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EMPIRICAL RESEARCH

Neighborhood Disadvantage, Parenting, and Adolescent Internalizing Symptoms in Mexican-Origin Families: Moderating Role of Discrimination

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Abstract
Mexican-origin populations tend to reside in disadvantaged neighborhoods, increasing adolescents' vulnerability to internalizing symptoms. While prior research highlights neighborhood disadvantage's impact on adolescents, few studies explore its effects on both perceived parenting (maternal and paternal) and internalizing symptoms and the underlying mechanism (i.e., subjective neighborhood violence) explaining such association. Notably, adolescents' perceptions of their neighborhood may vary across adolescent discrimination experiences (i.e., ethnic and group discrimination), subsequently contributing to parenting and adolescent internalizing symptoms. Using three-wave data (2012–2020) from 604 Mexican-origin adolescents ($M_{wave1.age} = 12.41$, $SD_{wave1.age} = 0.97$; 54.3% female), findings reveal that the detrimental influence of neighborhood disadvantage on adolescent internalizing symptoms and perceived parental hostility via subjective neighborhood violence was stronger when adolescents experienced higher discrimination. Future policies to reduce neighborhood disadvantage and discrimination are needed to promote adolescent mental health and positive parenting among Mexican-origin families.

Keywords Neighborhood disadvantage · Neighborhood violence · Parenting practices · Adolescent internalizing symptoms · Discrimination · Mexican-origin families

Introduction

Mexican-origin population, the largest immigrant group in the United States, exhibits a higher likelihood of experiencing objective neighborhood disadvantage (e.g., a larger proportion of families living below the poverty level) (Shrider et al., 2021), which adversely affects adolescent internalizing symptoms (Jocson & McLoyd, 2015). Although objective neighborhood disadvantage is found to be a risk factor for adolescent mental health problems (McBride Murry et al., 2011), the underlying mechanism explaining such association remains elusive. Supported by the family stress model (Conger et al., 2010), previous research demonstrates that the influence of neighborhood on adolescent development may be explained by parenting (Gonzales et al., 2011). However, studies are limited in considering (1) both objective assessments and subjective perceptions (i.e., subjective neighborhood violence) of neighborhoods, (2) cultural factors (e.g., discrimination) that may attenuate or amplify the association between objective neighborhood disadvantage and subjective perceptions of neighborhood violence, influencing how neighborhood context impacts parenting and adolescent internalizing symptoms in Mexican immigrant families, (3) the family system as an interdependent system to consider the reciprocal association between parents and adolescents (Brown, 1999). To develop culturally sensitive interventions and gain a more comprehensive understanding of neighborhood influence on Mexican immigrant families, this study investigates how objective neighborhood disadvantage affects the bidirectional

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association between parenting and adolescent internalizing symptoms through subjective neighborhood violence, and whether such indirect association may vary across youth with different discriminatory experiences.

Association between Objective and Subjective Measures of Neighborhood Environment Varies by Adolescent Discriminatory Experiences

Neighborhood context can be assessed by objective and subjective measures. Objective neighborhood measures refer to area-level indicators that are independent of individuals' own perceptions and provide a standardized assessment of neighborhoods' characteristics (Weden et al., 2008). These measures include quantifiable data such as poverty rate, unemployment rates, and access to public services (Kim et al., 2009). One of the most widely utilized objective neighborhood measures is objective neighborhood disadvantage, which is defined as the lack of economic and social resources within a community (McBride Murry et al., 2011). In contrast, subjective neighborhood measures focus on individual perceptions of the neighborhood (Leventhal & Brooks-Gunn, 2000). These measures capture individuals' personal experiences and feelings about their environment, such as perceived neighborhood violence. Previous research illustrates that individuals living in disadvantaged neighborhoods tend to have a higher likelihood of perceiving their community as high in violence (Fabio et al., 2011). It may be attributed to the lack of stable employment in economically disadvantaged communities that exacerbates individual financial hardship, leading to heightened violent behaviors, such as robbery and assault (Ross & Mirowsky, 2009).

