaged into the patterns of exposure modeled

in the *moderate* or *frequent* subgroups. There may be constructs on which youth are more consistent in the timing of the disruptions in development (e.g., initiating alcohol use when beginning college).

Subgroups identified in the mixture modeling analysis had some similarities to those identified in prior studies that have investigated heterogeneity in violence exposure over time. Prior longitudinal mixture model studies have also found evidence that a subgroup of adolescents reports consistently higher frequencies of exposure relative to their peers (e.g., Baskin and Sommers, 2015; Spano et al., 2010). The proportion of this sample that consistently reported experiences of witnessing community violence across middle school was similar to the rate reported in prior studies (33% in the current study vs. 34% in Baskin and Sommers, 2015, 40% in Spano et al., 2010). In contrast with prior studies, the smallest subgroup identified in the current study consisted of adolescents with the lowest reported frequency of witnessing violence. Whereas most of these prior studies modeled heterogeneity in responses to measures of violence exposure collected annually (Baskin and Sommers, 2015; Lambert et al., 2010; Spano et al., 2010) or 6 months apart (Whipple et al., 2021), the current study identified subgroups that differed in their past 3-month frequency across 12 waves of data. Findings from this study underscore the importance of examining changes in frequency of exposure within each school year as well as across school years. Taken together, these findings provide strong evidence that a subgroup of adolescents consistently report higher frequencies of violence exposure relative to their peers, with effect sizes ranging from medium to large, which may indicate that factors that increase individuals' likelihood of exposure are likely present prior to middle school and may remain consistent throughout middle school. For example, there may be differences in frequency of exposure among youth residing in different neighborhoods or attending different schools.

The current study did not find sex differences in overall frequencies of witnessing violence or changes in witnessing violence across time. This finding differs from prior studies that have found evidence of sex differences in frequency of community violence exposure (e.g., Farrell & Sullivan, 2004; Richards et al., 2015; Ruchkin et al., 2023; Zimmerman & Messner, 2013). However, these findings are consistent with other findings, such as an analysis of a national sample of youth that found no sex differences in rates of exposure (Finkelhor et al., 2015), and two mixture model studies that did not find sex differences in subgroup membership (Lambert et al., 2010; Whipple et al., 2021). Findings that male and female youth report similar frequencies of witnessing violence during middle school may be due to high rates of violence in the communities included in the current study, or indicative of similarities in neighborhood-level risk factors for violence exposure across sex among adolescents in this study. For example, Antunes and Ahlin (2017) argued that parental monitoring of adolescents' activities, which has been shown to protect against violence exposure, may be reduced in economically marginalized communities where caregivers often work extended hours and thus place all adolescents at an increased risk of violence exposure. Additionally, there may not be sex differences in changes in risk and protective factors over time, which may explain lack of sex differences in changes in witnessing violence frequency.

Associations with Distress Symptoms and Physical Aggression

The second aim of this study was to understand how changes in community violence exposure across middle school were associated with changes in distress symptoms and physical aggression. First, longitudinal changes in distress and aggression were examined for the overall sample. Distress symptoms decreased during middle school, which is inconsistent with both developmental theory and a body of literature that has found increases in internalizing and

distress symptoms as adolescents age (e.g., Rudolph et al., 2014), but is consistent with some studies of adolescents residing in urban neighborhoods (e.g., Taylor et al., 2018). It is possible that adolescents experienced higher levels of distress during the transition into middle school that then decreased as adolescents settled into the new school environment. Moreover, traumatic stress and internalizing disorders (e.g., depression, anxiety), are currently viewed as conceptually different disorders (American Psychiatric Association, 2022) and may consequently have different developmental trajectories. Inconsistent with prior studies (Farrell et al., 2005; Farrell et al., 2011; Karriker-Jaffe et al., 2008), physical aggression remained stable across middle school, rather than increasing, evident by slopes that were not significantly different from zero. There were significant decreases in physical aggression frequency during the summers, which may be the result of adolescents spending less time around their peers. There was variability in change over time for both distress and aggression, with the exception of the quadratic slope for distress and the 8th grade slope and summer factor for aggression, which supported investigating associations with patterns of witnessing community violence and differences across subgroups.

Findings of relations between witnessing community violence and distress support theories of maladaptation and traumatic stress and are consistent with prior studies (e.g., Fowler et al., 2009; Ruchkin et al., 2023). Inconsistent with pathologic adaptation, increases in witnessing violence were associated with increases in distress, and the rate of change in distress (i.e., quadratic slope) was not related to changes in witnessing violence frequency. Prior studies that have found quadratic associations between witnessing violence and distress have argued that these relations are indicative of pathologic adaptation (e.g., Gaylord-Harden et al., 2017; Kennedy & Ceballo, 2016; Ng-Mak et al., 2004). However, these studies only used a single observation of violence exposure, and thus relations with distress represent between-person

differences based on frequency of exposure rather than within-person changes. The current study builds on prior literature by suggesting that within-person changes in distress symptoms across middle school follow a curvilinear trajectory that is unrelated to an individuals' frequency in witnessing community violence, which contradicts pathologic adaptation theory. Higher baseline levels of distress symptoms were associated with greater decreases (i.e., more negative linear slope) in witnessing community violence, which may indicate that adolescents with higher levels of distress were more likely than their peers to develop skills that reduce their risk of violence exposure, such as by avoiding areas of violence or increasing protective factors.

