Adolescent Psychological Functioning and Membership in Latent Adolescent-Parent Communication Dual Trajectory Classes

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Abstract

The primary goal of this study was to examine the relationship between adolescents' psychological functioning (as indicated by depressive symptoms) and substance use (alcohol and drug use) and membership in adolescent-parent communication trajectory subgroups in a large, diverse community sample of adolescents from the U.S. (N=1,057; 53% females; 51% Caucasian; Age: M=16.15, SD =.75). Adolescents completed questionnaires at three annual assessments. Fit indices from parallel process growth mixture models suggested three dual-trajectory classes: 1) Average communication with both parents (Average-Both); 2) Good adolescent-mother and poor adolescent-father communication (Good-Mom/Poor-Dad); and 3) Poor adolescent-mother and good adolescent-father communication (Poor-Mom/Good-Dad). The trajectory classes differed by gender. In addition, psychological functioning and substance use were differentially related to the trajectory classes.

INTRODUCTION

Many changes take place within the individual during adolescence, including pubertal development, further maturation of the brain and related advances in cognitive abilities, and the development of autonomy and identity (Smetana, Campione-Barr, & Metzger, 2006; Smith, 2016; Spear, 2000; Steinberg, 2014). These changes influence the adolescent-parent relationship, which also undergoes change during this period, as adolescents become more autonomous and spend increasingly more time with peers and less time with parents (Laursen & Collins, 2009; Smetana et al., 2006; Smith, 2016). Consistent with family systems theory (Bowen, 1974; Minuchin, 2002), as adolescence progresses, changes in the adolescent and their parents continue to influence one another and the family system as a whole.

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Contemporary theories of human development such as relational developmental systems theories (Lerner et al., 2011; Lerner & Konowitz, 2016; Lerner & Callina, 2018; Overton & Lerner, 2014), Bronfenbrenner's bioecological theory (Bronfenbrenner & Morris, 2006), and Elder's life-course theory (Elder & Shanahan, 2006) purport that development proceeds through mutually influential relations between the individual and the contexts in which the individual is embedded (Lerner et al., 2011). These theories stress that the individual continuously is "contextually situated" (Overton & Lerner, 2014). Accordingly, it is essential to consider the adolescent's contexts when considering their adjustment. Numerous studies have shown a key context during adolescence is the family and that family functioning is closely linked to adolescent psychological adjustment, including depressed mood, and substance use (Chan, Kelly, & Toumbourou, 2013; Freed, Rubenstein, Daryanani, Olino, & Alloy, 2016; Kelly et al., 2016; Russell, Simpson, Flannery, & Ohannessian, 2017).

Nevertheless, research has shown that most adolescents experience positive relationships with their parents and are able to weather the temporary instability in their relationships due to the simultaneous changes that take place in the adolescent, their parents, and the family system (Smetana et al., 2006; Smith, 2016). Given the life-long bond between adolescents and their parents, research and theory suggest that positive aspects of the adolescent-parent relationship continue through the adolescent period and that family communication remains constant, despite perturbations in the family as adolescents push for autonomy and family relationships are renegotiated (Laursen & Collins, 2009; Smetana et al., 2006). Notwithstanding, adolescence is a period of relative instability, and variation exists across families in regard to how family members cope with changes in the adolescent, parents, and the family system. Clearly, some families struggle to adapt to the dramatic changes occurring within the family during this time more than others.

Trajectories of Family Functioning during Adolescence

The developmental trajectories of general adolescent-parent relationship qualities (e.g., conflict, closeness/warmth) during adolescence have been well documented. During early adolescence, research indicates that adolescent-parent conflict tends to increase and adolescent-parent closeness tends to decrease (Fleming, Catalano, Haggerty, & Abbott, 2010; Marceau, Ram, & Susman, 2015; McGue, Elkins, Walden, & Iacono, 2005). The degree of adolescent-parent conflict and closeness remains relatively stable during middle to late adolescence, with some studies demonstrating slight decreases in adolescent-parent conflict and/or slight increases in adolescent-parent closeness (Fleming et al., 2010; Laursen & Collins, 2009; Laursen, Coy, & Collins, 1998; Parra, Oliva, & Reina, 2013; Rothenberg, Hussong, & Chassin, 2017).

However, recent research also indicates that there may be heterogeneous adolescent-parent relationship trajectories exhibited by latent subgroups of youth that are not revealed by population-level trends (Nelson, Bahrassa, Syed, & Lee, 2015; Seiffge-Krenke, Overbeek, & Vermulst, 2010; Trentacosta et al., 2011). Adolescent-parent relationship trajectories identified across these studies include: 1) moderate levels of conflict and closeness/warmth that are stable across time; 2) increasingly negative relationship quality over time (increases in conflict and/or decreases in closeness/warmth); 3) increasingly positive relationship quality over time (decreases in conflict and/or increases in closeness/warmth); and 4) high levels of either conflict or closeness/warmth that remain stable across time. Of note, these relationship qualities capture broader affective, behavioral, and interpersonal aspects of adolescent-parent relationships rather than *specifically* communication patterns between adolescents and their parents.

Adolescent-Parent Communication

Although less work specifically has focused on the adolescent-parent relationship, research has indicated that adolescent-parent communication is related to adolescent psychosocial adjustment. For example, positive, open communication between adolescents and their parents has been shown to be associated with indicators of adolescent psychological health and adjustment including positive self-esteem, empathy, and academic achievement (Enger, Howerton, & Cobbs, 1994; Heller, Robinson, Henry, & Plunkett, 2006; Masselam, Marcus, & Stunkard, 1990; Yu et al., 2006). In contrast, problems in communication between adolescents and their parents have been linked to indicators of maladjustment, including anxiety, depression, delinquency, aggressive behavior, alcohol use (including binge drinking), and drug use (Cernkovich & Giordano, 1987; Finan, Schulz, Gordon, & Ohannessian, 2015; Kafka & London, 1991; Ohannessian, 2012, 2013; Ohannessian, Flannery, Simpson, & Russell, 2016; Russell et al., 2017; Wang et al., 2013; Yu et al., 2006)

Although some studies focusing on adolescent-parent communication have been longitudinal, the nature of adolescent-parent communication *trajectories* over time remains largely unknown. One preliminary study involved a large sample of urban adolescents who were participating in the control group of a randomized controlled trial evaluating substance use prevention programs (Tobler & Komro, 2010). Adolescents were followed from the sixth through eighth grade, and several latent trajectory subgroups of parental monitoring and communication (as a combined measure) were identified, including: 1) high monitoring/communication that remained stable across time; 2) moderate initial monitoring/communication that slightly increased over time; 3) high initial monitoring/communication that decreased markedly over time; and 4) high initial monitoring/communication that increased and then subsequently decreased over time. This initial study suggests that there may be several distinct subgroups of adolescent-parent communication trajectories that may be observed during early adolescence. However, the inclusion of the parental monitoring measure as part of a combined score makes it difficult to determine whether trajectories were influenced by parental monitoring, adolescent-parent communication, or both. In addition, it is unclear as to whether the adolescent-parent communication trajectory subgroups observed would generalize to middle-to-late adolescence and/or to a non-urban community sample. It also is important to note that differences in adolescent-mother and adolescent-father communication were not considered.

Parent and Adolescent Gender Differences

The majority of research focusing on adolescents and their parents has not considered differential influences that mothers and fathers may have on adolescent adjustment due to the paucity of father data. However, according to socialization models (Holmbeck, Paikoff, & Brooks-Gunn, 1995) and research (Smetana et al., 2006; Williams & Kelly, 2005), adolescents spend more time in direct interaction with their mother than with their father. Adolescents also discuss private matters more with their mother than with their father (Larson & Richards, 1994). In addition, mothers are more likely to influence adolescent risk behaviors than fathers (Guilamo-Ramos, Jaccard, Dittus, & Bouris, 2006). As such, it may be hypothesized that adolescent–mother communication is more closely associated with adolescent psychological adjustment in comparison to adolescent–father communication. However, this hypothesis remains relatively untested due to the scarcity of father data.

Clearly, the gender of the adolescent also is important to consider. In general, research and theory have shown that girls are more enmeshed in the family and affected by family relationships more than boys during adolescence (Gore, Aseltine Jr, & Colten, 1993; Ohannessian, 2012). As such, it is not surprising that the influence of adolescent-parent communication appears to be more salient for girls than for boys. For example, Ohannessian and colleagues (Ohannessian et al., 2016) found adolescent-mother communication to predict depressed mood for girls, but not for boys. Adolescent-father communication also predicted alcohol use for girls, but not for boys. Similarly, Finan et al. (2015) found adolescent-father communication to predict later rule-breaking behavior and aggressive behavior for girls, but not for boys. Neither adolescent-mother communication nor adolescent-father communication predicted any of the internalizing behaviors or externalizing behaviors for boys in the Ohannessian et al. (2016) study or in the Finan et al. (2015) study. It also is interesting to note that adolescent-father communication only predicted externalizing behaviors for girls.