Latinx families tend to have a high risk of experiencing objective neighborhood disadvantage. The U.S. Census Bureau report suggests that 17% of Latinxs live in disadvantaged neighborhoods, which is two times higher than non-Hispanic Whites (Shrider et al., 2021). Compared to U.S.-born Latinx families, Latinx immigrant families (with two foreign-born parents) are more likely to face unemployment due to the language barrier (Thiede et al., 2021). Such economic hardship may constrain low-income Latinx immigrant families' housing choices, leading them to prioritize affordability over neighborhood quality, which increases the likelihood of living in economically disadvantaged communities. Acknowledging the great heterogeneity within the Latino population, this current study focuses on Mexican immigrant families, the largest ethnic group among Latinx immigrants (Gonzalez-Barrera & Lopez, 2013), to investigate the impact of objective neighborhood disadvantage on those families.

While objective neighborhood disadvantage is shown to be associated with subjective neighborhood violence (Fabio et al., 2011), Mexican-origin adolescents who live in disadvantaged neighborhoods may not always perceive their neighborhoods as high in violence (Orstad et al., 2017). This discrepancy in perception may be shaped by adolescents' experiences with discrimination. Adolescents who encounter lower levels of discrimination may be protected from neighborhood disadvantage. For example, lower levels of discrimination may reflect residence in ethnically concentrated neighborhoods, which provide strong social support and a shared cultural identity (Boje-Kovacs et al., 2024; Li et al., 2017). These protective factors can help adolescents focus on the positive aspects of their community, fostering resilience against neighborhood disadvantage. Consequently, these adolescents may develop a more favorable perception of their environment, viewing it as less violent despite its objective disadvantage. On the other hand, adolescents' discriminatory experiences may intensify the negative effects of poverty and systemic inequity reflected by objective neighborhood disadvantage. Adolescents who face discrimination may internalize negative societal messages that portray their racial or ethnic group as less capable, less deserving, or inferior (Hipolito-Delgado, 2010). When these discriminatory experiences are compounded by living in a disadvantaged neighborhood, discrimination may feel like confirmation of the systemic inequities they already see in their daily lives, further shaping a negative perception of themselves or even the environment they live in (Umaña-Taylor & Updegraff, 2007). While previous studies have examined both objective and subjective neighborhood measures among Mexican immigrant families (Gonzales et al., 2011; White et al., 2012), there is limited understanding of how cultural factors, such as discrimination impact the influence of objective neighborhood disadvantage on adolescents' subjective perceptions of their neighborhoods. Cultural factors reflect the special experiences and values of Mexican-origin populations, which may interact with neighborhood disadvantage to uniquely influence adolescent developmental outcomes (Delgado et al., 2011). Therefore, it is essential to investigate the interaction between objective neighborhood disadvantage and discrimination to develop culturally sensitive interventions for Mexican-origin adolescents who live in disadvantaged neighborhoods.

While previous studies have examined adolescent discrimination experiences within disadvantaged neighborhoods, most of these studies solely focus on personal experiences of ethnic discrimination. However, the Personal/Group Discrimination Discrepancy framework (Taylor et al., 1990) indicates that individuals tend to report lower

levels of personal discrimination (i.e., ethnic discrimination) than discrimination against their ethnic groups (i.e., group discrimination). This discrepancy may stem from individuals being more inclined to minimize their perceptions of ethnic discrimination because acknowledging such experiences can be psychologically distressing, undermining their sense of belonging, and straining their social relationships (Bourguignon et al., 2006). In contrast, group discrimination is less likely to provoke self-blame due to individuals' limited control over group-level occurrences, and as a result, adolescents may perceive it as more pervasive than ethnic discrimination (Stevens & Thijs, 2018). Thus, to gain a more comprehensive understanding of discrimination experiences among Mexican-origin adolescents, it is essential to go beyond adolescents' personal experiences (i.e., ethnic discrimination) to also examine their perceptions of how their ethnic group is treated (i.e., group discrimination).