Regarding relations between changes in witnessing community violence and changes in physical aggression, findings from the current study are consistent with theories and build on existing literature. Findings indicated that higher overall frequencies of witnessing violence were associated with overall frequent aggressive behavior among adolescents and are consistent with theories of maladaptation (e.g., Foster & Brooks-Gunn, 2009) and pathologic adaptation (Ng-Mak et al., 2002) and prior cross-sectional (see Fowler et al., 2009 for a review) and longitudinal findings (e.g., Farrell, Thompson, & Curran, et al., 2020; Gaylord-Harden et al., 2017; Mrug & Windle, 2010). The current study found that adolescents' changes in witnessing community violence within one school year were related to concurrent changes in physical aggression but were not associated with changes in physical aggression during subsequent grades. These findings build upon prior studies that have typically used single observations of witnessing community violence to predict concurrent or subsequent physical aggression (e.g., Elsaesser, 2018; Mrug & Windle, 2010; Taylor et al., 2018) and consequently failed to capture the effects of within-person changes in witnessing violence. Additionally, the current study builds on findings from Farrell and Sullivan (2004), who collected data only twice each school year, by

demonstrating that changes in an individual's experiences of witnessing violence and physical aggression can occur over a few months within a school year. Findings that change in witnessing community violence was only associated with concurrent change in physical aggression may indicate that youth in the middle school setting are more vulnerable to engaging in aggression if they observe others engaging violence and aggression of others (Choukas-Bradley & Prinstein, 2014).

Subgroup Differences in Adjustment

The second goal of Aim 2 (Aim 2b) was to examine heterogeneity in changes in distress symptoms and physical aggression among adolescents who differed in their frequency of reported witnessing community violence during middle school. Heterogeneity in changes in adjustment over time (i.e., between-person differences in within-person change) was examined using a mixture modeling approach and subgroups were defined based on their trajectories of witnessing community violence during middle school. Analyses indicated that the three subgroups with different trajectories of witnessing violence identified by GMM significantly differed in their overall levels of both distress symptoms and frequency of physical aggression. In contrast, the functional form of change in distress and physical aggression during middle school did not differ between subgroups, with the exception of the extent to which physical aggression deviated from linear slopes during the summer for the *rarely witnessing* and *frequent witnessing* subgroups. Compared with the *rarely witnessing* subgroup, the *frequent witnessing* subgroup had a larger deviation from the linear slope in reported frequency of physical aggression during the summer and were likely driving the decrease in frequency in the model for the overall sample. Additionally, the nonsignificant quadratic slope of distress for the *frequent witnessing* subgroup indicated that distress symptoms continued to decrease at a similar linear

rate across middle school. This finding may indicate that adolescents in the *rarely* and *moderate witnessing* subgroups hit a "floor" of distress symptoms, and that the *frequent witnessing* subgroup had not yet reached the floor. Taken together, these findings suggest that adolescents who differ in the changes in reported witnessing community violence were similar in the functional form of change in distress symptoms and physical aggression during middle school.

Findings regarding subgroup differences in overall frequencies of reported adjustment were largely consistent with findings from prior studies. Prior studies have found that subgroups with higher frequency of witnessing violence report more severe internalizing or distress symptoms compared with subgroups with consistently low or decreasing frequencies of witnessing violence (Baskin & Sommers, 2015; Lambert et al., 2010; Whipple et al., 2021). In contrast, few studies have examined subgroup differences in overall frequency of externalizing symptoms, and one study that did found that aggression was not associated with subgroup membership (Whipple et al. 2021). However, Baskin and Sommers only examined PTSD, depression, and anxiety at the final data collection point and controlled for baseline symptoms rather than comparing changes in symptoms over time. Lambert et al. only investigated average symptoms of depression during each grade and only found subgroup differences in the 6th grade. Whipple et al. found that average depression symptoms predicted concurrent latent subgroup membership at two out of four waves. These findings reflect between-person differences. In contrast, the current study examined differences in adjustment over time by examining within-person change in measures of adjustment rather than comparing between-person differences in adjustment at any one timepoint. Findings add to the literature by demonstrating that subgroups identified by small changes in witnessing community violence across intervals of a few months

differed in their overall levels of distress symptoms and frequency of engaging in physical aggression.

Inconsistencies with prior studies regarding subgroup differences in the functional form of change in measures of adjustment over time may be due to methodological differences. For example, Spano et al. (2010) used mixture modeling analysis to identify subgroups with different trajectories of witnessing violence, repeated this analysis for violent behavior, and then used odds ratios to determine the probability that adolescents would have different trajectories of violent behavior based on their trajectory of witnessing violence. It is possible that there are latent subgroups of adolescents with different trajectories of distress symptoms and physical aggression frequency in the current sample that are different from the subgroups of adolescents identified through mixture modeling of witnessing violence trajectories, and consequently heterogeneity of youth adjustment may not have been captured in the witnessing violence latent subgroup variable. Spano et al. conducted analyses on measures of exposure and behavior collected annually for 5 years from early to late adolescence, which may have resulted in more variability in measures over time compared with the current study. Few other studies have investigated differences in the functional form of change in measures of adjustment among subgroups identified by different trajectories of violence exposure. However, findings from the current study suggest that the functional form of change in witnessing violence may only be associated with subgroup differences in overall adjustment and not the functional form of change in measures of adjustment during middle school.

Implications for Theory

Developmental psychopathology theory (Hinshaw & Beauchaine, 2017) hypothesizes that there is heterogeneity in the effects of adverse experiences, such as witnessing community

violence, on youth adjustment over time. Findings from LCM for the overall sample indicated that there was heterogeneity in overall levels and rate of change over time in constructs, evidenced by significant variance of latent curve parameters. In contrast, findings from mixture model analysis indicated that subgroups with different trajectories of witnessing violence generally did not differ in the functional form of trajectories of distress or aggression, as evidenced by a lack of subgroup differences in slopes, which is inconsistent with this framework. This finding suggested that adolescents with different experiences of witnessing community violence are similar in the functional form of trajectories of distress symptoms and aggression frequency during middle school, with overall levels of symptoms being influenced by recent and lifetime experiences of witnessing violence. This finding aligns more closely with maladaptation and traumatic stress theories (Foster & Brooks-Gunn, 2009), which stipulate that cumulative experiences of adverse experiences contribute to maladaptation for most youth. It is possible that meaningful subgroups of adolescents differ in their trajectories on measures of adjustment and are not identifiable by or significantly different in their trajectories of witnessing community violence. Thus, future studies should continue to examine subgroups of adolescents that differ in measures of development and factors that might be associated with these differences.