The Present Study

Although research consistently has shown that adolescent-parent communication is associated with better adolescent psychological adjustment, few studies have distinguished between adolescent-mother communication and adolescent-father communication. In addition, typical trajectories of adolescent-parent communication**,** and adolescent psychological factors at baseline that may be associated with these trajectories, have not been examined. Given limitations of the current literature, the primary goal of this study was to identify latent subgroups of adolescent-parent communication trajectories dually characterized by the parallel processes of adolescent-mother and adolescent-father communication in a large community sample of adolescent girls and boys (15–17 years), followed annually for three years. A secondary aim was to examine whether adolescents' psychological functioning (as indicated by depressive symptoms and substance use) was associated with membership in latent adolescent-parent communication trajectory subgroups, as well as growth factors (intercept, slope) within each trajectory subgroup. Given that research has shown consistent gender differences in adolescent-parent relationships (Ohannessian et al., 2016), adolescent internalizing problems (Mezulis, Funasaki, Charbonneau, & Hyde, 2010; Telzer & Fuligni, 2013), and adolescent externalizing problems (Grant et al., 2006), adolescent gender differences also were examined.

METHOD

Participants

The participants were drawn from a longitudinal study of adolescent psychological adjustment (Ohannessian, 2009; website: adolescentadjustmentproject.org). Adolescents were recruited from seven public high schools in the Mid-Atlantic region of the United States. During the spring of 2007 (Time 1), 10th and 11th grade students from participating high schools were invited to participate in the study. All participants were followed up during the spring of 2008 (Time 2) and the spring of 2009 (Time 3). Participants who completed self-reports of their demographic characteristics and who had complete survey data for communication with both their mother and their father at Time 1 were included in the present study (N = 1,057). As such, 24 participants were excluded from this study due to incomplete baseline surveys. There were no additional exclusion criteria. The mean age of participating adolescents at each time of measurement was as follows: 16.15 (SD = .75) years at Time 1, 17.18 (SD = 1.12) years at Time 2, and 18.06 (SD = 1.04) years at Time 3. At Time 1, 53% of the sample identified as female. The Time 1 racial/ethnic breakdown of the sample was as follows: 58% non-Hispanic White, 23% Black or African American, 11% Hispanic/Latino, 3% Asian, and 5% “other.”

The vast majority of adolescents (96%) reported living with at least one biological parent, with more than half of adolescents (60%) living with both biological parents. Adolescents reported their parents’ highest level of education completed as follows: less than high school for 4% of mothers and 4% of fathers; high school for 39% of mothers and 45% of fathers; two years of college for 20% of mothers and 18% of fathers; four years of college for 27% of mothers and 25% of fathers; and graduate/medical school for 10% of mothers and 8% of fathers.

Procedures

Prior to data collection, parents were mailed a consent form describing the study. Parents were instructed to contact the study staff via phone, mail, or e-mail if they did not want their adolescent to participate. Only two parents asked that their child not participate. Adolescents also were required to sign an assent form immediately prior to data collection. Forty-five of the adolescents declined participation. In total, 71% percent of the eligible students participated. Most of the non-participating students were absent on the day of data collection. Adolescents who had parental consent and provided assent were administered a self-report survey by trained research staff (all of whom were certified with human subjects training). The adolescents were reassured that all of the data collected were confidential, that participation was voluntary, and that they could withdraw from the study at any time. In addition, they were told that an active Certificate of Confidentiality from the U.S. government was in place to further protect their privacy. The survey took approximately 40 minutes to complete. Upon turning in their completed survey, participants were given a movie pass. Adolescents who were not present on the day of data collection were mailed a survey to complete at home and return to the research team. All of the participants were invited to participate again during the spring of 2008 (Time 2), and the spring of 2009 (Time 3). The same protocol was used at Time 2 and Time 3.

Measures

Demographic information.—At Time 1, a demographic questionnaire assessed participants' gender (male or female), age (years), race/ethnicity (Caucasian, African American, Hispanic or Latino, Asian, or "other"), and their parents' highest level of education completed (less than high school, high school, two years of college, four years of college, graduate or medical school).

Adolescent-parent communication.—The Parent-Adolescent Communication Scale (PACS; Barnes & Olson, 2003) was administered to the adolescents at Times 1–3 to measure communication between adolescents and parents. The 20-item PACS (see Table 1) captures two distinct dimensions of adolescent-parent communication - open communication and communication problems. Respective sample items from these subscales are "I find it easy to discuss problems with my mother/father" and "My mother/father insults me when she/he is angry with me." The response scale ranges from: 1 = *strongly disagree* to 5 = *strongly agree*. A PACS total score also may be generated by reverse coding the communication problem items and then summing them with the open communication items (range = 20 – 100). Higher PACS total scores are indicative of more open communication and fewer communication problems between adolescents and parents. Separate PACS total scores for adolescent-mother communication and adolescent-father communication were used in this study. The reliability and validity of both the adolescent-mother and adolescent-father versions of the PACS have been well established in community samples of adolescents (Barnes & Olson, 2003). In our sample, the Cronbach's α coefficients ranged from .90-.94 for the adolescent-mother PACS total score and from .90-.92 for the adolescent-father PACS total score.

Adolescent depressive symptoms.—The Center for Epidemiological Studies Depression Scale for Children (CES-DC; Weissman, Orvaschel, & Padian, 1980) assessed depressive symptoms at Time 1. The CES-DC is a 20-item self-report measure that asks participants to rate how they felt or acted during the past week. A representative item is "I felt sad." The response options range from 1 = *not at all* to 4 = *a lot*. In this study, responses were summed to generate a CES-DC total score (range = 20–80). The CES-DC is a widely used reliable and valid measure of depressive symptoms in adolescents (Garrison, Addy, Jackson, McKeown, & Waller, 1991). The Cronbach's α coefficient was .91 in our sample.

Adolescent alcohol use.—To assess alcohol consumption at Time 1, adolescents were asked to report their quantity and frequency of use. Specifically, adolescents reported *how much, on an average day,* they usually drank in the last six months (separate questions were used for beer, wine, and liquor). The response scale ranged from 0 = *none* to 9 = *more than 8 drinks*. A drink was defined as a can/bottle of beer, a glass of wine, or a drink containing liquor (1 shot = 1 ounce). To assess alcohol use frequency, adolescents were asked to report *how often* they usually had a drink in the last six months (separate questions were used for beer, wine, and liquor). To assess binge drinking frequency, adolescents were asked to report *how many times* they consumed six or more drinks (beer, wine, or liquor) in the last six months. The response scale for the alcohol use frequency and binge drinking frequency items were 0 = *never*, 1 = *a few times*, 2 = *about once a month*, 3 = *2–3 days a month*, 4 =

about once a week, 5 = *2–3 days a week*, 6 = *4–5 days a week*, and 7 = *every day*. Responses were summed across the beverage types to obtain a total score for alcohol use quantity and alcohol use frequency. The alcohol use quantity and frequency scores were multiplied to reflect an estimated total volume consumed (Sobell & Sobell, 1995), with higher scores indicating greater total alcohol consumption. The total alcohol consumption and binge drinking frequency scores were logarithm transformed because they were positively skewed.

Adolescent drug use.—At Time 1, the adolescents also were asked how frequently they had used marijuana, sedatives, stimulants, inhalants, hallucinogens, cocaine or crack, and opiates (non-medical use only) within the last six months. The response scale ranged from 0 = *never* to 7 = *every day*. A total drug use score was generated by summing the scores of the seven different types of drugs. Because the drug use score was positively skewed, the logarithmic transformation was used.

DATA ANALYSIS PLAN

All analyses were conducted with Mplus version 7.4 software (Muthen & Muthen, 1998–2015).

Descriptive Statistics

Table 2 displays the descriptive statistics for, and bivariate correlations among, continuous Time 1 study variables. For all continuous variables, skew and kurtosis were satisfactory, and no outliers were identified. Inspection of bivariate correlations among continuous measures at Time 1 suggested no problems with multicollinearity.

Parallel Process Latent Trajectory Model

An initial unconditional parallel process latent trajectory model using the structural equation framework (Bollen & Curran, 2006) was estimated to examine the growth factors for both adolescent-mother and adolescent-father communication trajectories. Gender differences in these growth factor parameters and associations among the growth factors also were evaluated using nested multiple group model comparisons. Factor loadings from the latent slope factors to the Time 1, Time 2, and Time 3 adolescent-mother and adolescent-father communication scores were set at 0, 1, and 2, respectively. Linear slope functions were evaluated. Time-specific residual correlations between adolescent-mother and adolescent-father communication scores were included in the model to account for within-time associations that were not due to each of the adolescent-parent communication trajectories. This procedure also minimized covariance between the measures that may have resulted from the use of identical questionnaires for both mothers and fathers. Covariances among all growth factors (intercept and slope factors for adolescent-mother and adolescent-father communication) were freely estimated.

