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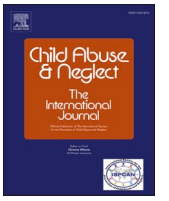

The effects of childhood maltreatment and social support on the trajectories of depressive symptoms from adolescence to young adulthood

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ABSTRACT

Background: Depression is one of the most common mental health concerns among adolescents and young adults. Childhood maltreatment is a particularly potent risk factor for the subsequent development of depressive symptoms. Meanwhile, social support has been identified as a robust protective factor against depressive symptoms. However, limited research has investigated the effects of childhood maltreatment and social support on the trajectories of depressive symptoms from adolescence to young adulthood.

Objective: The present study aimed to explore trajectories of depressive symptoms from adolescence to young adulthood as well as identify childhood maltreatment as a potential risk factor and social support as a protective factor to depressive symptoms over time.

Methods: We conducted growth curve modeling using public-use data from Add Health. Main variables (childhood maltreatment, social support, depressive symptoms from Wave I to Wave IV) and control variables (e.g., gender, race, poverty) were included in the analysis.

Results: Depressive symptoms demonstrated a quadratic pattern, with a decline from adolescence to emerging adulthood, and a slight increase in young adulthood. Childhood maltreatment was only significantly associated with the initial level of depressive symptoms but not the trajectories of depressive symptoms. Social support was not only associated with the initial level of depressive symptoms, but also the changes of depressive symptoms over time.

Conclusion: The present study provides an avenue towards untangling potential factors contributing to the heterogeneity of depressive symptoms. Identifying risk and protective factors with varying trajectories of depressive symptoms will potentially improve related treatments and interventions.

1. Introduction

Depression is one of the most common mental health concerns, as it is the leading cause of illness and disability among adolescents globally (World Health Organization, 2021). Prevalence of depression among adolescents in the USA increased from 8.1% in 2009 to 15.8% in 2019 (Daly, 2022). Adolescents experience a turbulent transitional period with heightened stress involving physical, neural,

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psychological, and social changes (Deng et al., 2019; Gilmore & Meersand, 2019). These drastic changes and adaptations during the developmental stage increase adolescents' vulnerability for developing depressive symptoms (Ellis et al., 2017). Early onset of depressive symptoms during adolescence tends to persist into adulthood and forecasts adverse psychosocial outcomes throughout life (Clayborne et al., 2019; Shorey et al., 2022). However, there has not been research yet to fully understand the dynamics of trajectories of depressive symptoms from adolescence to young adulthood. Longitudinal studies investigating the trajectories of depressive symptoms provide an avenue towards untangling potential factors contributing to the heterogeneity of depressive symptoms.

Childhood maltreatment has been found to increase the risk for depressive symptoms over the course of life (Bayly et al., 2022; Humphreys et al., 2020; Nelson et al., 2017). A growing body of research has also identified social support as one of the critical protective factors preventing the development of depressive symptoms (Bayly et al., 2022; Dion et al., 2016; Gregory et al., 2020). While the association between specific types of childhood maltreatment, social support, and depressive symptoms are well established (Dion et al., 2016; Rueger et al., 2016), there is a dearth of research examining how the associations among cumulative childhood maltreatment, social support, and depressive symptoms changes across the different developmental stages. Because childhood maltreatment survivors are more likely to experience more than one type of maltreatment (Nelson et al., 2017) and receive various sources of social support (Pettit et al., 2011), it is important to investigate how these multiple factors influence the growth trajectories of the depressive symptoms over time. Given this importance, the present study aimed to build on previous research by exploring trajectories of depressive symptoms from adolescence to young adulthood, as well as identifying childhood maltreatment as a potential risk factor and social support as a potential protective factor that could inform prevention and improve treatment of depression across different developmental stages.

1.1. Trajectories of depressive symptoms

Previous research has demonstrated divergent long-term trajectories of depressive symptoms across studies due to different sample sizes, developmental stages, etiological processes, and methodologies (Essau et al., 2020; Musliner et al., 2016; Schubert et al., 2017). Evidence suggests that there exists a higher heterogeneity in trajectories of depressive symptoms, revealing that the trajectory is nonlinear rather than linear. It has been well documented that depressive symptoms tend to increase during early to mid-adolescence and then decline in late adolescence to emerging adulthood (age 18–25) (Dion et al., 2016; Ge et al., 2006; Kwong et al., 2019).

Given that depressive symptoms are prevalent at every stage of life, it is particularly important to explore the trajectory of depressive symptoms across multiple transition periods. For example, in a recent study exploring the developmental trajectories of depressive from adolescence (aged 14–18) to young adulthood (aged 28–33) from a sample of 816 participants, Essau et al. (2020) reported that there were diverse trajectories of depressive symptoms, although most participants (78.8%) reported consistent low symptoms over time. Furthermore, when examining trajectories of depressive symptoms over 15 years from a nationally representative sample of adolescents and young adults, Elovainio et al. (2012) found that the depressive symptoms decreased from adolescence to emerging adulthood and slightly increased to later adulthood (age 33–50).