Pathologic adaptation theory also hypothesizes that subgroups of adolescents will differ in their adjustment following violence exposure, with most youth becoming maladjusted, and a subgroup of youth with chronic high frequencies of violence exposure becoming pathologically adapted (Ng-Mak et al., 2002). The lack of evidence of a subgroup of adolescents with a chronic high trajectory of witnessing violence limits the ability of this study to examine theories such as pathologic adaptation. Because GMM and other mixture models identify subgroups based on assumed unobservable differences between individuals within a given sample (Masyn, 2013), it

is possible that a subgroup of youth with chronic high levels of witnessing violence within another sample may experience desensitization. For example, analyses by Spano et al. (2010) and Baskin and Sommers (2015) each identified a subgroup of adolescents (40% and 34% of the sample respectively) who reported chronically high frequencies of community violence exposure. However, consistent with findings from the current study, both of these studies found that subgroups with chronic high trajectories of violence exposure reported higher overall levels of distress symptoms of physical aggression frequency. These studies used annual measures of exposure collected within the past year to identify subgroups that may aggregate more experiences of exposure per collection timepoint compared with the current study. Results from the current study suggest that over shorter periods of time adolescents still generally report few experiences of violence. Although witnessing violence decreased during middle school across subgroups, witnessing violence had a positive association with both distress symptoms and physical aggression, and the subgroup with more frequent witnessing violence relative to the other. This finding is consistent with those of prior studies and does not support pathologic adaptation theory.

Implications for Interventions

Findings from the current study have important implications for intervention efforts. Overall, frequencies of witnessing violence and distress symptoms decreased across middle school and decreases in witnessing violence were also associated with decreases in distress and aggression, which may indicate that reductions in violence exposure may help reduce distress symptoms and aggression among early adolescents. Subgroups of youth differed in overall frequencies of witnessing violence, physical aggression, and levels of distress symptoms, and these constructs changed in a similar functional form across subgroup during middle school. This

finding suggested that experiences and factors prior to middle school may be contributing to overall frequencies of exposure, aggression, and levels of distress symptoms. Thus, early identification and intervention of youth with high risk prior to middle school, in addition to identification and intervention across adolescences, may be critical in both reducing violence exposure and mitigating its negative consequences. Additionally, identifying protective factors among adolescents in the *rarely witnessing* subgroup may provide insight into modifiable promotive factors that could be implemented in interventions to prevent patterns of frequent witnessing violence and aggression across middle school. Universal prevention efforts prior to middle school are crucial to prevent community violence exposure among youth. On a broader scale, efforts to reduce violence within economically marginalized communities (e.g., policy changes, public programming) may offer the most promise in reducing exposure.

Findings from this study indicated that one subgroup of adolescents consistently reported higher frequencies of witnessing violence, frequencies of physical aggression, and levels of distress symptoms. Developing methods to identify this subgroup and target and/or tailor intervention efforts toward this subgroup may result in the greatest reduction in exposure and maladaptation. Interventions for this subgroup should include components that promote safety and reduce violence exposure, reduce symptoms of distress (e.g., promote coping skills), and target factors associated with engaging in aggressive behavior, such as social-information processing (e.g., beliefs about aggression and conflict resolution skills; Crick & Dodge, 1994). Further, for this subgroup, the school year, and possibly the school environment, were associated with the highest frequencies of witnessing violence and physical aggression. Thus, identifying risk factors associated with higher frequencies and implementing interventions during the school year may help reduce witnessing community violence and its consequences. Factors associated

with drops in exposure and aggression over the summer should also be incorporated into intervention efforts. Several studies have found that targeted interventions within universal school-based interventions have been effective in reducing problem behavior among youth with the highest baseline levels of problem behavior (e.g., Multisite Violence Prevention Project, 2014).

Limitations

Although this study had several strengths that addressed gaps in the existing literature on witnessing community violence, it also had several limitations that warrant discussion. This study relied on adolescent self-report for experiences of violence and for symptoms of distress, which might be biased or inaccurate. However, adolescents might be better informants than their parents or teachers for certain experiences, such as witnessing violence, because they often spend time unsupervised outside of home and school. Prior studies have found that caregivers underreport their adolescents' experiences of violence (e.g., Taylor et al., 2018). Because the sample of this study was predominately comprised of African American/Black youth residing in urban economically marginalized neighborhoods, the results of this study might not generalize to youth of other races, ethnicities, or urbanicities. Race was not included as a covariate because the majority of participants self-identified as African American, and the remaining represent a diverse group with fewer than 10% endorsing any other single race. I wanted results from this study to represent trajectories among youth within these communities, and limiting the sample may have limited the applicability of findings to some youth within these communities. According to ecological systems theory (Bronfenbrenner, 1979), youth development occurs within the context of multiple systems that interact with each other to influence adjustment. I did

not examine youth development within an ecological framework or the ways in which different systems influence development.

This study used data from a longitudinal study that used a missing-by-design approach. Therefore, most missing data was missing completely at random because students were randomized to complete surveys at two out of four waves of data collection. However, other data may not be missing at random due to attrition of students, which is common in many longitudinal studies. I addressed missing data by using full information maximum likelihood (FIML; Little et al., 2013) estimation. Although FIML assumes that data are missing at random, there are currently no well-accepted methods for testing this assumption (Enders, 2011), and FIML is preferred over other approaches (e.g., listwise deletion). In order to increase coverage of the data, I used an inclusion criterion of at least three waves of data being present, which may have increased sample bias. I did not examine or control for measures of possible covariates of adjustment (e.g., violence victimization, negative life events; Thompson et al., 2019). Examining associations among trajectories of youth experiences and behavior using correlations precluded me from controlling for possible covariates. Finally, because associations between witnessing community violence and physical aggression and distress were examined using correlations, it is impossible to draw conclusions about causality.