Several indicators of model fit were evaluated. The chi-square test statistic examined how well each model reproduced the variance-covariance matrix, with non-significant values indicating adequate model fit. Acceptable model fit also was indicated by values of the comparative fit index (CFI) and Tucker-Lewis index (TLI) greater than .95 and values of the root mean squared error of approximation (RMSEA) less than .08, the upper limit of the RMSEA's 90% confidence interval values of less than .08, and the standardized root mean square residual (SRMR) less than .08 (Wickrama, Lee, O'Neail, & Lorenz, 2016).

Parallel Process Growth Mixture Models

The significant variability in growth parameters observed in the unconditional parallel process latent trajectory model suggested that it was appropriate to proceed with estimating parallel process growth mixture models. As such, these models were conducted to examine latent subgroups distinguished dually by adolescent-mother and adolescent-father communication trajectories. To identify the best-fitting model and most appropriate growth factor variance constraints, a series of unconditional parallel process growth mixture models were estimated with increasingly lenient constraints imposed as part of standard methodological practice (see Figure 1; Olino, Klein, Lewisnsohn, Rohde, & Seely, 2010; Wickrama et al., 2016). All sets of models estimated one through seven dual trajectory classes. All models were estimated with 500 random initial start values and 50 optimizations to avoid solutions that represented local rather than global maxima.

A schematic display of the unconditional parallel process growth mixture models (GMMs) evaluated is presented in Figure 1. The fully constrained models (GMM-1) constrained all of the growth factor variances to zero and constrained all of the associations among growth factors to zero. In the second model (GMM-2), all of the growth factor variances and all of the associations between growth factors were freely estimated; however, the variances and covariances were constrained to be equal across trajectory classes. In the third model (GMM-3), all of the growth factor variances and all of the associations among growth factors were freely estimated. All of the growth factor variance estimates were permitted to vary across classes, whereas all of the associations among growth factors were constrained to be equal across trajectory classes. In the fourth model (GMM-4), all of the growth factor variances and all of the associations among growth factors were freely estimated. All of the growth factor variance estimates were constrained to be equal across trajectory classes, whereas all of the associations among growth factors were permitted to vary across trajectory classes. Finally, in the fifth model (GMM-5), all of the growth factor variances and all of the associations among growth factors were freely estimated, and both sets of these estimates were permitted to vary across trajectory classes.

Several indicators of model fit were considered when selecting the most appropriate constraints and best fitting number of latent classes dually distinguished by adolescent-mother and adolescent-father communication trajectories. The Bayesian information criterion (BIC; Schwarz, 1978) and the consistent Akaike information criterion (cAIC; Bozdogan, 1987) were examined to evaluate relative model fit, with lower values indicating a better fitting model. In addition, the Lo-Mendell-Rubin likelihood ratio-based test (LMR-LRT) compared the absolute fit between a *k*-class model and a *k*-1 class model (Lo, Mendell, & Rubin, 2001). All estimated models were compared on these three values to identify the preferred class solution. Classification accuracy also was examined using the entropy value, which is the average of the posterior probabilities for each participant's most likely trajectory class membership. Values closer to 1.0 indicated better classification accuracy, with values of .70 or greater suggesting acceptable accuracy. Finally, the bootstrapped parametric likelihood ratio test (BLRT) was used to confirm the best fitting model (Nylund, Asparouhov, & Muthén, 2007).

Following the identification of the best-fitting model, conditional GMMs were estimated to examine adolescents' Time 1 demographic psychological characteristics as predictors of latent class membership in distinct adolescent-parent communication trajectories.

These analyses consisted of combining the unconditional GMM with a multinomial logistic regression model in a sequential three-step approach (Asparouhov & Muthen, 2014). The three-step approach protects the formation of latent GMM classes from the influence of independent variables. First, the best-fitting unconditional GMM was estimated. Second, participants were assigned to a latent class on the basis of posterior probabilities obtained from the unconditional GMM estimation (i.e., assigned to a class for which the probability of membership was the largest), creating a "most likely class" variable. The classification uncertainty rate for each latent class also was estimated at this time. Finally, in the third step, the most likely class variable was used as the primary indicator variable, and the classification uncertainty rates were fixed at the probability obtained in step two. Auxiliary variables (i.e., independent variables in this analysis) were then included in a multinomial logistic regression predicting GMM class membership using the most likely class variable as the dependent variable while accounting for classification uncertainty.

The Mplus auxiliary option was used to automate this three-step approach (Wickrama et al., 2016). The dependent variable was latent trajectory class membership, with the largest trajectory class serving as the reference class as recommended by Muthen and Muthen (1998–2015). Within-class regression analyses also were conducted utilizing the parameters from the best-fitting growth mixture model to examine the relationship between baseline adolescent psychological characteristics and individual growth factors (intercept, slope) within each latent trajectory class. Three separate models were estimated: 1) adolescent gender as an independent variable; 2) adolescent depressive symptoms and demographic covariates as independent variables; and 3) adolescent substance use (total alcohol consumption, binge drinking frequency, drug use frequency) and demographic covariates as independent variables. Demographic covariates included age, gender (for the latter models), race/ethnicity, and mean parental education (a proxy for socioeconomic status). These variables were selected as covariates because research has shown that age (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016; Vannucci & Ohannessian, 2017), gender (Deutsch & Crockett, 2016; Popovici, Homer, Fang, & French, 2012; Racz & McMahon, 2011), race/ethnicity (Johnston et al., 2016), and socioeconomic status (Kendler et al., 2014; Vannucci & Ohannessian, 2017) are associated with the primary study variables. All continuous independent variables were mean-centered.

Missing Data

Participants who reported on their demographic characteristics and communication with both their mother and father at Time 1 were included in analyses (N = 1,057). The attrition rate was 20% between baseline (Time 1) and the subsequent wave of measurement (Time 2).

There were no systematic differences between adolescents with and without missing data (*p*s > .05) with regard to gender (missing data: 51% girls; complete study data: 54% girls), race/ethnicity (missing data: 49% non-Hispanic white; complete study data: 52% non-Hispanic white), and Time 1 measures of psychological functioning, including depressive symptoms (missing data: M = 15.76, SD = 11.22; complete study data: M = 15.77, SD = 10.78), total alcohol consumption (missing data: M = 5.14, SD = 13.78; complete study data: M = 4.96, SD = 10.97), binge drinking frequency (missing data: M = 1.87, SD = 5.51; complete study data: M = 2.01, SD = 7.02), and total drug use frequency (missing data: M = 1.13, SD = 3.64; complete study data: M = 0.95, SD = 1.89). In addition, there were no significant differences between adolescents with and without missing data with regard to their adolescent-mother total communication scores or adolescent-father total communication scores at any time point (*p*s > .05).

There was a significant, small-to-moderate age difference, such that participants with any missing data were older at Time 1 than those with complete data (missing data: M = 16.71, SD = .69 years; complete study data: M = 16.46, SD = .58 years), $t(602.88) = 5.91$, $p < .001$, Cohen's $d = .39$. There also were small, yet significant, differences with regard to parental education, such that participants with any missing data reported lower levels of education completed on average than those without any missing data for both mothers (missing data: M = 3.89, SD = 1.18 years; complete study data: M = 4.09, SD = 1.13 years), $t(1{,}050) = -2.40$, $p = .017$, Cohen's $d = .17$, and fathers (missing data: M = 3.72, SD = 1.10 years; complete study data: M = 4.02, SD = 1.12 years), $t(1{,}055) = -3.78$, $p < .001$, Cohen's $d = 0.27$.

The robust full information maximum-likelihood (FIML) estimation approach was used to handle missing data with the MLR estimator in Mplus. The robust FIML approach utilizes all available data to obtain parameter estimates with robust standard errors, which enhances power to detect significant effects by preserving the sample size and minimizes potential missingness biases (Schafer & Graham, 2002). Standard errors generated by the MLR estimator are robust to non-normality and non-independence of observations (Muthen & Muthen, 1998–2015). Of note, follow-up sensitivity analyses revealed comparable results from parallel process latent trajectory and growth mixture models when including only individuals with complete data.

RESULTS

Unconditional Parallel Process Latent Trajectory Model

The unconditional parallel process latent trajectory model provided a good fit to the data, $\chi^2[4] = 5.17$, $p = .27$; CFI = 1.00; TLI = 1.00; RMSEA = .02, 90% CI = .00 - .05; SRMR = .01. Model fit significantly worsened when cross-sectional associations between the residual error terms of adolescent-mother communication and adolescent-father communication were not estimated, $\Delta\chi^2 = 30.26$, Δ df = 3, $p < .05$. These results confirmed the need to retain these time-specific residual correlations in subsequent parallel process growth mixture models.

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The intercept factors were significantly greater than zero for both adolescent-mother communication (M = 67.01, SE = .48, $p < .001$) and adolescent-father communication (M = 63.68, SE = .52, $p < .001$). There was a significant, positive correlation between both mean intercept factors ($r = .32$, $p < .001$), suggesting that higher initial levels of adolescent-mother communication were associated with higher initial levels of adolescent-father communication, with a medium effect size. The intercept factor variance was significant for both adolescent-mother communication ($\mathbf{S^2}$ = 178.43, SE = 16.87, $p < .001$) and adolescent-father communication ($\mathbf{S^2}$ = 214.28, SE = 17.77, $p < .001$), indicating the presence of substantial individual variability in adolescents' reported initial adolescent-parent communication levels.