Subjective Neighborhood Violence, Parenting Practices, and Adolescent Internalizing Symptoms in Mexican Immigrant Families

Early adolescence is characterized by dramatic biological and cognitive changes, making adolescents particularly sensitive to environmental stressors and increasing their risk of internalizing symptoms (Merikangas et al., 2010). Latinx adolescents tend to report higher levels of depressive symptoms and anxiety compared to Black and White adolescents (McLaughlin et al., 2007). Subjective neighborhood violence, as a significant contextual stressor, can negatively impact adolescent psychological health (Roosa et al., 2003). Previous research has shown that adolescents who perceive their neighborhoods as violent tend to have more negative attitudes and greater fear about their community, increasing their risk of developing internalizing symptoms (Roosa et al., 2009). Internalizing symptoms adolescents develop during early adolescence may persist or aggravate into severe mental health problems in late adolescence (King et al., 2022). As such, it is necessary to take a developmental perspective and investigate the long-term impact of subjective neighborhood violence on youth internalizing symptoms from early to late adolescence.

The family stress model (Conger et al., 2010) recognizes that parenting practices play an important role in explaining the impact of contextual stress on adolescent internalizing symptoms. Previous research has adopted the family stress model to show that the influence of subjective neighborhood violence on Mexican-origin adolescent internalizing symptoms may occur via decreases in effective parenting practices (White et al., 2012). Parental warmth, characterized by displays of acceptance and support towards a child, has emerged as a crucial dimension of effective parenting in shaping adolescent internalizing symptoms (Conger et al., 2010). Research indicates that higher levels of perceived neighborhood violence create a stressful and fearful environment that hinders parents' ability to provide supportive and nurturing care (White et al., 2012), leading to increased Mexican-origin adolescent internalizing symptoms (Gonzales et al., 2011). On the other hand, subjective neighborhood violence may also affect Mexican-origin adolescents' internalizing symptoms through increased ineffective parenting practices, such as parental hostility (Parke et al., 2004). Specifically, parents living in high-violence neighborhoods may experience heightened stress and exhibit more hostility in parenting, which may contribute to adolescents' poor psychological adjustment.

While numerous studies have focused on parental influence on adolescent internalizing symptoms, family systems theory (Brown, 1999) emphasizes that the family is an interdependent system where parents and adolescents may influence each other. Previous literature has mixed findings on how adolescent internalizing symptoms could impact parenting practices. Some longitudinal literature suggests that higher levels of adolescent internalizing symptoms are associated with more positive parenting, such as higher parental warmth and lower parental hostility, as parents try to provide more support after noticing their children's internalizing symptoms (Serbin et al., 2015). However, some other longitudinal research illustrates that higher levels of adolescent internalizing symptoms lead to lower levels of parental warmth, as adolescents' internalizing symptoms may negatively influence parental psychological status, impairing parents' ability to provide positive parenting (Manongdo & García, 2011). Although there are contradictory findings regarding the direction and nature of the association between adolescent internalizing symptoms and parenting practices, there is no doubt that adolescent internalizing symptoms are essential predictors of parenting practices. Therefore, it is important to investigate the reciprocal association between parents and adolescents from a developmental perspective to identify potential different feedback loops that may operate during adolescence.

It has been suggested that mothers and fathers may respond differently to neighborhood contexts. Higher levels of perceived neighborhood danger are found to be significantly associated with higher hostility and lower warmth among Mexican-origin fathers but not among mothers (White et al., 2009). This might be because Mexican-origin mothers tend to be more responsible for taking care of the family and fathers are more responsible for dealing with the stressors of dangers present in their neighborhood. Thus, fathers tend to spend more time in their neighborhoods and are more exposed to neighborhood violence (Pinchevsky et al., 2013). As mothers and fathers may be differently influenced by their

neighborhood, it is essential to include both fathers and mothers to gain a more comprehensive understanding of the ways in which neighborhood contexts may influence parenting, subsequently affecting adolescent internalizing symptoms.

In addition to neighborhood, some demographic factors are also associated with parenting practices and adolescent internalizing symptoms. It has been shown that adolescents' reports of parenting practices vary based on their gender and age. For example, Mexican-origin girls are less likely than boys to report parental hostility (Domenech RodrÍGuez et al., 2009). Additionally, adolescents tend to report more supportive parenting during early adolescence, with this perception declining as they mature into late adolescence (Merianos et al., 2020). Mothers with higher levels of education are less likely to exhibit hostility and more likely to show warmth (Carr & Pike, 2012). In terms of adolescent internalizing symptoms, previous research demonstrated that adolescents have significantly different levels of internalizing symptoms at different ages and across genders. Specifically, females report more internalizing symptoms than males, and older adolescents report more severe internalizing symptoms than younger adolescents (Crawford et al., 2001). U.S.-born adolescents are also at a higher risk of internalizing symptoms than Mexican-born adolescents (Alegria et al., 2007). Moreover, adolescents with mothers who have a higher level of education tend to report fewer internalizing symptoms (Bennett et al., 2016).