Conclusions

Findings from this study provide knowledge that may refine theory and inform intervention efforts related to community violence exposure among youth residing in economically marginalized neighborhoods with high rates of violence. Overall, findings suggested that there is heterogeneity in adolescents' overall frequency of witnessing community violence over time within economically marginalized communities in, which can be modeled by

distinct subgroups. However, subgroups did not differ in the functional form of change or in their rate of decreases in exposure. Subgroups with different trajectories of witnessing community violence differed in their overall levels of distress symptoms and frequency of physical aggression. Adolescents with the highest reported frequencies of witnessing community violence had higher levels of distress symptoms and frequencies of physical aggression. However, for all adolescents, exposure and distress symptoms decreased across middle school whereas aggressive behavior remained relatively stable. Decreases in reported witnessing violence frequency were associated with decreases in both distress symptoms and physical aggression frequency. Thus, school-based interventions that target subgroups of adolescents with most frequent violence exposure, particularly during the school year, may be most effective in reducing exposure and aggression. Taken together, findings do not support pathologic adaptation theory or developmental psychopathology theories but were more consistent with stress process theories. These findings fill gaps in the literature that are due to prior studies assuming that adolescents' frequency of exposure is either stable over time or follows the same trajectory. Findings improve the understanding of dynamic developmental processes that contribute to maladaptation and highlight the strength of using mixture modeling to examine subgroup differences in developmental processes across time.

References

Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control, 19*(6), 716–723. https://ieeexplore.ieee.org/document/1100705

Akins, S. (2009). Racial segregation, concentrated disadvantage, and violent crime. *Journal of Ethnicity in Criminal Justice*, *7*(1), 30–52. https://doi.org/10.1080/15377930802711771

Allison, K. W., Burton, L., Marshall, S., Perez-Febles, A., Yarrington, J., Kirsh, L. B., & Merriwether-DeVries, C. (1999). Life experiences among urban adolescents: Examining the role of context. *Child development*, *70*(4), 1017–1029. https://doi.org/b4txrj

American Psychiatric Association. (1987). Diagnostic and statistical manual of mental disorders (3rd ed., rev.).

American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.). https://doi.org/10.1176/appi.books.9780890425787

Antunes, M. J. L., & Ahlin, E. M. (2017). Youth exposure to violence in the community: Towards a theoretical framework for explaining risk and protective factors. *Aggression and Violent Behavior, 34,* 166–177. https://doi.org/10.1016/j.avb.2017.01.015

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Using the BCH method in Mplus to estimate a distal outcome model and an arbitrary secondary model (Mplus web notes, 21). Retrieved from https://www.statmodel.com/download/asparouhov_muthen_2014.pdf

Bakk, Z., Oberski, D. L., & Vermunt, J. K. (2016). Relating latent class membership to continuous distal outcomes: Improving the LTB approach and a modified three-step implementation. *Structural Equation Modeling*: *A Multidisciplinary Journal, 23*(2), 278-289. https://doi.org/10.1080/10705511.2015.1049698

Baskin, D., & Sommers, I. (2015). Trajectories of exposure to community violence and mental health symptoms among serious adolescent offenders. *Criminal Justice and Behavior, 42*(6), 587–609. https://doi.org/10.1177/0093854814556882

Bollen, K. A., & Curran, P. J. (2006). Latent curve models: A structural equation perspective. Wiley.

Borg, B. A., Rabinak, C. A., & Marusak, H. A. (2021). Violence exposure and mental health consequences among urban youth. *Current Psychology*. https://doi.org/10.1007/s12144-021-02141-4

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

Chen, P., Voisin, D. R., Marotta, P. L., & Jacobson, K. C. (2020). Racial and ethnic comparison of ecological risk factors and youth outcomes: A test of the desensitization hypothesis. *Journal of Child and Family Studies, 29*(10), 2722–2733. https://doi.org/10.1007/s10826-020-01772-8

Choukas-Bradley, S., Prinstein, M.J. (2014). Peer Relationships and the Development of Psychopathology. In: Lewis, M., Rudolph, K. (eds) *Handbook of Developmental Psychopathology*. https://doi.org/10.1007/978-1-4614-9608-3_10

Cicchetti, D., & Rogosch, F. A. (2002). A developmental psychopathology perspective on adolescence. *Journal of Consulting and Clinical Psychology, 70*(1), 6–20. https://doi.org/10.1037/0022-006X.70.1.6

Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*(1), 74–101. https://doi.org/10.1037/0033-2909.115.1.74

Crockett, L. J., & Crouter, A. C. (Series Ed.). (1995). *Pathways through adolescence: Individual development in relation to social contexts*. Lawrence Erlbaum Associates, Inc.

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual review of psychology*, *62*, 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

Elsaesser, C. (2018). The longitudinal relations between dimensions of community violence exposure and developmental outcomes among adolescent ethnic minority males. *Psychology of Violence, 8*(4), 409–417. https://doi.org/10.1037/vio0000140

Enders, C. K. (2011). Analyzing longitudinal data with missing values. *Rehabilitation Psychology, 56*(4), 267-288. https://doi-org.proxy.library.vcu.edu/10.1037/a0025579

Farrell, A. D., Ampy, L. A., & Meyer, A. L. (1998). Identification and assessment of problematic interpersonal situations for urban adolescents. *Journal of Clinical Child Psychology*, *27*(3), 293–305. https://doi.org/10.1207/s15374424jccp2703_6

Farrell, A. D., & Bruce, S. E. (1997). Impact of exposure to community violence on violent behavior and emotional distress among urban adolescents. *Journal of Clinical Child Psychology, 26*(1), 2–14. https://doi.org/10.1207/s15374424jccp2601_1

Farrell, A. D., Erwin, E. H., Allison, K. W., Meyer, A., Sullivan, T., Camou, S., Kliewer, W., & Esposito, L. (2007). Problematic situations in the lives of urban African American middle school students: A qualitative study. *Journal of Research on Adolescence, 17*(2), 413–454. https://doi.org/10.1111/j.1532-7795.2007.00528.x

Farrell, A. D., Goncy, E. A., Sullivan, T. N., & Thompson, E. L. (2018). Victimization, aggression, and other problem behaviors: Trajectories of change within and across middle

school grades. *Journal of Research on Adolescence, 28*(2), 438–455. https://doi.org/10.1111/jora.12346

Farrell, A. D., Henry, D. B., Mays, S. A., & Schoeny, M. E. (2011). Parents as moderators of the impact of school norms and peer influences on aggression in middle school students. *Child Development, 82,* 146–161. https://doi.org/10.1111/j.1467-8624.2010.01546.x