A significant, positive linear slope factor was observed for adolescent-mother communication (M = 1.07, SE = .33, $p = .001$), suggesting average increases or improvements in adolescent-mother communication over time. However, the linear slope factor was not significant for adolescent-father communication (M = .31, SE .34, $p = .37$), suggesting an overall stable course of adolescent-father communication over time. There was a significant, positive correlation between both mean slope factors ($r = .48$, $p = .004$), indicating that increases in adolescent-mother communication (i.e., more open, fewer problems) were associated with simultaneous increases in adolescent-father communication, with a large effect size. The slope factor variance was significant for both adolescent-mother communication ($\mathbf{S^2}$ = 29.29, SE = 8.64, $p = .001$) and adolescent-father communication ($\mathbf{S^2}$ = 40.80, SE = 8.74, $p < .001$), indicating the presence of substantial individual variability in rate of change in adolescents' reported communication with their parents over time.

Reciprocal effects between intercept and slope factors also were examined to evaluate whether the initial level of adolescent-parent communication in one domain influenced the rate of change in the other domain of adolescent-parent communication. Initial levels of adolescent-mother communication were not significantly associated with the subsequent rate of change in adolescent-father communication ($b = -.07$, SE = .05, $p = .12$), suggesting that initial adolescent-mother communication did not influence growth in adolescent-father communication. However, initial levels of adolescent-father communication were significantly and negatively associated with the subsequent rate of change in adolescent-mother communication ($b = -.08$, SE = .04, $p = .03$), suggesting that better initial adolescent-father communication contributed to more attenuated improvements in adolescent-mother communication.

Unconditional Parallel Process Growth Mixture Models

Table 3 displays the fit indices derived from unconditional parallel process growth mixture models (GMM) with admissible solutions.

Model selection across GMM model types.—Inspection of the relative fit indices suggested that the BIC and cAIC were lowest for the two-class GMM-4 model and then the two-class GMM-5 model, respectively. However, the entropy of these models was low (.35-.38), suggesting poor overall classification accuracy. Of the remaining models, the BIC and cAIC values were lowest for the three-class GMM-2 model. Moreover, the entropy indicated good overall classification accuracy (.84). As such, the three-class model with variances and covariances constrained to be equal across latent classes (GMM-2) was considered the preferred model. The probability of correct class assignment for this three-class solution suggested good to excellent classification accuracy, as the average posterior probabilities for most likely class membership of each class ranged between .83 - .95. Finally, the BLRT confirmed that the three-class solution provided a superior fit compared to the two-class solution ($p < .001$).

Descriptive statistics for the preferred three-class model.—The descriptive statistics for each latent class are displayed in Table 4. In addition, as shown in Figure 2, the adolescent-parent parallel process trajectory classes identified were: 1) high initial levels of adolescent-mother communication (i.e., high open communication, few communication problems) and low initial levels of adolescent-father communication (i.e., low open communication, many communication problems), both of which remained stable over time (Good-Mom/Poor-Dad; $n = 106$; 10%); 2) low initial levels of adolescent-mother communication and high initial levels of adolescent-father communication, both of which remained stable over time (Poor-Mom/Good-Dad; $n = 77$; 7%); and 3) a "normative" class reflecting average initial levels of adolescent-mother communication and adolescent-father communication, with slight increases in adolescent-mother communication, but no growth in adolescent-father communication over time (Average-Both; $n = 874$; 83%).

It is notable that the best-fitting model suggested that the growth factor variances and covariances were equal all three classes, indicating that the primary distinguishing feature of the subgroups were initial mean levels of adolescent-mother and adolescent-father communication. All growth factor variances were statistically significant (*p*s < .001), suggesting marked individual variability in the initial level and rates of change for both adolescent-mother communication and adolescent-father communication within each class. All growth factor parameters also were significantly correlated (see Table 4). The initial levels of adolescent-mother and adolescent-father communication were strongly and positively associated ($r = .81$, $p < .001$). The associations between the initial levels of adolescent-parent communication and the subsequent rates of change in adolescent-parent communication were of a similar magnitude within and across domains (i.e., adolescent-mother, adolescent-father). Specifically, all patterns suggested that higher initial levels of adolescent-parent communication were associated with either more attenuated increases (if the respective mean slope factor was positive) or more rapid decreases (if the respective mean slope factor was negative) in adolescent-parent communication. Finally, residual correlations examining within-time associations between adolescent-mother communication and adolescent-father communication were significant at Time 2 ($r = .28$, $p < .001$), but not at Time 1 or Time 3.

Conditional Parallel Process Growth Mixture Models

Gender differences.—Adolescent girls had significantly increased odds, in comparison to boys, of being in the Good-Mom/Poor-Dad (OR = 1.87, 95% CI = 1.05 – 3.32, $p = .03$) and the Poor-Mom/Good-Dad (OR = 2.21, 95% CI = 1.19 – 4.14, $p = .01$) trajectory classes, in comparison to the Average-Both trajectory class. There were no significant gender differences with regard to the odds of being in the Good-Mom/Poor-Dad trajectory class relative to the Poor-Mom/Good-Dad trajectory class (OR = 1.18, 95% CI = .53 – 2.62, p = .68).

When examining whether gender was associated with growth factors within each latent trajectory class (Table 5), girls reported significantly better initial adolescent-mother communication than boys among those within the Good-Mom/Poor-Dad class (γ = 5.14, SE = .04, p = .04). However, gender was not associated with any other within-class intercept or slope factors (ps = .06 - .96).

Adolescent depressive symptoms.—Table 6 presents results from the multinomial logistic regression analyses examining the association between Time 1 depressive symptoms and membership in latent adolescent-parent communication trajectory classes, adjusting for age, gender, race/ethnicity, and mean parental education. Adolescents reporting higher Time 1 depressive symptoms had significantly increased odds of being in the Poor-Mom/Good-Dad trajectory class relative to the Average-Both trajectory class (OR = 1.04, 95% CI = 1.01 – 1.07, p = .02). For each additional point on the total CES-DC score at Time 1, there was a 4% increase in the odds of adolescents being in the Poor-Mom/Good-Dad trajectory class. Time 1 depressive symptoms were unrelated to membership in the Good-Mom/Poor-Dad trajectory class relative to the Average-Both trajectory class (OR = 1.01, 95% CI = .98 – 1.04, p = .58). No significant gender differences emerged in these associations (ps = .18 - .94).

As shown in Table 5, adolescents with higher baseline depressive symptoms reported significantly lower initial levels of adolescent-mother and adolescent-father communication among those in the Average-Both and Good-Mom/Poor-Dad trajectory classes (ps < .01). Among adolescents in the Poor-Mom/Good-Dad trajectory class, baseline depressive symptoms were unrelated to inter-individual differences in initial adolescent-mother and adolescent-father communication (ps > .05). In addition, higher baseline depressive symptoms were significantly associated with greater decreases in adolescent-mother communication over time within both the Good-Mom/Poor-Dad and Poor-Mom/Good-Dad trajectory classes (ps = .01). However, there was no relationship between baseline depressive symptoms and slope factors for adolescent-father communication in any trajectory class (ps > .05).

Adolescent substance use.—Table 7 presents results from the multinomial logistic regression analyses examining the association between Time 1 substance use and membership in latent adolescent-parent communication trajectory classes, adjusting for age, gender, race/ethnicity, and mean parental education. Time 1 total alcohol consumption, binge drinking frequency, and overall drug use frequency each was significantly associated with membership in the Poor-Mom/Good-Dad trajectory class relative to the Average-Both trajectory class (ps = .001 - .02). Specifically, adolescents reporting more total alcohol consumption (OR = 1.18, 95% CI = 1.04 – 1.34, p = .02) and higher frequencies of binge drinking (OR = 1.35, 95% CI = 1.14 – 1.60, p = .001) and drug use (OR = 1.30, 95% CI = 1.08 – 1.58, p = .007) at Time 1 had significantly increased odds of being in the Poor-Mom/Good-Dad trajectory class. However, Time 1 total alcohol consumption, binge drinking frequency, and overall drug use frequency were unrelated to membership in the Poor-Dad/ Good-Mom trajectory class relative to the Average-Both trajectory class (*p*s = .46 - .96). No significant gender differences emerged in these associations (*p*s = .05 - .71).