Current Study

Understanding the impact of objective neighborhood disadvantage on Mexican immigrant families is crucial for promoting adolescent mental wellness and positive parenting practices. However, few empirical studies have examined the mechanisms or risk factors that explain or moderate the effects of objective neighborhood disadvantage on Mexican immigrant families. To address this gap, the current study examined how the influence of objective neighborhood disadvantage on Mexican-origin adolescent internalizing symptoms (i.e., depressive symptoms and anxiety) and adolescent perceived parenting practices (i.e., parental hostility and warmth) through subjective neighborhood violence varies across adolescent discrimination experiences (i.e., ethnic discrimination and group discrimination). Based on the previous literature review, the study hypothesized that the indirect influence of objective neighborhood disadvantage on parenting and adolescent internalizing symptoms via subjective neighborhood violence would be stronger for adolescents experiencing higher levels of discrimination and weaker for those experiencing lower levels of discrimination (Figs. S1 and S2).

Method

Participants

Data for the current study came from a three-wave longitudinal study (2012–2015 for Wave 1; 2013–2016 for Wave 2; 2017–2020 for Wave 3). Participants were 604 Mexican-origin adolescents from low-income immigrant families in central Texas, USA. Adolescents were in 6th–8th grade with their age ranging from 11 to 15 years old ($M_{\text{age}} = 12.41$, $SD_{age} = 0.97$) in Wave 1. Around half of the participants were females ($N = 328$, 54.3%), and approximately 75% of participants were born in the U.S. ($N = 455$, 75.3%) at Wave 1. The mean household income for participants' families was between $20,001 to $30,000 at Wave 1, with the average highest education level of participants' parents being middle/junior high school. Of the 604 Mexican-origin adolescents who participated in Wave 1, 483 remained in Wave 2 ($M_{\text{age}} = 13.22$, $SD = 0.95$), and 334 continued participation in Wave 3 ($M_{\text{age}} = 17.10$, $SD = 1.12$). Attrition analysis was conducted to identify potential differences between adolescents who continued in the study and those who dropped out. Results show that adolescents whose mothers had higher education levels at Wave 1 were more likely to stay in the study for Wave 2 ($t(591) = -2.41$, $p < 0.05$). Furthermore, younger adolescents and those whose mothers had higher education at Wave 1 (age: $t(602) = 3.49$, $p < 0.001$; maternal education: $t(591) = -3.45$, $p < 0.001$) and Wave 2 (age: $t(480) = 3.20$, $p < 0.01$; maternal education: $t(476) = -3.39$, $p < 0.001$) were more likely to remain engaged in Wave 3. Therefore, adolescent age and maternal education were controlled as covariates in the analyses.

Procedure

Participants were initially recruited through school presentations, community recruitment, and public records. Families were selected if parents were of Mexican origin and the target child used English and Spanish to translate for at least one of the parents (mother or father). Informed consent from parents and informed assent from adolescents were obtained. Questionnaires were presented in both English and Spanish so that participants could choose the language with which they were most comfortable. Participants' responses were recorded on a laptop computer. Families that participated were compensated $60 at Wave 1, $90 at Wave 2, and $90 at Wave 3. All procedures were

approved by the Institutional Review Board at the University of Texas at Austin.

Measures

Objective Neighborhood Disadvantage

Objective neighborhood disadvantage was measured using ZIP code tabulation areas (ZCTAs) from the US Census Bureau's American Community Survey, which was collected over five years, from 2013 to 2017 (Melendez et al., 2020). Objective neighborhood disadvantage data mapped onto Wave 1 (2012–2015) and Wave 2 (2013–2016) of the study data. Neighborhood disadvantage was assessed by averaging the standardized mean of five variables: proportion of families living below the poverty level, proportion of adults aged 16 years and older who are unemployed, proportion of families headed by females with children, proportion of households receiving public assistance income or food stamps, and proportion of non-Hispanic Blacks in the neighborhood. The standardized score of neighborhood disadvantage in the current sample ranged from 0.03 to 0.21, with a mean of 0.12 ($SD = 0.041$). Higher mean scores represent higher levels of objective neighborhood disadvantage.