Farrell, A. D., Pittman, S. K., O'Connor, K. E., & Sullivan, T. N. (2021). Peer factors as mediators of relations between exposure to violence and physical aggression in middle school students in a low-income urban community. *Psychology of Violence, 12*(3), 170–182. https://doi.org/10.1037/vio0000405

Farrell, A. D., & Sullivan, T. N. (2004). Impact of witnessing violence on growth curves for problem behaviors among early adolescents in urban and rural settings. *Journal of Community Psychology, 32*(5), 505–525. https://doi.org/10.1002/jcop.20016

Farrell, A. D., Sullivan, T. N., Esposito, L. E., Meyer, A. L., & Valois, R. F. (2005). A latent growth curve analysis of the structure of aggression, drug use, and delinquent behaviors and their interrelations over time in urban and rural adolescents. *Journal of Research on Adolescence, 15*, 179–204. https://doi.org/10.1111/j.15327795.2005.00091.x

Farrell, A. D., Sullivan, T. N., Goncy, E. A., & Le, A.-T. H. (2016). Assessment of adolescents' victimization, aggression, and problem behaviors: Evaluation of the Problem Behavior Frequency Scale. *Psychological Assessment, 28*(6), 702–714. https://doi.org/10.1037/pas0000225

Farrell, A. D., Sullivan, T. N., Sutherland, K. S., Corona, R., & Masho, S. (2018). Evaluation of the Olweus Bully Prevention Program in an urban school system in the USA. *Prevention Science*, *19*(6), 833–847. https://doi.org/10.1007/s11121-018-0923-4

Farrell, A. D., Thompson, E. L., Curran, P. J., & Sullivan, T. N. (2020). Bidirectional relations between witnessing violence, victimization, life events, and physical aggression among adolescents in urban schools. *Journal of Youth and Adolescence, 49*(6), 1309–1327. https://doi.org/10.1007/s10964-020-01204-2

Farrell, A. D., Thompson, E. L., Mehari, K. R., Sullivan, T. N., & Goncy, E. A. (2020). Assessment of in-person and cyber aggression and victimization, substance use, and delinquent behavior during early adolescence. *Assessment, 27*(6), 1213–1229. https://doi.org/10.1177/1073191118792089

Feldman, B. J., Masyn, K. E., & Conger, R. D. (2009). New approaches to studying problem behaviors: A comparison of methods for modeling longitudinal, categorical adolescent drinking data. *Developmental Psychology*, *45*(3), 652–676. https://doi.org/10.1037/a0014851

Finkelhor, D., Turner, H. A., Shattuck, A., & Hamby, S. L. (2015). Prevalence of childhood exposure to violence, crime, and abuse: Results from the National Survey of Children's Exposure to Violence. *JAMA Pediatrics, 169*(8), 746-754. https://doi.org/10.1001/jamapediatrics.2015.0676

Foster, H., & Brooks-Gunn, J. (2009). Toward a stress process model of children's exposure to physical family and community violence. *Clinical Child and Family Psychology Review, 12*(2), 71–94. https://doi.org/10.1007/s10567-009-0049-0

Fowler, P. J., Tompsett, C. J., Braciszewski, J. M., Jacques-Tiura, A. J., & Baltes, B. B. (2009). Community violence: A meta-analysis on the effect of exposure and mental health outcomes of children and adolescents. *Development and Psychopathology, 21*(1), 227-259. https://doi.org/10.1017/S0954579409000145

Gaylord-Harden, N. K., Burnside, A., & Tinsley, D. (2020). The prevalence and longitudinal patterns of continuous community violence exposure and trauma-related symptoms in adolescent male serious offenders. *Journal of Traumatic Stress*, *33*(4), 541–551. https://doi.org/10.1002/jts.22535

Gaylord-Harden, N. K., Dickson, D., & Pierre, C. (2016). Profiles of community violence exposure among African American youth: An examination of desensitization to violence using latent class analysis. *Journal of Interpersonal Violence, 31*(11), 2077–2101. https://doi.org/10.1177/0886260515572474

Gaylord-Harden, N. K., So, S., Bai, G. J., Henry, D. B., & Tolan, P. H. (2017). Examining the pathologic adaptation model of community violence exposure in male adolescents of color. J*ournal of Clinical Child & Adolescent Psychology, 46*(1), 125–135. https://doi.org/10.1080/15374416.2016.1204925

Hinshaw, S. P., & Beauchaine, T. P. (Eds.). (2017). *Child and Adolescent Psychopathology*. John Wiley & Sons, Incorporated.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. https://doi.org/10.1080/10705519909540118

Hussong, A. M., Curran, P. J., Moffitt, T. E., Caspi, A., & Carrig, M. M. (2004). Substance abuse hinders desistance in young adults' antisocial behavior. *Development and Psychopathology*, *16*(4), 1029–1046. https://doi.org/10.1017/s095457940404012x

Jung, T., & Wickrama, K. A. (2008). An introduction to latent class growth analysis and growth mixture modeling. *Social and personality psychology compass, 2*(1), 302-317. https://doi.org/10.1111/j.1751-9004.2007.00054.x

Karriker-Jaffe, K., Foshee, V. A., Ennett, S. T., & Suchindran, C. (2008). The development of aggression during adolescence: Sex differences in trajectories of physical and social aggression among youth in rural areas. *Journal of Abnormal Child Psychology, 36*, 1227–1236. https://doi.org/10.1007/s10802-008-9245-5

Kennedy, T. M., & Ceballo, R. (2016). Emotionally numb: Desensitization to community violence exposure among urban youth. *Developmental Psychology, 52*(5), 778–789. https://doi.org/10.1037/dev0000112

Lambert, S. F., Bettencourt, A. F., Bradshaw, C. P., & Ialongo, N. S. (2013). Early predictors of urban adolescents' community violence exposure. *Journal of Aggression, Maltreatment & Trauma*, *22*(1), 26–44. https://doi.org/10.1080/10926771.2013.743944