As shown in Table 5, within the Average-Both trajectory class, adolescents with higher total alcohol consumption at baseline reported lower initial levels of both adolescent-mother communication and adolescent-father communication (*p*s = .01). Higher baseline total alcohol consumption also was associated with significantly greater decreases in adolescent-mother communication over time ($p = .01$), but was unrelated to changes in adolescent-father communication ($p > .05$), within the Average-Both trajectory class. Within the Good-Mom/Poor-Dad trajectory class, higher baseline total alcohol consumption, binge drinking frequency, and drug use frequency each were associated with significantly greater decreases in adolescent-father communication over time (*p*s < .05). Within the Good-Mom/Poor-Dad trajectory class; however, baseline substance use was unrelated to adolescent-mother communication growth factors or initial levels of adolescent-father communication (*p*s > .05). Finally, within the Poor-Mom/Good-Dad trajectory class, higher baseline total alcohol consumption, binge drinking frequency, and drug use frequency each were associated with lower initial levels of adolescent-father communication and greater decreases in adolescent-father communication over time (*p*s < .01). With regard to adolescent-mother communication, higher baseline total alcohol consumption was associated with greater decreases over time ($p = .001$), whereas higher baseline binge drinking frequency and drug use frequency were associated with lower initial levels of adolescent-mother communication (*p*s < .01).

DISCUSSION

The primary purpose of this study was to identify latent subgroups of adolescent-parent communication trajectories, dually characterized by the parallel processes of adolescent-mother and adolescent-father communication, in a large community sample of adolescents followed from middle through late adolescence. Results from the unconditional parallel process latent trajectory model and the unconditional parallel process growth mixture model indicated that higher levels of adolescent-mother communication were highly associated with higher levels of adolescent-father communication at Time 1. These findings are consistent with prior research that has found adolescent-mother communication and adolescent-father communication to be positively correlated with one another (Ohannessian, 2013). Of note, a significant, positive linear slope factor was observed for adolescent-mother communication, indicating average increases in adolescent-mother communication over time. In contrast, the linear slope factor was not significant for adolescent-father communication, suggesting a stable course of adolescent-father communication over time. These findings are in line with research suggesting that adolescent-parent conflict increases and adolescent-parent warmth decreases during early adolescence, but stabilizes or even improves during middle to late adolescence (Fleming et al., 2010; Laursen & Collins, 2009; Marceau et al., 2015; McGue et al., 2005; Parra et al., 2013). Our study extends this pattern to adolescent-parent communication and underscores the importance of separately examining the adolescent-mother and adolescent-father relationship.

Significant variability in growth parameters were observed in the unconditional parallel process latent trajectory model, suggesting the presence of substantial inter-individual heterogeneity in growth factors and that it was appropriate to proceed with estimating parallel process growth mixture models. These models specifically were conducted to examine latent *subgroups* distinguished dually by adolescent-mother and adolescent-father communication trajectories. Results indicated that the three-class model with variances and covariances constrained to be equal across latent classes was the best model. This model yielded the following three distinct trajectory classes: 1) Good-Mom/Poor-Dad - high initial levels of adolescent-mother communication (i.e., high open communication, few communication problems) and low initial levels of adolescent-father communication (i.e., low open communication, many communication problems), both of which remained stable over time; 2) Poor-Mom/Good-Dad - low initial levels of adolescent-mother communication and high initial levels of adolescent-father communication, both of which remained stable over time and 3) Average-Both - average initial levels of adolescent-mother communication and adolescent-father communication, with slight increases in adolescent-mother communication but no growth in adolescent-father communication over time. Given that the best-fitting model suggested that the variance and covariance structured were equal across subgroups, the primary distinguishing feature of latent trajectory classes may be predominantly based on initial mean levels and not differences in variance or covariance structures.

Overall, findings suggest that adolescents fall into distinctive subgroups based on initial mean levels of communication with their mother and father, and that their degree of communication may remain stable throughout middle-to-late adolescence. One exception is adolescents in the normative Average-Both trajectory class, who experienced improvement in communication with their mother over time. These findings are consistent with prior work on family functioning indicating that the degree of adolescent-parent conflict and closeness remains largely stable during this developmental period (Fleming et al., 2010; Laursen & Collins, 2009; Laursen, Coy, & Collins, 1998; Parra, Oliva, & Reina, 2013; Rothenberg, Hussong, & Chassin, 2017). Although growth mixture modeling accounted for much inter-individual heterogeneity in adolescent-parent communication trajectories, there nonetheless remained significant variances and covariances within each trajectory class. Specifically, findings suggested that there may be a comparable degree of inter-individual heterogeneity across trajectory subgroups with regard to adolescents' initial level of parent-adolescent communication and their subsequent changes over time for both mothers and fathers. Moreover, growth factors within and between adolescent-parent communication were significantly related to a similar degree across subgroups. Existing developmental theories do not currently address the degree of inter-individual heterogeneity expected, so it will be important in future studies to replicate these findings and examine additional variables that may account for additional within-class heterogeneity in growth factors.

Of note, findings from our study of middle-late adolescents are consistent with Tobler and Komro's (2010) examination of trajectories of adolescent-parent communication during early adolescence (6^{th} - 8^{th} grade). In both the Tobler and Komro (2010) study and our study, trajectories of high adolescent-parent communication that remained stable over time and average adolescent-parent communication that remained stable over time were observed.

However, it is difficult to further compare the studies because adolescent-parent communication was combined with parental monitoring in the Tobler and Komro (2010) study. Moreover, a distinction was not made between adolescent-mother communication and adolescent-father communication. In addition, the adolescents in Tobler and Komro's study participated in a randomized controlled trial focusing on substance use prevention and were from an urban area. Nevertheless, results from the present study extend Tobler and Komro's findings to older adolescents. Our community based study validates their initial findings and further contributes to the literature by separately examining the adolescent-mother and adolescent-father relationship. The relatively stable trajectories observed to date throughout adolescence in these initial studies also are consistent with the tenets of Fitzpatrick and colleagues' family communication model (Fitzpatrick & Ritchie, 1994; Koerner & Fitzpatrick, 2004), which suggests that family members tend to develop fairly predictable patterns of communication with each other. Yet, findings from the current study further suggest that there is a large degree of inter-individual variability in the initial level of adolescent-parent communication and whether adolescent-parent communication changes over time.

Analyses also were conducted to examine whether adolescent gender was associated with latent trajectory classes, as well as growth factors within each trajectory class. Findings indicated that adolescent girls had significantly increased odds, in comparison to boys, of being in the Good-Mom/Poor-Dad and the Poor-Mom/Good-Dad trajectory classes in comparison to the Average-Both trajectory class. Boys were more likely to be in the Average-Both trajectory class. In essence, girls were more likely to be in trajectory classes characterized by very poor or very good communication with their parents in comparison to boys. Furthermore, girls in the Good-Mom/Poor-Dad trajectory class had significantly higher initial levels of adolescent-mother communication than boys. Within families in which adolescents have particularly good communication with their mother but poor communication with their father, girls may be especially likely to go to their mothers for support and engage in warm, open discussions relative to boys. Taken together, these findings are in line with research suggesting that girls may be more closely tied to the family and influenced by family dynamics (e.g., conflict, disruptions) in comparison to boys during adolescence (Davies & Lindsay, 2004; Unger, Brown, Tressel, & McLeod, 2000). Findings from this study also are consistent with recent research suggesting that adolescent-parent communication may be more salient for girls than for boys during adolescence. For example, Ohannessian and colleagues (Ohannessian et al., 2016) found adolescent-mother communication to predict depressed mood for girls, but not for boys. Adolescent-father communication also predicted alcohol use for girls, but not for boys. Similarly, Finan et al. (2015) found adolescent-father communication to predict later rule-breaking behavior and aggressive behavior for girls, but not for boys. Neither adolescent-mother communication nor adolescent-father communication predicted any of the internalizing behaviors or externalizing behaviors for boys in the Ohannessian et al. (2016) study or in the Finan et al. (2015) study.

Given that relational developmental systems theories (Lerner et al., 2011; Lerner & Konowitz, 2016; Overton & Lerner, 2014) and bioecological theory (Bronfenbrenner & Morris, 2006) underscore the importance of the interplay between the individual and the context in development and psychological adjustment, an additional goal of this study was to examine whether adolescents' psychological functioning (internalizing and externalizing problems) was associated with membership in latent adolescent-parent communication trajectory classes and within-class growth factors. Results indicated that adolescents' with higher baseline depressive symptoms reported lower initial levels of adolescent-mother communication and adolescent-father communication across all trajectory classes. These findings make sense given that social withdrawal, irritability, and inattention are common components of depression (Allen et al., 2006), which may adversely impact communication with others, including parents. Depression also is characterized by a negative cognitive style (Kindt, Scholte, Schuck, Kleinjan, & Janssens, 2015), which also may negatively influence adolescent-parent communication.