Although the aforementioned studies shed light on diverse trajectories of depressive symptoms from adolescence to adulthood, the conclusions that can be drawn from them are limited. More research exploring trajectories of depressive symptoms from adolescence to later adulthood would enable researchers to identify potential interventions or preventions for different stages of life. The current study sought to build on this body of research by estimating trajectories of depressive symptoms from adolescence to young adulthood.

1.2. The impact of childhood maltreatment on trajectories of depressive symptoms

Trajectories of depressive symptoms are dynamic and heterogeneous (Schubert et al., 2017), and a number of risk factors can influence these trajectories. Childhood maltreatment is a particularly potent risk factor for the subsequent development of depression in adulthood (Humphreys et al., 2020). A recent meta-analysis study revealed that 45.49% of individuals indicated expressing depression from childhood maltreatment and 19.13% reported more than one type of childhood maltreatment (Nelson et al., 2017). Individuals with a history of childhood maltreatment are more than twice as likely as those without a history of childhood maltreatment to develop recurrent or persistent depressive symptoms (Nanni et al., 2012; Nelson et al., 2017).

Although childhood maltreatment has been found to be a risk factor that elevates an individual's vulnerability to heightened depressive symptoms for both adolescents and young adults (Barboza, 2020), limited research has investigated the effect of childhood maltreatment on the trajectories of depressive symptoms over long time spans. Additionally, childhood maltreatment includes a range of distinct adverse experiences that often co-occur (Brodbeck et al., 2018) and individuals exposed to any type of child maltreatment are more likely to develop depressive symptoms (Gardner et al., 2019). Thus, it is pivotal to address a broader range of childhood maltreatment experiences and their cumulative effect on depressive symptoms. For example, in a 10-year longitudinal study of 605 adolescents, Dion et al. (2016) conducted multilevel growth modeling and found that participants who experienced childhood maltreatment had higher levels of depressive symptoms at baseline than those of non-maltreated youth. Additionally, a higher amount of childhood maltreatment was associated with a higher level of depressive symptoms at baseline and remained higher throughout the following 10 years. While experiencing one or more forms of childhood maltreatment increased the overall level of distress, it did not impact the change of distress over time. In a more recent study, Bayly et al. (2022) explored the impact of different types of maltreatment and accumulation of maltreatment changes from adolescence to young adulthood using time-varying effect models. They found that all types of maltreatment were associated with increased depressive symptoms throughout adolescence, but different trajectories into young adulthood were manifested. Specifically, physical abuse had a stable association across adolescence and young adulthood; physical neglect had a peak during and transition to young adulthood (age 20 and 21); supervisory neglect had a stable

association throughout adolescence and then a decline in adulthood (age 26 to 30); and sexual abuse had a stable incline across adolescence and into adulthood. In contrast to Dion's study, they found that experiencing all four types of maltreatment was associated with changes of depressive symptoms over time as compared to experiencing only three types of maltreatment or fewer. These findings provide meaningful implications for the contributions of specific types of maltreatment as well as cumulative maltreatment types to trajectories of depressive symptoms. The discrepancies among the previous studies indicate that other factors may impact the trajectories of depressive symptoms over time.

1.3. The role of social support on trajectories of depressive symptoms

Social support has been identified as a robust protective factor against depressive symptoms (Gregory et al., 2020). Empirical studies have demonstrated various sources of social support in relation to depression in adolescence (Pössel et al., 2018; Seok & Doom, 2022). Family support has unequivocally been a protective factor against depression and fostering healthy development for adolescents (Rueger et al., 2016; van Harmelen et al., 2016). Meanwhile, school support (e.g., teachers' emotional support) predicted lower levels of adolescent depression (Pössel et al., 2013). Interestingly, evidence demonstrates inconsistent findings regarding the role of peer support. Some studies reported strong inverse associations between peer support and depressive symptoms (Rueger et al., 2016), while others indicated that peer support did not contribute significantly to decreasing adolescent depressive symptoms (Pössel et al., 2018).