Subjective Neighborhood Violence

Wave 1 and 2 subjective neighborhood violence was assessed using three items from the Survey of Children's Exposure to Community Violence (Richters & Saltzman, 1990). Adolescents reported their perceived neighborhood violence on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample items included, "People in my neighborhood offer, sell, buy, or use illegal drugs", and "People in my neighborhood are picked up, arrested, or taken away by the police." Given that 2013–2017 objective neighborhood disadvantage as the precursor of subjective neighborhood violence and objective neighborhood disadvantage mapped onto Wave 1 (2012–2015) and Wave 2 (2013–2016) of the studied data, subjective neighborhood violence was assessed using the average value of items for Wave 1 and Wave 2 adolescent-reported neighborhood violence. Higher mean scores represent higher levels of subjective neighborhood violence ($\alpha_{\text{Wave 1}} = 0.831$, $\alpha_{\text{Wave 2}} = 0.848$).

Adolescent Discrimination Experience

Two measures of adolescent discrimination experiences were included in the current study: *ethnic discrimination* and *group discrimination*. Wave 1 and 2 adolescent ethnic discrimination was assessed using nine items adapted from the Everyday Discrimination Scale (Williams et al., 1997). Adolescents reported their experience of ethnic discrimination on a four-point scale ranging from 1 (never) to 4 (frequently). Sample items included "I am threatened or harassed because I am Mexican", and "People act like I am dishonest because I am Mexican." Wave 1 and 2 adolescent group discrimination was assessed using three items adapted from a previous study (Malcarne et al., 2006). Adolescents reported their experience of group discrimination on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items included "Mexicans have not been treated well in the U.S.", "Mexicans are often criticized in the U.S.", and "Discrimination against Mexicans is a problem in the U.S". Given that ethnic or group discrimination is a moderator of the association between 2013–2017 objective neighborhood disadvantage and Wave 1 and 2 subjective neighborhood violence, ethnic and group discrimination was assessed using the average value of items for Wave 1 and Wave 2 adolescent-reported ethnic or group discrimination, respectively. Higher mean scores indicate adolescents experienced higher levels of ethnic and group discrimination ($\alpha_{\text{Wave 1 ethnic}} = 0.882$, $\alpha_{\text{Wave 2 ethnic}} = 0.888$; $\alpha_{\text{Wave 1 group}} = 0.830$, $\alpha_{\text{Wave 2 group}} = 0.856$).

Parental Hostility

Wave 2 and 3 adolescent perceived parental hostility was assessed using six items from the Iowa Youth and Families Project (Ge et al., 1996). Adolescents reported perceived maternal and paternal hostility on a seven-point scale ranging from 1 (never) to 7 (always). Sample items included, "[Does] your mother/father shout or yell at you because (s)he was mad at you?" and "[Does] your mother/father get into a fight or argument with you?" Higher mean scores represent higher levels of adolescent perceived parental hostility ($\alpha_{\text{Wave 2 mother}} = 0.845$, $\alpha_{\text{Wave 3 mother}} = 0.881$, $\alpha_{\text{Wave 2 father}} = 0.882$, $\alpha_{\text{Wave 3 father}} = 0.885$).

Parental Warmth

Wave 2 and 3 adolescent perceived parental warmth was assessed using seven items from the Iowa Youth and Families Project (Ge et al., 1996). Adolescents reported perceived maternal and paternal warmth on a seven-point scale ranging from 1 (never) to 7 (always). Sample items included, "[Does] your mother/father let you know that (s)he appreciates you, your ideas, or the things you do?" and "[Does] your mother/father help you do something that was important to you?" Higher mean scores represent higher levels of adolescent perceived parental warmth ($\alpha_{\text{Wave 2 mother}} = 0.915$, $\alpha_{\text{Wave 3 mother}} = 0.916$, $\alpha_{\text{Wave 2 father}} = 0.928$, $\alpha_{\text{Wave 3 father}} = 0.935$).