Of note, the findings also suggest that adolescent depressive symptoms may influence adolescent-mother communication adversely to a greater degree than adolescent-father communication. Adolescents reporting higher depressive symptoms at Time 1 had significantly increased odds of being in the Poor-Mom/Good-Dad trajectory class relative to the Average-Both trajectory class. However, depressive symptoms were not related to membership in the Poor-Dad/Good-Mom trajectory class. These findings suggest that adolescent depressive symptoms are associated with a stable course of problematic communication with mothers, but not with fathers. Furthermore, for adolescents in the Good-Mom/Poor-Dad and Poor-Mom/Good-Dad trajectory classes, higher baseline depressive symptoms were related to more accelerated declines in *only* adolescent-mother communication over time. Taken together, these findings are consistent with socialization models (Holmbeck et al., 1995) and research indicating that adolescent depressive symptoms may be more closely related to problems in the adolescent-mother relationship than in the adolescent-father relationship (Ohannessian, 2012; Ohannessian et al., 2016). As noted previously, mothers play a relatively more central role than do fathers in their child's life. From the start, the role of the mother is to provide a sense of security and to provide reassurance when their child is in distress (Grossman et al., 2002). Research also has shown that adolescents spend more time in direct interaction with their mother than with their father (Smetana et al., 2006; Williams & Kelly, 2005). Adolescents spend more time talking about private matters with their mother than with their father (Larson & Richards, 1994). Moreover, mothers are more likely than fathers to communicate with their adolescents about their adolescents' social life, school, and problems (Finley, Mira, & Schwartz, 2008; Hawkins, Amato, & King, 2006). Research also has shown that adolescent risk behaviors are more closely linked to the adolescent-mother relationship than the adolescent-father relationship (Guilamo-Ramos et al., 2006).

When considering the impact of substance use, adolescents reporting higher total alcohol consumption, binge drinking frequency, and overall drug use frequency at Time 1 were more likely to be in the Poor-Mom/Good-Dad trajectory class relative to the Average-Both trajectory class. Notably, Time 1 substance use was not related to membership in the Poor-Dad/Good-Mom trajectory class relative to the Average-Both trajectory class. In addition, higher total alcohol consumption, binge drinking frequency, and drug use frequency at baseline were associated with more accelerated declines in adolescent-father communication among adolescents in the Poor-Mom/Good-Dad and Poor-Dad/Good-Mom trajectory classes. These findings suggest that adolescent substance use may be linked to a stable course of poor communication with mothers, as well as decreases in communication with fathers. Adolescent substance use may negatively influence communication with others, especially if it is linked to depression, which some studies have found (Russell et al., 2017; Skogen, Knudsen, Hysing, Wold, & Sivertsen, 2016). Consistent with family systems theory (Bowen, 1974; Cox & Paley, 2003), adolescent substance use ultimately influences the entire family system, including interactions with parents.

Although this study contributes to the literature in many respects, caveats should be noted. Given that the sample was drawn from the Mid-Atlantic region of the United States, the participants might not be representative of the broader population. Therefore, caution should be taken in generalizing the findings to adolescents residing in other areas of the United States. Also, although the overall sample size was large ($N = 1,057$), some of the trajectory classes included a relatively small number of adolescents, which may have resulted in less precision in the within class trajectory estimates. In addition, the study relied on self-report data. However, research has indicated that adolescents are accurate reporters of their own behaviors (Deković et al., 2006). Nonetheless, it would be informative for future studies to replicate the study findings, including the trajectory classes observed, using other types of methodology. In addition, it would be important for future research to examine whether the trajectory classes of adolescent-parent communication observed in this study predict later adolescent adjustment.

Clearly, growth mixture modeling represents a strength of this study because it provided an empirically driven method to identify meaningful subgroups of adolescents who exhibited distinct parallel trajectories of communication patterns with their mothers and fathers, which were previously masked when only overall sample trajectories were considered. However, admissible solutions could not be found for growth mixture models specifying four or more classes that also freely estimated between-class differences in growth factor variances and covariances. It is possible that this limitation may have influenced the selection of the best fitting solution. Yet, it is notable that all models specifying up to three classes that freely estimated between-class differences in growth factor variances and covariances had low entropy values, suggesting poor classification accuracy. By contrast, growth mixture models constraining growth factor variances and covariances to be equal across classes had high entropy values, suggesting good classification accuracy. Therefore, the best fitting solution was determined to be the three-class model with these parameters.

In sum, results from this study yielded the following three dual-trajectory classes of adolescent-parent communication: Good-Mom/Poor-Dad, Poor-Mom/Good-Dad, and Average-Both. Notably, girls were more likely than boys to be in the Good-Mom/Poor-Dad and Poor-Mom/Good-Dad trajectory classes. Findings also indicated that initial adolescent psychological adjustment (depressive symptoms, total alcohol consumption, binge drinking frequency, and drug use frequency) consistently was associated with membership in the Poor-Mom/Good-Dad trajectory class, but not in the Poor-Dad/Good-Mom trajectory class. Importantly, adolescent depressive symptoms and substance use were differentially related to changes in adolescent-mother and adolescent-father communication among adolescents in the Poor-Mom/Good-Dad and Poor-Dad/Good-Mom trajectory classes. These findings provide novel information relating to the developmental course of adolescent-parent communication in a diverse community sample adolescent girls and boys. In addition, they contribute to the extant literature by extending the examination of adolescent-parent communication trajectories into middle and late adolescence. Moreover, findings from this study underscore the importance of systematically considering both the gender of the adolescent and the gender of the parent in research focusing on adolescents and their families. Given the paucity of research that has included fathers, findings from this study mandate that future studies examining adolescent psychosocial adjustment include fathers as well as mothers. Notably, findings from this study also have implications for prevention and intervention. Clinicians working with families of adolescents should be mindful that the adolescent's psychological functioning and substance use may impact the adolescent-parent relationship, including their communication with one another, over time**.** Nonetheless, it is important to keep in mind that the majority of adolescents were classified in the Average-Both class, a class characterized by average levels of adolescent-parent communication and lower levels of depressive symptoms and substance use. As such, overall, findings from this study concur with prior research (Cicchetti & Rogosch, 2002; Gollner et al., 2017) indicating that although adolescents face many changes and challenges, including changes in relationships within the family, most adolescents progress through adolescence relatively unscathed.

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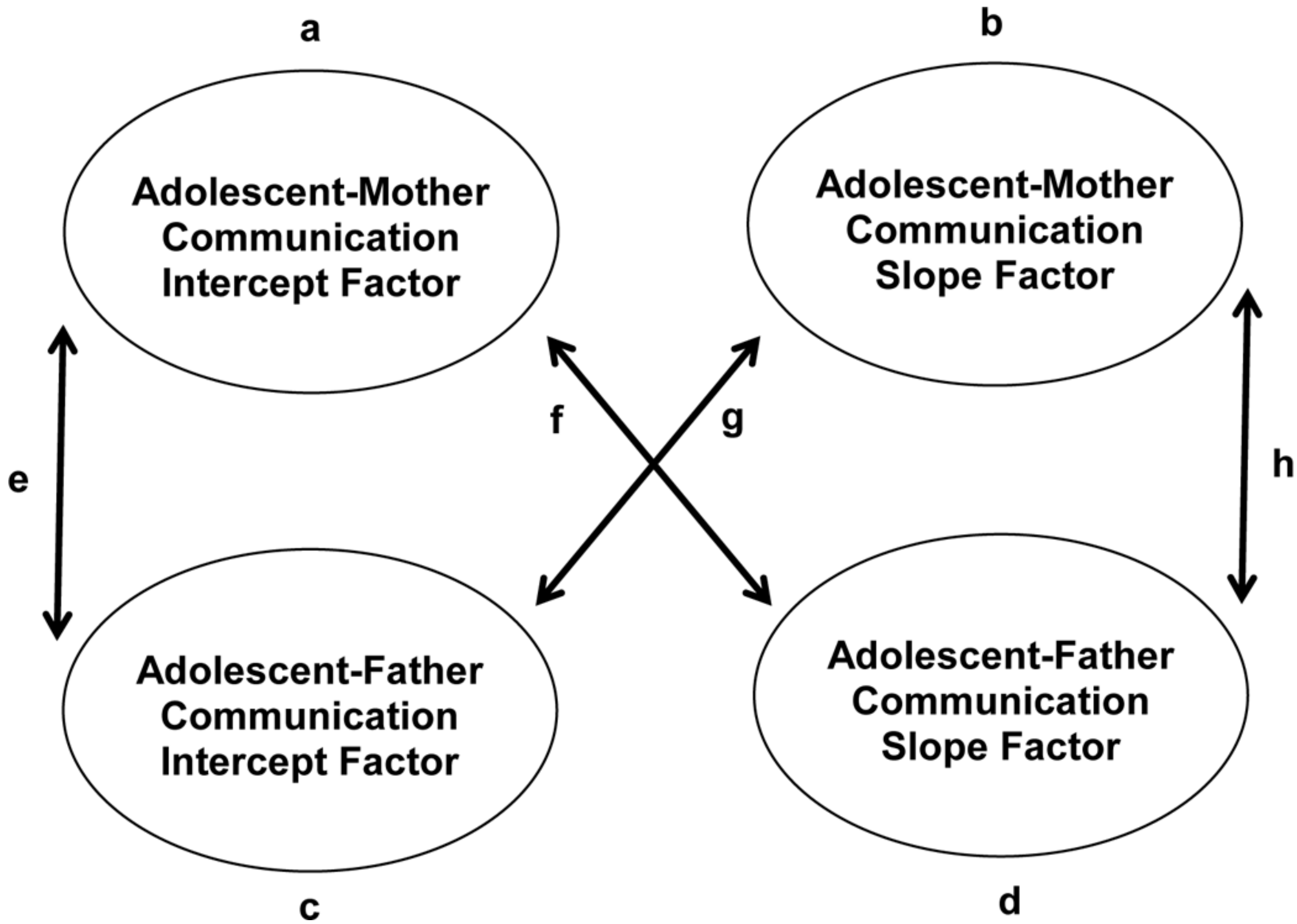

Figure 1. Schematic Display of Models Tested in Parallel Process Growth Mixture Models

Notes: Only the latent growth parameters are displayed here for ease of presentation. Labels a-d represent growth factor parameter variance estimates. Labels e-h represent growth factor parameter covariance estimates. Five different unconditional parallel process growth mixture models (GMM) were estimated that differed in their patterns of constraints placed upon these parameters. GMM-1 constrained parameters a-h to be zero across trajectory classes. GMM-2 freely estimated parameters a-h, but these parameters were constrained to be equal across classes. GMM-3 freely estimated parameters a-h; however, parameters a-d were allowed to vary across classes, whereas parameters e-h were constrained to be equal across classes. GMM-4 freely estimated parameters a-h; however, parameters a-d were constrained to be equal across classes, whereas parameters e-h were allowed to vary across classes. GMM-5 freely estimated parameters a-h and permitted each parameter to vary across classes.