Most of the aforementioned evidence is based on cross-sectional studies. As a result, less is known about how social support received from adolescence influences the longitudinal trajectories of depressive symptoms from adolescence to young adulthood. In a study of 1137 participants followed from the ages of 12 to 17 in the first wave to the ages of 18 to 23 in the fourth wave from the National Population Health Survey (NPHS), Colman et al. (2014) examined potential protective factors (e.g., unspecified sources of social support) during adolescence and their role in the onset or continuation of depressive symptoms in adulthood and identified social support in adolescence as a protective factor against the recurrence of depressive symptoms in adulthood. In a later study, Finan et al. (2018) explored whether social relationships (e.g., relationships with parents, peers, and siblings) were associated with trajectories of depressive symptoms from adolescence into emerging adulthood using growth curve modeling. They found that adolescents with positive relationships with parents reported lower levels of depressive symptoms in adulthood. Peer support served as a protective factor against depressive symptoms in adolescence but was not significantly related to trajectories of depressive symptoms in emerging adulthood. The limited evidence suggests that social support may map onto decreases in depressive symptoms from adolescence to emerging adulthood, specifically in ages from 18 to 25. To our knowledge, the role of social support in early adolescence on the trajectories of depressive symptoms to young adulthood (ages from 25 to 35) has not been examined. Additionally, although different sources of social support serve different roles in the trajectories of depressive symptoms, it is possible that different sources of social support may operate in an additive manner to impact depressive symptoms (Pettit et al., 2011). By investigating cumulative and simultaneous social support from parents, friends, teachers, and other adults, this study sought to provide a deeper understanding of whether these sources of support might act as a protective factor for the changes of depressive trajectories from adolescence to young adulthood.

1.4. Current study

Although the existing studies as reviewed earlier have mapped a variety of trajectories of depressive symptoms and expanded our knowledge of the risk effect of childhood maltreatment and the protective effect of social support on depressive symptoms, it is still unclear how these factors contribute to the trajectories of depressive symptoms from adolescence to young adulthood. To address this research gap, the present study aimed to address the following research questions: (1) What are the trajectories of depressive symptoms from adolescence to young adulthood? (2) How does child maltreatment experience impact the changes in depressive symptoms from adolescence to young adulthood? (3) How does social support impact the changes in depressive symptoms from adolescence to young adulthood? Correspondingly, we posed three hypotheses, informed by previous research findings: (1) Depressive symptoms would be significant at the initial level and demonstrate a non-linear growth rate of changes from adolescence to young adulthood; (2) Child maltreatment experience would be associated with higher initial levels of depressive symptoms and a slower rate of change from adolescence to young adulthood; (3) Social support would be associated with lower initial levels of depressive symptoms and accelerate the rate of change from adolescence to young adulthood.

2. Methods

2.1. Participants

The present study used the dataset from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative longitudinal cohort study of more than 20,000 adolescents in grades 7–12 (aged 12–19) in the USA on adolescent health and risk behaviors (Harris, 2013). A stratified sample of 80 high schools and 52 feeder middle schools were selected in the USA in 1994 with respect to region, urbanicity, school type, ethnicity, and size. Wave I was conducted in 1994–1995 (aged 12–19), following Wave II in 1996 (aged 13–19), Wave III in 2001–2002 (aged 18–26), Wave IV in 2008 (aged 24–32), and the most recent Wave V in 2016–2018 (aged 33–43). In this study, we included public-use data from Waves I-IV, but only a subset (about 6500 participants) of the full Add Health sample. Participants who responded to child maltreatment questions in Wave III and had at least one Wave of

depressive symptoms were included in the study. This study had a final sample of 6189 participants. See Table 1 for full descriptive statistics on sample characteristics.

2.2. Measures

2.2.1. Depressive symptoms

Depressive symptoms were measured at Wave I, II, III, and IV using an abbreviated version of 9 items from the 20 items of the Center for Epidemiological Studies-Depression Scale (CES—D) (Radloff, 1977). The abbreviated version of CES-D has been commonly used to measure adolescents and young adults' depressive symptoms (Bayly et al., 2021). Participants were asked a range of questions regarding their feelings that have occurred in the past week, including "*I was bothered by things that usually don't bother me*", "*I felt that I could not shake off the blues, even with help from my family and friends*", "*I felt depressed*", "*I had trouble keeping my mind on what I was doing", "I had trouble concentrating", "I was too tired to do things", "I felt that people disliked me", "I felt that I was just as good as other people*" (reverse coded), and "*I enjoyed life*" (reverse coded). Responses ranged on a Likert scale from 0 = *never or rarely*, 1 = *sometimes*, 2 = *a lot of times*, 3 = *most of the times or all the time*. Items were averaged to create composite variables in each wave. A higher score indicated more depressive symptoms. The scale has demonstrated acceptable internal consistency with Cronbach's alphas of 0.79 (Wave I), 0.80 (Wave II), 0.81 (Wave III), and 0.81 (Wave IV).