Adolescent Depressive Symptoms

Wave 2 and 3 adolescent depressive symptoms were assessed using the 20-item Center for Epidemiological Studies-

Depression (CES-D) scale (Radloff, 1977). Adolescents self-reported their depressive symptoms during the past week on a four-point scale ranging from 0 (rarely or none) to 3 (most or all days). Sample items included, "I did not feel like eating; my appetite was poor", and "I had trouble keeping my mind focused on what I was doing". Higher mean scores represent more depressive symptoms adolescents have experienced ($\alpha_{\text{Wave 2}} = 0.844$, $\alpha_{\text{Wave 3}} = 0.866$).

Adolescent Anxiety

Wave 2 and 3 adolescent anxiety was assessed using four items (Reynolds & Richmond, 1978; Spitzer et al., 2006). Adolescents self-reported their experience of anxiety in the past two weeks on a four-point scale ranging from 1 (not at all) to 4 (nearly every day). Items included, "Feeling nervous, anxious or on edge", "Worrying about what is going to happen", "Trouble relaxing", and "Becoming easily annoyed or irritable". Higher mean scores indicate a higher level of adolescent anxiety ($\alpha_{\text{Wave 2}} = 0.822$, $\alpha_{\text{Wave 3}} = 0.811$).

Covariates

A set of demographic variables, including adolescents' age, binary gender, and nativity, were included as covariates. Mothers self-reported their education level on a scale of 1 (no formal schooling) to 11 (finished graduate degree).

Analysis Plan

Two sets of models were estimated in Mplus 8.3 (Muthén & Muthén, 2017) in four steps using Structural Equation Modeling (SEM). Maximum likelihood estimation with robust standard errors (MLR) was used for all models to account for potential non-normality of variables. Full information maximum likelihood (FIML) was used to account for missing data. Families were nested within neighborhoods based on ZCTAs, so the zip code of neighborhoods was used as the cluster variable. First, Model 1 was tested to investigate the indirect effects of objective neighborhood disadvantage on Wave 3 adolescent internalizing symptoms through Waves 1 and 2 subjective neighborhood violence to Wave 2 parenting practices. Second, Model 2 was tested to investigate the indirect effects of objective neighborhood disadvantage on Wave 3 parenting practices through Waves 1 and 2 subjective neighborhood violence to Wave 2 adolescent internalizing symptoms. Third, the moderating effect of Waves 1 and 2 adolescent discrimination experiences (i.e., ethnic discrimination and group discrimination) on the association between objective neighborhood disadvantage and Wave 1 and 2 subjective neighborhood violence was analyzed in Models 1 and 2. Fourth, the conditional indirect effect of objective neighborhood disadvantage on Wave 3 adolescent internalizing symptoms and Wave 3 parenting practices across different levels of adolescents' discrimination experiences was estimated in Models 1 and 2 respectively (Figs. S1 and S2). In all models, adolescent depressive symptoms and anxiety were analyzed in the same model. Maternal and paternal parenting practices were analyzed separately, and ethnic discrimination and group discrimination were analyzed separately due to high correlation. All covariates, including Wave 1 adolescent age, binary gender, nativity, and Wave 1 maternal education, were controlled for on all pathways. Descriptive statistics and intercorrelations of all studied variables are presented in Table 1.

Sensitivity Analysis

Sensitivity analysis was conducted to test the robustness of Models 1 and 2. The sensitivity analysis model further constrains Models 1 and 2 to examine the conditional indirect effects of objective neighborhood disadvantage on Wave 3 adolescent internalizing symptoms and parenting practices across different levels of adolescent discrimination experiences by including both Wave 2 and 3 adolescent internalizing symptoms and parenting practices (Fig. S3).

Results

Indirect Effect of Objective Neighborhood Disadvantage on Adolescent Internalizing Symptoms and Parenting Practices

Model 1

Model 1 tested the indirect effect of 2013–2017 objective neighborhood disadvantage on Wave 3 Mexican-origin adolescent internalizing symptoms (i.e., depressive symptoms and anxiety) through Waves 1 and 2 subjective neighborhood violence to Wave 2 parenting practices (i.e., parental hostility and warmth) (Fig. 1). The structural models with maternal parenting (RMSEA = 0.047 [90% CI: 0.028–0.067], CFI = 0.943, SRMR = 0.032) and paternal parenting (RMSEA = 0.030 [90% CI: 0.000–0.052], CFI = 0.977, SRMR = 0.028) fitted the data well based on the acceptable cutoff values for model fit CFI ≥ 0.90, RMSEA ≤ 0.08. The results show that higher objective neighborhood disadvantage was associated with increased perceptions of neighborhood violence, which in turn predicted higher levels of maternal and paternal hostility at Wave 2, subsequently leading to elevated Wave 3 adolescent anxiety (Table S1). Furthermore, objective neighborhood disadvantage was associated with greater Wave 3 adolescent depressive symptoms through the pathway of increased subjective neighborhood violence to heightened Wave 2 paternal hostility.