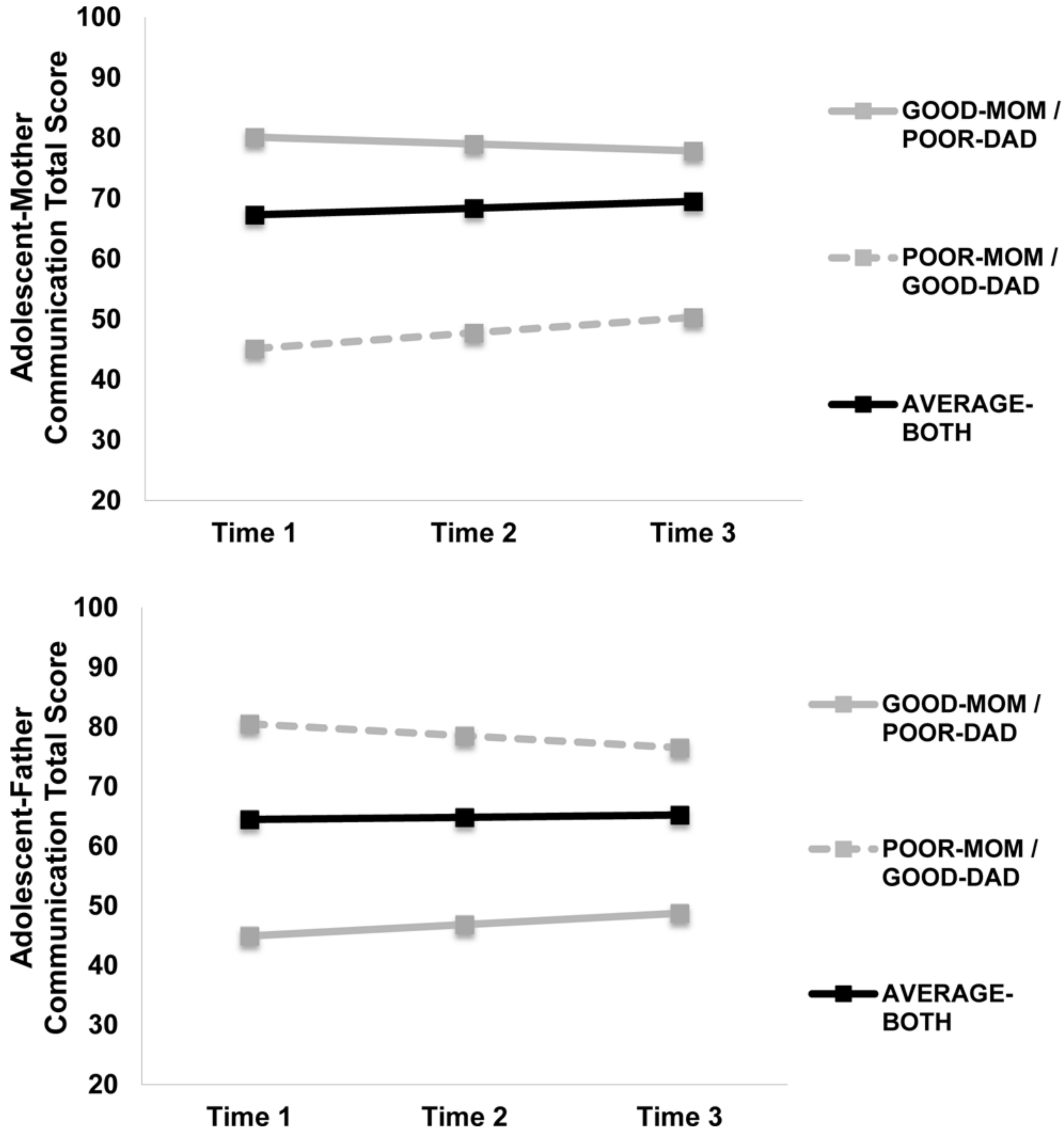

Figure 2. Estimated Course Trajectories of Adolescent-Mother Communication (Top) and Adolescent-Father Communication (Bottom) from Growth Factors of the Best-Fitting Unconditional Parallel Process Growth Mixture Model

Notes: Lines with the same color and markers across individual plots reflect the same latent class.

Table 1.

Parent-Adolescent Communication Scale

	Strongly Disagree	Moderately Disagree	Neither Agree Nor Disagree	Moderately Agree	Strongly Agree
1. I can discuss my beliefs with my mother/father without feeling restrained or embarrassed.	1	2	3	4	5
2. Sometimes I have trouble believing everything my mother/father tells me.	1	2	3	4	5
3. My mother/father is always a good listener.	1	2	3	4	5
4. I am sometimes afraid to ask my mother/father for what I want.	1	2	3	4	5
5. My mother/father has a tendency to say things to me which would be better left unsaid.	1	2	3	4	5
6. My mother/father can tell how I'm feeling without asking.	1	2	3	4	5
7. I am very satisfied with how my mother/father and I talk together.	1	2	3	4	5
8. If I were in trouble, I could tell my mother/father.	1	2	3	4	5
9. I openly show affection to my mother/father.	1	2	3	4	5
10. When we are having a problem, I often give my mother/father the silent treatment.	1	2	3	4	5
11. I am careful about what I say to my mother/father.	1	2	3	4	5
12. When talking to my mother/father, I have a tendency to say things that would be better left unsaid.	1	2	3	4	5
13. When I ask questions, I get honest answers from my mother/father.	1	2	3	4	5
14. My mother/father tries to understand my point of view.	1	2	3	4	5
15. There are topics I avoid discussing with my mother/father.	1	2	3	4	5
16. I find it easy to discuss problems with my mother/father.	1	2	3	4	5
17. It is very easy for me to express all my true feelings to my mother/father.	1	2	3	4	5
18. My mother/father nags/bothers me.	1	2	3	4	5
19. My mother/father insults me when she is angry with me.	1	2	3	4	5
20. I don't think I can tell my mother/father how I really feel about some things.	1	2	3	4	5

Table 2

Descriptive Statistics of and Correlations Among Continuous Baseline Study Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	M (SD)
1. Age	--									16.64 (0.67)
2. Maternal Education	−.07*	--								3.95 (1.17)
3. Paternal Education	−.06	.50***	--							3.81 (1.11)
4. Adolescent-Mother Communication	−.01	.04	.07	--						67.07 (15.30)
5. Adolescent-Father Communication	−.02	.08*	.13***	.26***	--					63.95 (16.20)
6. Depressive Symptoms	.12***	−.09**	−.06	−.36***	−.28***	--				15.77 (11.07)
7. Total Alcohol Consumption	.10**	−.05	−.01	−.08*	−.02	.06	--			−0.94 (2.13)
8. Binge Drinking Frequency	.05	−.04	.02	−.13***	.01	.06	.73***	--		−1.58 (1.60)
9. Total Drug Use Frequency	.07*	−.06	−.06	−.11***	−.02	.08*	.52***	.60***	--	−1.69 (1.42)

Note. Total alcohol consumption, binge drinking frequency, total drug use frequency, mother problem drinking, and father problem drinking raw scores were logarithm-transformed to achieve a normal distribution.