Lambert, S. F., Nylund-Gibson, K., Copeland-Linder, N., & Ialongo, N. S. (2010). Patterns of community violence exposure during adolescence. *American Journal of Community Psychology*, *46*(3–4), 289–302. https://doi.org/10.1007/s10464-010-9344-7

Lambert, S. F., Tache, R. M., Liu, S. R., Nylund-Gibson, K., & Ialongo, N. S. (2019). Individual differences in patterns of community violence exposure and internalizing and externalizing behaviors. *Journal of Interpersonal Violence, 36*(19-20), 9484-9506. https://doi.org/10.1177/0886260519867148

Little, T. D., Jorgensen, T. D., Lang, K. M., & Moore, E. W. G. (2013). On the joys of missing data. *Journal of Pediatric Psychology, 39*, 151–162. https://doi.org/10.1111/cdep.12043

Lynch, M., & Cicchetti, D. (1998). An ecological-transactional analysis of children and contexts: The longitudinal interplay among child maltreatment, community violence, and children's symptomatology. *Development and Psychopathology*, *10*(2), 235–257. https://doi.org/10.1017/S095457949800159X

Masyn, K. E. (2013). Latent class analysis and finite mixture modeling. In T. D. Little (Ed.), *The Oxford handbook of quantitative methods: Statistical analysis* (pp. 551–611). Oxford University Press.

McDowall, D., Loftin, C., & Pate, M. (2012). Seasonal cycles in crime, and their variability. *Journal of Quantitative Criminology*, *28*(3), 389–410. http://www.jstor.org/stable/43551937

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*(4), 674–701. https://doi.org/10.1037/0033-295X.100.4.674

Mrug, S., & Windle, M. (2010). Prospective effects of violence exposure across multiple contexts on early adolescents' internalizing and externalizing problems. *Journal of Child Psychology and Psychiatry, 51*(8), 953–961. https://doi.org/10.1111/j.1469-7610.2010.02222.x

Mrug, S., Madan, A., & Windle, M. (2016). Emotional desensitization to violence contributes to adolescents' violent behavior. *Journal of Abnormal Child Psychology, 44*(1), 75–86. https://doi.org/10.1007/s10802-015-9986-x

Multisite Violence Prevention Project. (2014). Targeting high-risk, socially influential middle school students to reduce aggression: Universal versus selective preventive intervention effects. *Journal of Research on Adolescence, 24*(2), 364–382. https://doi.org/10.1111/jora.12067

Muthén, B. (2008). Latent variable hybrids: Overview of old and new models. In Hancock, G. R., & Samuelsen, K. M. (Eds.), *Advances in latent variable mixture models*, (pp. 1-24). Information Age Publishing, Inc.

Muthén, L.K. and Muthén, B.O. (2017). Mplus User's Guide. Eighth Edition. Muthén & Muthén

Ng-Mak, D. S., Salzinger, S., Feldman, R., & Stueve, A. (2002). Normalization of violence among inner-city youth: A formulation for research. *American Journal of Orthopsychiatry, 72*(1), 92–101. https://doi.org/10.1037/0002-9432.72.1.92

Ng-Mak, D. S., Salzinger, S., Feldman, R. S., & Stueve, C. A. (2004). Pathologic adaptation to community violence among inner-city youth. *American Journal of Orthopsychiatry, 74*(2), 196-208. https://doi.org/10.1037/0002-9432.74.2.196

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*(4), 535–569. https://doi.org/10.1080/10705510701575396

Olweus, D., & Limber, S. P. (2010). Bullying in school: Evaluation and dissemination of the Olweus Bullying Prevention Program. *American Journal of Orthopsychiatry, 80*(1), 124–134. https://doi.org/10.1111/j.1939-0025.2010.01015.x

Overstreet, S. (2000). Exposure to community violence: Defining the problem and understanding the consequences. *Journal of Child and Family Studies, 9*(1), 7–25. https://doi.org/10.1023/A:1009403530517

Pellegrini, A. D. (2002). Bullying, victimization, and sexual harassment during the transition to middle school. *Educational psychologist*, *37*(3), 151-163. https://doi.org/10.1207/S15326985EP3703_2

Pittman, S. K., & Farrell, A. D. (2022). Patterns of community violence exposure among urban adolescents and their associations with adjustment. *American Journal of Community Psychology*, 1–13. https://doi.org/10.1002/ajcp.12598

Prinstein, M. J., & Giletta, M. (2016). Peer relations and developmental psychopathology. In D. Cicchetti (Ed.), *Developmental psychopathology: Theory and method, Vol. 1*, 3rd ed (pp. 527–579). John Wiley & Sons Inc.

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological methodology*, 111-163. https://doi.org/10.2307/271063

Richards, M. H., Romero, E., Zakaryan, A., Carey, D., Deane, K., Quimby, D., Patel, N., & Burns, M. (2015). Assessing urban African American youths' exposure to community violence through a daily sampling method. *Psychology of Violence, 5*(3), 275–284. https://doi.org/10.1037/a0038115

Richters, J. E., & Martinez, P. (1990). Checklist of Children's Distress Symptoms: Self-report version. National Institute of Mental Health.

Richters, J. E., & Martinez, P. (1993). The NIMH community violence project: I. Children as victims to and witnesses of violence. *Psychiatry*, *56,* 7–21.

Richters, J. E., & Saltzman, W. (1990). Survey of Children's Exposure to Community Violence: Parent report and self-report version. National Institute of Mental Health.

Ruchkin, V., Isaksson, J., Stickley, A., & Schwab-Stone, M. (2023). Longitudinal associations between community violence exposure and mental health problems in inner-city youth: Ethnicity and gender perspectives. *Journal of Interpersonal Violence*, Advance online publication. https://doi.org/10.1177/08862605231158754

Rudolph, K. D. (2014). Puberty as a Developmental Context of Risk for Psychopathology. In M. Lewis & K. D. Rudolph (Eds.), *Handbook of Developmental Psychopathology* (pp. 331–354). Springer US. https://doi.org/10.1007/978-1-4614-9608-3_17

Satorra, A., & Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye & C. C. Clogg (Eds.*), Latent variables analysis: Applications for developmental research* (pp. 399–419). Sage.

Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics, 6*(2), 461-464. https://projecteuclid.org/euclid.aos/1176344136

Sheats, K. J., Irving, S. M., Mercy, J. A., Simon, T. R., Crosby, A. E., Ford, D. C., Merrick, M. T., Annor, F. B., & Morgan, R. E. (2018). Violence-related disparities experienced by Black youth and young adults: Opportunities for prevention. *American Journal of Preventive Medicine*, *55*(4), 462–469. https://doi.org/10.1016/j.amepre.2018.05.017

Sher, K. J., Jackson, K. M., & Steinley, D. (2011). Alcohol use trajectories and the ubiquitous cat's cradle: cause for concern? *Journal of abnormal psychology*, *120*(2), 322–335. https://doi.org/10.1037/a0021813

Spano, R., Rivera, C., & Bolland, J. M. (2010). Are chronic exposure to violence and chronic violent behavior closely related developmental processes during adolescence? *Criminal Justice and Behavior, 37*(10), 1160–1179. https://doi.org/10.1177/0093854810377164

Sullivan, T. N., Farrell, A. D., Sutherland, K. S., Behrhorst, K. L., Garthe, R. C., & Greene, A. (2021). Evaluation of the Olweus Bullying Prevention Program in US urban middle schools using a multiple baseline experimental design. *Prevention Science*, *22*(8), 1134–1146. https://doi.org/10.1007/s11121-021-01244-5

Taylor, J. J., Grant, K. E., Zulauf, C. A., Fowler, P. J., Meyerson, D. A., & Irsheid, S. (2018). Exposure to community violence and the trajectory of internalizing and externalizing symptoms in a sample of low-income urban youth. *Journal of Clinical Child & Adolescent Psychology, 47*(3), 421–435. https://doi.org/10.1080/15374416.2016.1152553

Thompson, E. L., Coleman, J. N., O'Connor, K. E., Farrell, A. D., & Sullivan, T. N. (2019). Exposure to violence and nonviolent life stressors and their relations to trauma-related distress and problem behaviors among urban early adolescents. *Psychology of Violence, 10*(5), 509–519. https://doi.org/10.1037/vio0000264

Whipple, C. R., Robinson, W. L., Jason, L. A., Kaynak, Ö., Harris, C. W., Grisamore, S. P., & Troyka, M. N. (2021). Patterns of community violence exposure among African American adolescents living in low-resourced urban neighborhoods. *American Journal of Community Psychology*, *68*(3-4), 414-426. https://doi.org/10.1002/ajcp.12522

Zimmerman, G. M., & Messner, S. F. (2013). Individual, family background, and contextual explanations of racial and ethnic disparities in youths' exposure to violence. *American Journal of Public Health*, *103*(3), 435–442. https://doi.org/10.2105/AJPH.2012.300931

Appendix

Correlations Among Witnessing Community Violence, Distress Symptoms, and Aggression at Each Wave

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Witnessing 6F	—											
2. Witnessing 6W	.64***	—										
3. Witnessing 6Sp	.54***	.59***	—									
4. Witnessing 6Su	.48***	.51***	.59***	—								
5. Witnessing 7F	.59***	.54***	.49***	.56***	—							
6. Witnessing 7W	.52***	.46***	.54***	.41***	.65***	—						
7. Witnessing 7Sp	.36***	.43***	.40***	.38***	.60***	.56***	—					
8. Witnessing 7Su	.38***	.43***	.31***	.52***	.48***	.59***	.61***	—				
9. Witnessing 8F	.22**	.34***	.37***	.42***	.45***	.51***	.49***	.48***	—			
10. Witnessing 8W	.34***	.31***	.27***	.36***	.47***	.48***	.48***	.51***	.66***	—		
11. Witnessing 8Sp	.27***	.31***	.23***	.44***	.40***	.47***	.50***	.54***	.59***	.60***	—	
12. Witnessing 8Su	.37***	.44***	.29***	.55***	.25***	.47***	.48***	.33***	.65***	.43***	.36***	—
13. Distress 6F	.51***	-.09	-.21**	-.11	.3**	.01	.13	.08	.10	.32**	.27	.08
14. Distress 6W	-.16	.44***	-.04	-.08	.19*	.19**	.35***	.13	.10	-.05	.20**	.09
15. Distress 6Sp	-.20**	-.24***	.42***	-.01	.02	.16*	-.06	.12	.21*	.09	-.11	.09
16. Distress 6Su	-.04	-.10	-.12	.38***	.19**	.13	.22***	.20*	.17	.01	.10	.12
17. Distress 7F	.19*	.18**	.29***	.21**	.48***	-.16*	-.16**	-.20**	.17	.01	.16*	.11
18. Distress 7W	.13	.05	.21**	.07	-.28***	.45***	-.19***	-.09	.24**	.16*	.00	.12
19. Distress 7Sp	.16	.08	.12	.02	-.23***	-.12*	.38***	-.27***	.11	.16*	.24**	-.12
20. Distress 7Su	.29**	.27***	.21**	.25**	-.07	-.20**	-.09	.42***	.13	.2**	.15*	.28**
21. Distress 8F	.09	.18*	.01	.06	.11	.07	-.07	.04	.47***	-.08	-.16*	-.29**
22. Distress 8W	.27**	.14	.17*	.14	.08	.23***	.20***	.28***	-.15*	.37***	-.11	-.24**
23. Distress 8Sp	.09	.10	.37***	.16	.23**	.14	.17**	.17*	-.28***	-.18*	.41***	.00
24. Distress 8Su	.10	-.04	-.01	.04	-.15	.02	.01	.01	-.25*	-.05	-.27**	.32***

(Table continues)