2.2.2. Childhood maltreatment

Childhood maltreatment was measured by participants' retrospective report of the abuse and neglect experiences from their childhood using a cumulative index, which provides a more holistic picture of childhood maltreatment experiences than dichotomous variables (Brumley et al., 2019). In Wave III, participants were asked how often they experienced physical abuse, sexual abuse, physical neglect and supervisory neglect before 6th grade (11 or 12 years old). For each type of maltreatment experience, participants rated responses using a 6-point scale ranged from 0 = *never happened*, 1 = *one time,* 2 = *two times*, 3 = *three to five times*, 4 = *six to ten times*, 5 = more than *10 times*. The most common approach for measuring child maltreatment in epidemiological studies is to create a dichotomous variable to indicate the absence or exposure to a certain type of maltreatment and summed to form a cumulative index (Brumley et al., 2019). However, that approach has several limitations. The same coding criteria for each type of maltreatment indicates the same underlying construct of maltreatment. For example, a single occurrence of sexual abuse has the same statistical weight as a single occurrence of supervisory neglect, which should not be the case. Therefore, different cutoff scores for each type of maltreatment were used to produce estimates of maltreatment that are consistent with previous Add Health studies and the national estimates of each type of maltreatment as follows (Bayly et al., 2022; Brumley et al., 2019).

2.2.2.1. Physical abuse. Participants retrospectively reported on the experience of "By the time you started 6th grade, how often had your parents or other adult caregivers slapped, hit, or kicked you?" Participants who selected three or more times were considered experiencing physical abuse.

2.2.2.2. Sexual abuse. Participants were asked "By the time you started 6th grade, how often had one of your parents or other adult caregivers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations?" Participants who selected once or more were considered experiencing sexual abuse.

Table 1
Descriptive statistics (N = 6189).

Variables	*N* (%)	Mean	*SD*	MIN	MAX
Depressive symptoms at wave 1		0.64	0.47	0	2.78
Depressive symptoms at wave 2		0.63	0.47	0	3.00
Depressive symptoms at wave 3		0.50	0.45	0	2.78
Depressive symptoms at wave 4		0.58	0.46	0	3.00
Social support		4.25	0.56	1	5.00
Childhood maltreatment					
0	3614 (75.8 %)				
1	893 (18.7 %)				
2	198 (4.15 %)				
3	55 (1.15 %)				
4	11 (0.23 %)				
Poverty					
Yes	1802 (52.6 %)				
No	1621 (47.4 %)				
Gender					
Female	3218 (52.0 %)				
Male	2971 (48.0 %)				
Race					
White	3761 (61.0 %)				
All Others	2405 (39.0 %)				

2.2.2.3. Physical neglect. Participants retrospectively reported on the experience of "By the time you started 6th grade, how often had your parents or other adult caregivers not taken care of your basic needs, such as keeping you clean or providing food or clothing?" Participants who selected one or more times were categorized as experiencing physical neglect.

2.2.2.4. Supervisory neglect. Participants were asked "By the time you started 6th grade, how often had your parents or other caregivers left you home alone when an adult should have been with you?" Participants who reported ten times or more were considered as experiencing supervisory neglect.

For analyses, each type of child maltreatment was dummy coded as 0 = *no indication of maltreatment experience*, 1 = *indication of maltreatment experience* based on the cut-off scores. A cumulative index was created by adding the number of types of maltreatment experiences, ranging from 0 to 4.

2.3. Social support

Social support is a composite variable evaluated with four single items from four sources during adolescence in Wave I, including adults, teachers, parents, and friends. Participants were asked to rate how much they feel that (a) adults, (b) teachers, (c) parents, (d) friends care about them. Respondents used a 5-item Likert scale ranging from 1 = *not at all* to 5 = *very much*. Items were averaged, with a higher score indicating a higher level of social support. The internal consistency with Cronbach's alphas was 0.63.

2.4. Control variables

We controlled three variables in this study, including race, gender, and poverty at Wave I. Gender was dummy coded as 0 = *male*, 1 = *female*. Due to over 60 % of the sample identified as White, race was dummy coded as 1 = *White,* 2 = *All others* to maintain the sufficient power for analysis. In Wave I, caregivers reported their household income and number of people in the house. Poverty was calculated by dividing the annual household income by the number of people living in the house following the 1995 Federal Poverty Line guidelines (U.S. Department of Health & Human Services, 1995). Poverty status was dichotomized as 0 = *equal or above the federal poverty threshold*, 1 = *below the federal poverty threshold.*

2.5. Data analysis plan

Descriptive analyses were conducted in SPSS, and all other analyses were conducted in R. We specified the appropriate factor loadings to correspond with the time intervals for the intercept and slope. Specifically, the zero time score for the slope growth factor at Wave I (1994–1995) defines the intercept growth factor as an initial status factor, 0.1 for Wave II (1996), 0.7 for Wave III (2001), and 1.4 for Wave IV (2008). To identify the impact of childhood maltreatment and social support on the trajectories of depressive symptoms from adolescence to young adulthood, latent growth curve modeling was conducted. First, we ran an unconditional model to determine the trajectories of depressive symptoms. Then, we ran a series of conditional models with linear and quadratic slopes to compare the goodness of fit. Fit indices were used to evaluate growth model fit. Fit indices include the $\chi 2$ goodness-of-fit test, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The conventional cut-off values $\geq$0.95 are a good fit for TLI. For RMSEA, values $<$0.08 represent acceptable fit, and values $<$0.05 suggest good fit. SRMR values $<$0.10 support acceptable fit, and values $<$0.08 indicate good fit (Hu & Bentler, 1999; McDonald & Ho, 2002).