*$p < .05$;

**$p < .01$;

***$p < .001$.

Table 3

Fit Indices of Unconditional Parallel Process Growth Mixture Models with Admissible Solutions

Model Set	Classes	LL	Parameters	BIC	cAIC	LMR-LRT	Entropy
GMM-1	1	−16402.23	13	32894.99	32907.99	--	1.00
	2	−16208.15	18	32541.64	32559.64	377.33 ***	.59
	3	−16072.11	23	32304.37	32327.37	264.49 ***	.72
	4	−15922.05	28	32039.07	32067.07	291.74 **	.73
	5	−15840.94	33	31911.67	31944.67	157.69 **	.74
	6	−15807.79	38	31880.18	31918.18	64.46	.67
	7	−15786.47	43	31872.36	31915.36	41.44	.70
GMM-2	1	−15848.12	23	31856.39	31879.39	--	1.00
	2	−15827.43	28	31849.83	31877.83	40.22 *	.89
	3	−15785.66	33	31801.10	31834.10	81.21 **	.84
	4	−15768.65	38	31801.90	31839.90	36.95 *	.86
	5	−15751.26	43	31801.94	31844.94	33.70	.84
	6	−15736.74	48	31807.71	31855.71	39.33	.74
	7	−15719.95	53	31808.94	31861.94	36.53	.76
GMM-3	1	−15848.12	23	31856.39	31879.39	--	1.00
	2	−15798.96	32	31820.75	31852.75	96.80	.79
	3	−15751.82	41	31789.13	31830.13	92.81	.56
	4	−15702.54	50	31753.23	31803.23	97.02	.57
GMM-4	1	−15849.23	22	31851.65	31873.65	--	1.00
	2	−15739.46	28	31673.89	31701.89	216.42 ***	.35
	3	−15714.01	42	31720.47	31762.47	50.19	.46
GMM-5	1	−15849.23	22	31851.65	31873.65	--	1.00
	2	−15727.64	36	31705.96	31741.96	240.71 ***	.38
	3	−15684.32	50	31716.80	31766.80	85.76	.45

Notes. BIC = Bayesian Information Criterion; cAIC = Consistent Akaike Information Criterion; LL = Log-likelihood; LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test; Lower BIC and cAIC values indicated better model fit. LMR-LRT p values < .05 indicated that the k-class solution was a superior fit compared to a k-1 class solution. Entropy values > .70 indicate an acceptable level of overall classification accuracy. GMM-1 constrained all growth factor variance and covariance parameter estimates to be zero across trajectory classes. GMM-2 freely estimated all growth factor variance and covariance parameters, but these parameters were constrained to be equal across classes. GMM-3 freely estimated all growth factor variance and covariance parameters; however, growth factor variances were allowed to vary across classes, whereas growth factor covariance estimates were constrained to be equal across classes. GMM-4 freely estimated all growth factor variance and covariance parameters; however, growth factor variance estimates were constrained to be equal across classes, whereas growth factor covariance estimates were allowed to vary across classes. GMM-5 freely estimated all growth factor variance and covariance parameters and permitted each parameter to vary across classes.

*$p < .05$

**$p < .01$

***$p < .001$.

Table 4

Descriptive Statistics and Within-Class Associations Between Growth Factors for the Best-Fitting Three-Class Solution from Unconditional Parallel Process Growth Mixture Models

		Adolescent-Mother Communication				Adolescent-Father Communication			
		Intercept		Slope		Intercept		Slope	
		M	***SE***	***M***	***SE***	***M***	***SE***	***M***	***SE***
M	Class 1 (n = 106; 10%)	80.17***	1.65	−1.31	1.16	44.91***	1.46	1.90	2.00
	Class 2 (n = 77; 7%)	45.18***	1.95	2.58	2.04	80.47***	1.73	−1.99	1.30
	Class 3 (n = 874; 83%)	67.32***	0.52	1.10**	0.37	64.44***	0.62	0.39	0.42
Variance (S^2)		132.36***	15.09	33.91***	8.29	162.45***	16.79	40.67***	8.65
		Correlations Among Growth Factor Parameters							
Adolescent-Mother Communication	Intercept	--							
	Slope	−.42***		--					
Adolescent-Father Communication	Intercept	.81***		−.35***		--			
	Slope	−.29***		.60***		−.40***		--	

*$p < .05$;

**$p < .01$

***$p < .001$.

Table 5

Unstandardized Parameter Estimates for Associations between Baseline Psychological Characteristics and Within-Class Latent Growth Factors

	Adolescent-Mother Communication						Adolescent-Father Communication					
	Intercept Factor			Linear Slope Factor			Intercept Factor			Linear Slope Factor		
Predictor	γ	*SE*	*p* value	γ	*SE*	*p* value	Γ	*SE*	*p* value	γ	*SE*	*p* value
Average-Botd Trajectory Class (n = 874)												
Female	0.74	1.02	.47	0.16	0.72	.83	−1.47	1.10	.18	−1.43	0.75	.06
Depressive Symptoms	−0.48	0.07	< .001	0.07	0.05	.12	−0.62	0.06	< .001	−0.08	0.05	.06
Total Alcohol Consumption	−1.12	0.43	.01	−0.60	0.24	.01	−0.78	0.32	.01	−0.07	0.21	.74
Binge Drinking Frequency	−0.49	0.34	.15	−0.44	0.24	.06	−0.43	0.45	.33	0.02	0.29	.95
Drug Use Frequency	−0.47	0.44	.29	0.57	0.48	.23	−0.66	0.47	.16	0.07	0.41	.87
Good-Mom/Poor-Dad Trajectory Class (n = 106) [a]												
Female	5.14	2.40	.04	−0.70	2.02	.73	0.72	2.66	.79	−5.56	3.17	.08
Depressive Symptoms	−1.24	0.26	< .001	0.62	0.24	.01	−0.62	0.20	.002	−0.14	0.14	.32
Total Alcohol Consumption	−1.59	1.62	.27	0.47	0.76	.64	−1.40	1.29	.28	−0.93	0.47	.04
Binge Drinking Frequency	−1.43	2.31	.54	1.44	1.66	.39	−2.45	1.41	.08	−0.74	0.12	< .001
Drug Use Frequency	−1.21	1.92	.27	0.21	1.45	.93	−0.96	0.51	.06	−0.66	0.21	.01
Poor-Mom/Good-Dad Trajectory Class (n = 77) [b]												
Female	−2.52	3.49	.47	−4.35	3.63	.23	0.17	3.50	.96	0.61	2.54	.81
Depressive Symptoms	0.14	0.14	.30	−0.80	0.30	.01	−0.54	0.36	.13	−0.11	0.33	.75
Total Alcohol Consumption	−0.79	1.24	.72	−0.74	0.17	.001	−0.69	0.19	< .001	0.75	0.22	.001
Binge Drinking Frequency	−3.46	1.14	.002	−1.12	1.05	.25	−0.56	0.20	.004	0.81	0.11	< .001
Drug Use Frequency	−2.94	0.74	< .001	−0.58	1.06	.58	−1.91	0.12	< .001	0.74	0.19	.001

Note. Analyses for gender, depressive symptoms, and substance use were conducted in separate growth mixture models. Gender, age, non-Hispanic white status, and parental education were included as covariates in models examining psychological characteristics as predictors.

[a]The mean slope factor of adolescent-mother communication is decreasing, and therefore positive values of the parameter estimates for this slope factor indicate significantly greater decreases in adolescent-mother communication.

[b]The mean slope factor of adolescent-father communication is decreasing, and therefore positive values of the parameter estimates for this slope factor indicate significant greater decreases in adolescent-father communication.

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Table 6

Associations Between Baseline Depressive Symptoms and Membership in Latent Adolescent-Parent Communication Trajectories

	Good-Mom/Poor-Dad (*n* = 106)		**Poor-Mom/Good-Dad (*n* = 77)**	
Predictor	**OR (95% CI)**	***p* value**	**OR (95% CI)**	***p* value**
Age	1.22 (0.73 – 2.02)	.45	1.07 (0.69 – 1.64)	.77
Female	1.42 (0.68 – 2.94)	.35	1.74 (0.81 – 3.76)	.16
Non-Hispanic White	1.13 (0.57 – 2.23)	.73	1.10 (0.50 – 2.42)	.81
Parental Education	1.15 (0.85 – 1.55)	.37	1.41 (0.99 – 2.03)	.06
Depressive Symptoms	1.01 (0.98 – 1.04)	.58	1.04 (1.01 – 1.07)	.02

Note. The Average-Both trajectory (n = 874) served as the reference class for all analyses

Table 7

Associations Between Baseline Substance Use and Membership in Latent Adolescent-Parent Communication Trajectories

	Good-Mom/Poor-Dad (*n* = 106)		Poor-Mom/Good-Dad (*n* = 77)	
Predictor	**OR (95% CI)**	***p* value**	**OR (95% CI)**	***p* value**
Age	1.39 (0.81 – 2.39)	.23	0.99 (0.60 – 1.63)	.97
Female	2.03 (1.00 – 4.14)	.05	2.12 (0.91 – 4.91)	.08
Non-Hispanic White	1.91 (0.94 – 3.90)	.07	0.94 (0.43 – 2.06)	.88
Parental Education	1.05 (0.76 – 1.45)	.76	1.34 (0.92 – 1.93)	.13
Total Alcohol Consumption	1.00 (0.86 – 1.17)	.96	1.18 (1.04 – 1.34)	.02
Binge Drinking Frequency	0.99 (0.80 – 1.22)	.89	1.35 (1.14 – 1.60)	.001
Drug Use Frequency	0.91 (0.70 – 1.18)	.46	1.30 (1.08 – 1.58)	.007

Note. The Average-Both trajectory (n = 874) served as the reference class for all analyses.