Table 1 Descriptive information and correlation of study variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. 2013–2017 objective neighborhood disadvantage	0.12	0.04	—												
2. W1 & 2 subjective neighborhood violence	2.08	0.84	0.19***	—											
3. W1 & 2 adolescent ethnic discrimination	1.37	0.43	–0.08	0.29***	—										
4. W1 & 2 adolescent group discrimination	3.18	0.78	0.03	0.21***	0.34***	—									
5. W2 maternal hostility	2.73	1.07	0.00	0.28***	0.31***	0.12**	—								
6. W2 maternal warmth	5.09	1.26	0.04	–0.23***	–0.20***	0.01	–0.36***	—							
7. W2 paternal hostility	2.27	1.07	0.04	0.29***	0.25***	0.11*	0.66***	–0.26***	—						
8. W2 paternal warmth	4.79	1.44	0.07	–0.22***	–0.16***	–0.01	–0.33***	0.65***	–0.22***	—					
9. W3 maternal hostility	2.83	1.12	–0.11*	0.07	0.17**	0.01	0.43***	–0.24***	0.24***	–0.12	—				
10. W3 maternal warmth	4.79	1.25	0.01	–0.09	–0.12*	–0.06	–0.21***	0.50***	–0.11	0.35***	–0.29***	—			
11. W3 paternal hostility	2.29	1.02	–0.12*	0.01	0.17**	–0.02	0.17**	–0.14*	0.35***	–0.10	0.49***	–0.14*	—		
12. W3 paternal warmth	4.31	1.44	–0.00	–0.12*	–0.12*	–0.06	–0.18**	0.34***	–0.13*	0.52***	–0.23***	0.66***	–0.09	—	
13. W2 adolescent depressive symptoms	1.55	0.39	–0.03	0.24***	0.26***	0.09	0.42***	–0.37***	0.27***	–0.39***	0.23***	–0.14*	0.05	–0.18**	—
14. W2 adolescent anxiety	1.72	0.65	–0.02	0.15***	0.27***	0.12*	0.37***	–0.25***	0.28***	–0.29***	0.13*	–0.17**	0.09	–0.19**	0.63***
15. W3 adolescent depressive symptoms	1.55	0.38	–0.08	0.10	0.24***	0.11*	0.15**	–0.17**	0.15*	–0.20***	0.23***	–0.24***	0.24***	–0.34***	0.35***
16. W3 adolescent anxiety	1.85	0.67	–0.02	0.16**	0.26***	0.17**	0.18**	–0.08	0.19**	–0.14*	0.25***	–0.13*	0.27***	–0.25***	0.33***
17. W1 maternal hostility	2.76	1.12	0.00	0.20***	0.22***	0.10*	0.50***	–0.28***	0.36***	–0.19***	0.29***	–0.13*	0.15*	–0.11	0.22***
18. W1 maternal warmth	5.18	1.27	0.01	–0.14***	–0.19***	0.05	–0.28***	0.62***	–0.21***	0.42***	–0.22***	0.44***	–0.11	0.28***	–0.26***
19. W1 paternal hostility	2.31	1.04	0.03	0.18***	0.23***	0.08*	0.29***	–0.15**	0.48***	–0.15**	0.13*	–0.02	0.33***	–0.06	0.10*
20. W1 paternal warmth	4.95	1.47	0.04	–0.16***	–0.15***	0.01	–0.26***	0.45***	–0.23***	0.64***	–0.20***	0.36***	–0.12*	0.44***	–0.27***
21. W1 adolescent depressive symptoms	1.56	0.38	–0.02	0.18***	0.31***	0.04	0.38***	–0.34***	0.27***	–0.34***	0.20***	–0.15**	0.06	–0.15**	0.53***
22. W1 adolescent anxiety	1.69	0.61	0.02	0.18***	0.31***	0.15***	0.28***	–0.20***	0.18***	–0.24***	0.14*	–0.14*	0.14*	–0.17**	0.40***
23. W1 adolescent age	12.41	0.97	0.10*	0.12**	0.03	0.12**	0.08	–0.02	0.08	–0.06	–0.10	0.00	0.03	0.01	–0.05
24. W1 adolescent binary gender	0.54	—	–0.07	–0.02	–0.07	0.02	0.01	0.09	–0.10*	0.05	0.06	0.08	–0.19**	0.02	0.19***
25. W1 adolescent nativity	0.25	—	0.03	–0.02	0.02	–0.05	–0.00	–0.07	0.08	–0.02	–0.01	0.01	0.02	0.03	0.09*
26. W1 maternal education	4.81	2.2	–0.02	–0.04	0.01	0.11**	0.00	0.07	–0.05	0.04	–0.03	0.06	–0.12*	0.06	–0.02