Table continued

Variable	1	2	3	4	5	6	7	8	9	10	11	12
25. Aggression 6F	.35***	.09	.11	-.06	.20*	.23*	.17*	.25**	.17	.18*	.13	.12
26. Aggression 6W	.06	.46***	.05	.13	.22**	.27***	.24***	.33***	.25***	.21**	.14*	.02
27. Aggression 6Sp	.26**	.11	.40***	.18*	.29***	.18**	.03	.28***	.23**	.12	.31***	.11
28. Aggression 6Su	.19*	.09	.09	.41***	.30***	.24***	.13*	.01	.04	.12	.33***	.14
29. Aggression 7F	.34***	.23***	.24***	.29***	.51***	.24**	.13*	.31***	.23**	.35***	.25***	-.07
30. Aggression 7W	-.03	.07	.32***	.08	-.02	.35***	-.03	.27***	.27***	.08	.22***	.14
31. Aggression 7Sp	.34***	.23***	-.05	.25***	.17**	.14*	.48***	.25**	.27***	.36***	.27***	.34***
32. Aggression 7Su	.23**	.21**	.03	.05	.03	.16*	.03	.34***	.16*	.16*	.34***	.34***
33. Aggression 8F	-.06	.13	.01	.10	-.02	.07	.01	.14*	.40***	.21***	.02	.24*
34. Aggression 8W	.25**	.24**	.04	.25**	.34***	.16*	.26***	.28***	.37***	.50***	.09	.33**
35. Aggression 8Sp	.08	.14	.29***	.26**	.09	.39***	.17*	.23***	.19*	.06	.58***	.47***
36. Aggression 8Su	.15	.13	.05	.22	.21*	.07	.32***	.30***	-.05	.19*	.03	.30***

(Table continues)

Table continued

Variable	13	14	15	16	17	18	19	20	21	22	23	24
13. Distress 6F	—											
14. Distress 6W	.54***	—										
15. Distress 6Sp	.64***	.59***	—									
16. Distress 6Su	.59***	.55***	.54***	—								
17. Distress 7F	.51***	.59***	.60***	.62***	—							
18. Distress 7W	.45***	.49***	.50***	.59***	.65***	—						
19. Distress 7Sp	.47***	.46***	.39***	.64***	.65***	.57***	—					
20. Distress 7Su	.44***	.54***	.44***	.59***	.50***	.58***	.60***	—				
21. Distress 8F	.44***	.40***	.39***	.61***	.49***	.60***	.49***	.66***	—			
22. Distress 8W	.49***	.41***	.37***	.54***	.51***	.57***	.64***	.56***	.62***	—		
23. Distress 8Sp	.53***	.44***	.44***	.49***	.53***	.51***	.57***	.67***	.74***	.60***	—	
24. Distress 8Su	.42***	.26**	.50***	.38***	.55***	.48***	.42***	.62***	.52***	.49***	.67***	—
25. Aggression 6F	.32***	-.12	-.25*	-.10	.06	.17*	.06	.08	.19	.22*	.04	-.04
26. Aggression 6W	-.10	.40***	-.35***	-.29***	.16*	.01	.00	.19*	.06	-.04	.08	.23*
27. Aggression 6Sp	-.02	-.07	.37***	.00	.15*	.19**	.27***	.13	.07	.20**	.15	.09
28. Aggression 6Su	-.07	-.08	-.07	.47***	.26***	.16*	.14*	.15*	.21**	.10	.14	.08
29. Aggression 7F	.20*	.05	-.03	.11	.41***	-.16*	-.15**	-.26***	.17*	.17*	.17**	-.07
30. Aggression 7W	.18	.20**	.26***	.13	-.15	.42***	-.19**	-.12*	.23**	.18**	.15*	.20*
31. Aggression 7Sp	.19*	.22***	-.04	.25***	-.05	-.16**	.38***	-.17*	.11	.04	.04	.18
32. Aggression 7Su	.18	.17*	.25**	.10	-.08	-.15*	-.20*	.43***	.05	.20**	.22***	.26***
33. Aggression 8F	.08	.12	.24**	.01	.17*	.07	.13	.10	.48***	-.21***	-.30***	-.04
34. Aggression 8W	.22*	.14	-.06	.07	.09	.18*	.17*	.25***	-.27***	.46***	-.19***	-.05
35. Aggression 8Sp	.19	.15	.03	.24*	.16*	.22**	.17	.17*	-.12	-.22***	.50***	-.18*
36. Aggression 8Su	.08	.12	-.03	-.09	.11	.11	-.09	.15	-.35***	-.17*	-.19*	.39***

(Table continues)

Table continued

Variable	25	26	27	28	29	30	31	32	33	34	35
25. Aggression 6F	—										
26. Aggression 6W	.58***	—									
27. Aggression 6Sp	.47***	.46***	—								
28. Aggression 6Su	.37***	.57***	.61***	—							
29. Aggression 7F	.38***	.50***	.52***	.55***	—						
30. Aggression 7W	.48***	.41***	.55***	.40***	.55***	—					
31. Aggression 7Sp	.40***	.40***	.28***	.38***	.47***	.58***	—				
32. Aggression 7Su	.46***	.34***	.38***	.45***	.38***	.51***	.63***	—			
33. Aggression 8F	.39***	.31***	.33***	.35***	.30***	.45***	.48***	.48***	—		
34. Aggression 8W	.48***	.40***	.34***	.30***	.52***	.42***	.52***	.65***	.56***	—	
35. Aggression 8Sp	.19**	.27***	.51***	.40***	.36***	.55***	.45***	.55***	.67***	.62***	—
36. Aggression 8Su	.14	.34***	.32***	.28**	.24**	.21**	.51***	.44***	.50***	.40***	.52***

Note. Waves are listed by grade and collection period where F = fall, W = winter, SP = spring, and SU = summer.

*p < .05. **p < .01. ***p < .001.

Vita

Sarah Katherine Pittman was born on May 19, 1994 in Raleigh, North Carolina. She received her Bachelor of the Arts in Psychology with a minor in Cognitive Science from the University of North Carolina at Chapel Hill in 2016. She began her graduate study in the Clinical Psychology program at Virginia Commonwealth University in 2018. She received her Master of Science degree in Psychology from Virginia Commonwealth University, Richmond, Virginia in 2020. Sarah will complete her predoctoral clinical psychology internship at Virginia Treatment Center for Children during the 2023-2024 academic year.