Missing data analyses were performed to examine potential attrition bias due to missing data. Study participants who had complete data on depressive symptoms at all four waves were compared on key study variables to study participants who had missing data at any of these waves. The results showed that there was no significant difference in childhood maltreatment, social support, depressive symptoms, and poverty between study participants with missing data and study participants with complete data. It was found that the participants with missing data included more racially minoritized participants and men. Given that the data were missing at random, full information maximum likelihood (FIML) estimation was used to address the missingness because the FIML provides less biased parameter estimates and lower sampling variability (Enders & Bandalos, 2001).

3. Results

3.1. Descriptive statistics

Table 1 presents the descriptive statistics of key study variables and sample characteristics. The mean score of depressive symptoms ranges between 0.50 and 0.64. The average score of social support at Wave 1 is 4.25 (SD = 0.56). Approximately a quarter of the participants (24.2%) experienced maltreatment during their childhood. Regarding demographic information, the majority (61.0%) of the participants were white, and over half (52.0%) of the participants were women. In addition, more than half (52.6%) of the participants were found to live below the federal poverty threshold.

3.2. Unconditional latent growth model

A series of unconditional growth models (see Table 2) were tested to determine whether trajectories of depressive symptoms were best represented by a linear or a nonlinear (quadratic) slope. First, the linear growth model showed a poor model fit, $\chi^2(5) = 404.35$; CFI = 0.90; TLI = 0.88; RMSEA = 0.11, $p < .001$, SRMR = 0.07. Then, a quadratic term was added to the nonlinear growth model, which fit the data very well, χ^2 (1) = 26.46, CFI=. 99, TLI =. 96, RMSEA = 0.06, $p = .11$, SRMR = 0.01. A chi-square test was run to assess whether adding the quadratic term improved the model fit. The results showed that the nonlinear model with a quadratic slope provided a better fit, $\Delta\ \chi^2$ (4) = 377.89, $p < .001$. Thus, the final growth model with a quadratic slope was determined (see Fig. 1). The mean initial level (intercept) of depressive symptoms ($Mi = 1.73$, $SE = 0.01$, $p < .001$), the linear slope ($Ms = -0.48$, $SE = 0.02$, $p < .001$), and the quadratic slope ($Mq = 0.64$, SE = 0.01, $p < .001$) were all significant. While the negative linear slope indicates a decrease in depressive symptoms, the positive quadratic slope suggests a leveling off the rate of change in depressive symptoms over time. Significant individual variability in the intercept ($Di = 0.14$, $SE = 0.00$, $p < .001$), linear slope ($Ds = 0.53$, $SE = 0.10$, $p < .001$), and quadratic slope ($Dq = 0.12$, $SE = 0.06$, $p < .05$) of depressive symptoms indicates the individual differences across the participants in these latent growth factors.

3.3. Conditional latent growth model

Fig. 2 demonstrated the conditional growth model, which was performed to identify the effects of childhood maltreatment and social support on depressive symptoms trajectories. The model fit of the conditional growth model with a quadratic term was good, $\chi^2(6) = 19.19$; CFI = 0.99; TLI = 0.98; RMSEA = 0.03, $p = .99$, SRMR = 0.01. The participants who experienced multiple types of maltreatment during childhood had significantly higher initial levels of depressive symptoms ($\beta = 0.09$, $p < .001$) than those who did not. The participants with higher levels of social support exhibited significantly lower initial levels of depressive symptoms (β = -0.37, $p<$. 001). In terms of sociodemographic factors, those who lived below the federal poverty threshold ($\beta = 0.04$, $p < .10$), women ($\beta = 0.20$, $p < .001$), and racially minoritized participants ($\beta = 0.10$, $p < .001$) had higher initial levels of depressive symptoms. For latent growth factors, only social support and gender were significantly related to changes in the growth rate of depressive symptoms over time. Specifically, higher levels of social support were related to a less steep decline in depressive symptoms over time ($\beta = 0.21$, $p < .001$). Women exhibited a steeper decrease in depressive symptoms compared to men ($\beta = -0.08$, $p < .05$) over time. Similarly, social support and gender were also significantly related to the quadratic slope. For example, while the participants having higher levels of social support experienced a gradual increase in depressive symptoms ($\beta = -0.21$, $p < .001$), women's depressive symptoms began to increase more rapidly ($\beta = 0.09$, $p < .10$) than those of men (see Table 3).

4. Discussion

Childhood maltreatment and social support have been shown to predict depressive symptoms in adolescence and young adulthood (Ellis et al., 2017; Gregory et al., 2020; Humphreys et al., 2020). However, the longitudinal trajectories of depressive symptoms from adolescence to young adulthood is not fully established. Furthermore, little is known how cumulative childhood maltreatment and social support impact the trajectories of depressive symptoms across different developmental stages. To contribute knowledge to this area, the current study explored trajectories of depressive symptoms from adolescence to young adulthood, as well as identify how childhood maltreatment as a risk factor and social support as a protective factor impact the changes of depressive symptoms over time.

4.1. Trajectories of depressive symptoms

Results suggested that the trajectories of depressive symptoms from adolescence to young adulthood were nonlinear from the growth curve modeling. This study was also able to expand on previous work by examining trajectories of depressive symptoms across multiple developmental stages, especially addressing the gaps from emerging adulthood to young adulthood. Specifically, consistent with hypothesis 1, depressive symptoms declined from adolescence (age 12–15) to emerging adulthood (age 18–24), and slightly increased to young adulthood (age 24–32). These findings support the previous studies that trajectories of depressive symptoms decrease from adolescence to emerging adulthood (Ferro et al., 2015; Kwong et al., 2019). This result may indicate a general improvement in depressive symptoms from adolescence to emerging adulthood. During the transition to emerging adulthood, youth experience several positive changes including increased autonomy, expanded social connections, identity development, and enhanced

Table 2
Parameter estimates for the unconditional growth model of depressive symptoms.

Variables	Intercept					Linear slope			Quadratic slope			
	Mean	*SE*	Variance	*SE*	Mean	*SE*	Variance	*SE*	Mean	*SE*	Variance	*SE*
Depressive symptoms	1.73***	0.01	0.14***	0.00	−0.48***	0.02	0.53***	0.10	0.64***	0.01	0.12*	0.06

Note. SE = Standard error.
*** $p < .001$.
* $p < .05$.

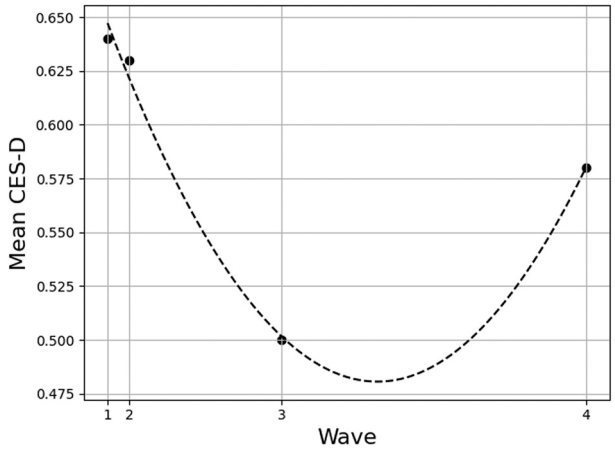

Fig. 1. Trajectories of depressive symptoms.

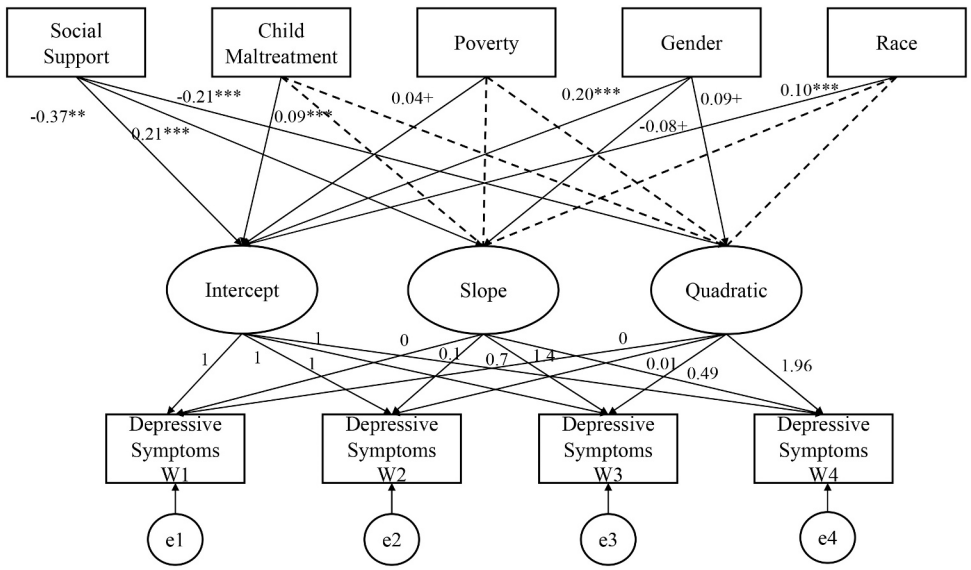

Fig. 2. Conditional latent growth model predicting depressive symptoms. *Note.* $+p < .10$, $*p < .05$, $**p < .01$, $***p < .001$.

Table 3
Parameter estimates for the conditional growth model of depressive symptoms.

Variables	Intercept			Linear slope			Quadratic slope		
	β	*SE*	*p*	*β*	*SE*	*p*	*β*	*SE*	*p*
Social support	−0.37***	0.02	<0.001	0.21***	0.05	<0.001	−0.21***	0.03	<0.001
CM	0.09***	0.01	<0.001	0.04	0.04	0.22	−0.06	0.03	0.26
Poverty	0.04+	0.02	0.08	0.01	0.05	0.87	0.02	0.03	0.74
Gender	0.20***	0.02	<0.001	−0.08*	0.05	0.02	0.09+	0.03	0.08
Race	0.10***	0.02	<0.001	−0.04	0.05	0.24	0.05	0.04	0.33

Note. CM = Childhood maltreatment.
+ $p < .10$.
* $p < .05$.
*** $p < .001$.

self-regulation skills (Howard et al., 2010; Liew et al., 2023; Telzer et al., 2023). These positive psychosocial, neurobiological, and behavioral changes may correlate with lower depressive symptoms in this developmental stage. It is also noteworthy that we found an increasing trajectory from emerging adulthood to young adulthood. This finding is consistent with Elovainio et al. (2012)'s study,

which identified similar curvilinear patterns of depressive symptoms. However, our results demonstrated more specific curvilinear pattern-quadratic slope of depressive symptoms, indicating an accelerated increase in depressive symptoms from emerging adulthood to young adulthood. This increase may be related to the transition from emerging adulthood to young adulthood, a period that is characterized by academic achievement, career pursuit, marriage, and parenthood (Arnett, 2012; Howard et al., 2010). During this transition period, emerging adults may feel a lot of distress when experiencing both failures and success. Given these changes are associated with both risks and opportunities, it could either enhance or jeopardize mental health.

4.2. Childhood maltreatment and depressive symptoms

Our study documented that the cumulative index of childhood maltreatment was significantly associated with higher initial levels of depressive symptoms, which is similar to the findings of previous studies (Dion et al., 2016; Infurna et al., 2016). However, our study did not find a significant association between childhood maltreatment and the linear and quadratic slopes of depressive symptoms over time, which aligns with findings from a previous study (Dion et al., 2016). This could be a hopeful finding that childhood maltreatment only impacted depressive symptoms in early adolescence, but did not persist into adulthood. Several potential explanations exist for this finding. Specifically, previous research has identified that there is variability in the effect of childhood maltreatment on depressive symptoms later in life (Dion et al., 2016; Kaplow & Widom, 2007). These studies have also noted that the variability can be explained by some factors, such as the timing, chronicity, severity, or subtypes of child maltreatment (Bayly et al., 2022). For instance, Infurna et al. (2016) reported that, compared to other types of maltreatment, emotional maltreatment was more strongly predictive of depressive symptoms. In addition, Bayly et al. (2022) suggested that considering the differential impact on depressive symptoms by various types of child maltreatment, future research should employ person-centered models, such as latent class analysis, to capture the variability in the impacts of childhood maltreatment on the trajectories of depressive symptoms. Since our study did not measure all subtypes of maltreatment, future research might consider including all types of maltreatment and examining the individual effect of each subtype of maltreatment on both linear and quadratic slopes of depressive symptoms.

4.3. Social support and depressive symptoms

Social support accounted for significant variance in the intercept as well as the linear and quadratic slopes of depressive symptoms, which partially supported our third hypothesis. This result indicated that higher levels of social support were associated with lower levels of depressive symptoms in early adolescence. The notion that social support from crucial sources (e.g., teachers, family, and friends) had a positive impact on depression in adolescence is supported by a growing body of empirical studies (Dion et al., 2016; Pössel et al., 2018; Rueger et al., 2016).

Another finding unique to this study was that social support was associated not only to youth's initial level of depressive symptoms, but also to changes in participants' depressive symptoms over time. Our results indicated that youth with higher levels of social support in early adolescence predicted a less steep decrease in depressive symptoms into emerging adulthood. This finding was similar to one of the few other longitudinal studies examining the impact of perceived social support on the trajectories of depressive symptoms. For example, Pettit et al. (2011) indicated that higher levels of perceived family support at age of 21 predicted a slower decrease in depressive symptoms transitioning into emerging adulthood among women but not among men. One possible explanation is that there are gender differences in the variations of perceived social support on the trajectories of depressive symptoms over time. Our results also indicated that women with higher levels of initial social support experienced a gradual increase of depressive symptoms over time than men. Future study could explore gender differences of the effect of social support on the trajectories of depressive symptoms. Another explanation is that social support from different sources may have prevented depressive symptoms in a different way. It is possible that one or more sources of social support may become irrelevant when all sources are examined at once. For example, family support reduced the negative effect of depressive symptoms over time (Dion et al., 2016), while friend support did not contribute to the trajectories of depressive symptoms (Dion et al., 2016; Pettit et al., 2011). Future studies could examine the different sources of social support separately. Furthermore, it is possible that individuals who did not have strong social support in early adolescence may enhance their emotional wellbeing from increased autonomy and resilience transitioning into emerging adulthood.

Surprisingly, we found that individuals with higher levels of social support in early adolescence experienced a gradual increase in depressive symptoms from emerging adulthood to young adulthood. As the first study on the trajectories of depressive symptoms in this developmental stage, there are a few possible explanations. From the linear slope, for every unit increase in social support, there was an increase in the rate of reduction of depressive symptoms by 0.21 units per time period. Meanwhile, from the quadratic slope, there was a significant effect on the acceleration; initially, the rate of decrease in depressive symptoms sped up, but over time, this deceleration reversed by 0.21 units per time period, which indicates that higher levels of social support could reduce depressive symptoms from early adolescence to emerging adulthood and prevent rapid increase in depressive symptoms into young adulthood. Therefore, social support in early adolescence has a long-term protective effect. Additionally, we measured social support from four different sources (e.g., adults, teachers, parents, friends) in early adolescence, which may differ from that received in young adulthood. Auerbach et al. (2011) suggested that there may be a social support hierarchy of importance when transitioning from adolescence to young adulthood. Although support from romantic partners was not considered in the present study, it may play a central role in emotional support and companionship in adulthood, as the cumulative effect of support from teachers, parents, and friends relatively decreases over time (Dion et al., 2016; Tillman et al., 2019). Young adults who have poor romantic relationship quality are more likely to experience higher levels of depressive symptoms over time (Gustavson et al., 2012). Future studies could consider assessing social support across different developmental stages and its impact on the trajectories of depressive symptoms over time.

4.4. Strengths, limitations, and future directions

The present study has a few strengths as well as some limitations for consideration in future research. To the best of our knowledge, this is the first study to use nationally representative data to examine the impact of both childhood maltreatment and social support on over a 15-year trajectory of depressive symptoms from early adolescence to young adulthood. Another strength of this study is the longitudinal design of Add Health, combined with a robust statistical technique, growth curve modeling, which may overcome the limitations of other statistical methods. Our results shed light on prevention and treatment of depressive symptoms among adolescents and young adults.

One limitation to the present study was that adult participants reported their childhood maltreatment retrospectively, which could potentially lead to recall biases and under report maltreatment experiences, especially their experiences of neglect (Hardt & Rutter, 2004). Although we used the cut-offs of each type of maltreatment that were consistent with rates from other epidemiological studies and other Add Health studies (Afifi et al., 2011; Humphreys et al., 2020; McLaughlin et al., 2012), rates of maltreatment experiences could still be underestimated. Another limitation is that using the single item of each type of childhood maltreatment that was available in Add Health and dichotomizing each item to create a cumulative index would not fully capture the complexity of maltreatment experiences. Although the cumulative index accounted for the co-occurrence, it did not account for the distinctiveness of maltreatment experiences which could impact the reliability and generalizability of the findings (Brodbeck et al., 2018). Similarly, other important factors of childhood maltreatment (e.g., severity, frequency) that could potentially be associated with depressive symptoms over time were not assessed in this study. Future studies are needed to identify the robustness of patterns between multiple types of maltreatment as well as characteristics of maltreatment in association with depressive symptoms across different developmental stages. Furthermore, although the Cronbach's alphas of social support variables (0.63) were acceptable, it is worth noting that the limited single items of social support variables may impact the internal reliability. Future studies should consider other sources of social support (e.g., relationship with romantic partners) to increase their reliability.

5. Conclusion

Trajectories of depressive symptoms from adolescence to young adulthood were heterogenous. Results from the present study indicated that an accumulation of childhood maltreatment was associated with depressive symptoms in early adolescence, but posed no significant risk to the long-term trajectories of depressive symptoms. Additionally, the cumulative social support from teachers, parents, and friends had a great impact on the trajectories of depressive symptoms. In other words, cumulative social support in early adolescence might not, in itself, be effective in decreasing depressive symptoms over time. As needs and circumstances evolve, the most effective type of support may also change. Ensuring that social support is diverse and adaptive to meet evolving personal circumstances can help manage depressive symptoms more effectively over the long term.

CRediT authorship contribution statement

Fei Shen: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Ranran Z. Mi:** Writing – review & editing, Data curation, Conceptualization. **Hyunji Lee:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Jennifer J. Chen:** Writing – review & editing. **Ying Zhang:** Writing – review & editing.

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Declaration of competing interest

The authors declare no competing interests.

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Data availability

The authors do not have permission to share data.

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