Variable	14	15	16	17	18	19	20	21	22	23	24	25
14. W2 adolescent anxiety	—											
15. W3 adolescent depressive symptoms	0.30***	—										
16. W3 adolescent anxiety	0.39***	0.68***	—									
17. W1 maternal hostility	0.22***	0.14*	0.14**	—								
18. W1 maternal warmth	–0.17***	–0.10	–0.05	–0.28***	—							
19. W1 paternal hostility	0.14**	0.13*	0.14*	0.64***	–0.18***	—						

Table 1 (continued)

Variable	14	15	16	17	18	19	20	21	22	23	24	25
20. W1 paternal warmth	–0.24***	–0.12*	–0.12*	–0.27***	0.69***	–0.22***	—					
21. W1 adolescent depressive symptoms	0.41***	0.27***	0.25***	0.43***	–0.32***	0.36***	–0.33***	—				
22. W1 adolescent anxiety	0.51***	0.30***	0.32***	0.36***	–0.18***	0.32***	–0.23***	0.61***	—			
23. W1 adolescent age	–0.01	–0.01	0.01	0.09*	–0.05	0.02	–0.04	–0.08	–0.03	—		
24. W1 adolescent binary gender	0.19***	0.08	0.17**	0.03	0.10*	–0.06	0.05	0.08*	0.10*	–0.04	—	
25. W1 adolescent nativity	0.10*	0.01	0.06	0.01	–0.04	0.01	–0.01	0.07	0.02	0.20***	–0.02	—
26. W1 maternal education	–0.02	–0.05	–0.05	–0.01	0.05	–0.02	0.05	0.01	–0.03	0.01	0.03	–0.03

W1 = Wave 1, W2 = Wave 2, W3 = Wave 3. Adolescent gender and nativity are dummy-coded. For gender, 0 represents male and 1 represents female. For nativity, 0 represents born in the United States and 1 represents born in Mexico

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Model 2

To test the bidirectional association between parenting and adolescent internalizing symptoms, Model 2 then tested the indirect effect of 2013–2017 objective neighborhood disadvantage on Wave 3 parenting practices, through Waves 1 and 2 subjective neighborhood violence to Wave 2 adolescent internalizing symptoms (Fig. 2). The structural models with maternal parenting (RMSEA = 0.050 [90% CI: 0.030–0.071], CFI = 0.941, SRMR = 0.040) and paternal parenting (RMSEA = 0.055 [90% CI: 0.035–0.075], CFI = 0.927, SRMR = 0.041) fitted the data well based on the acceptable cutoff values for model fit CFI ≥ 0.90, RMSEA ≤ 0.08. The result shows that objective neighborhood disadvantage was directly related to lower levels of Wave 3 paternal hostility (Table S2). Furthermore, objective neighborhood disadvantage was indirectly associated with increased maternal hostility, through higher adolescent-perceived neighborhood violence to greater Wave 2 adolescent depressive symptoms.

Moderating Effect of Adolescent Discrimination Experiences

Adolescent discrimination experiences (i.e., ethnic discrimination and group discrimination) significantly moderated the association between 2013–2017 objective neighborhood disadvantage and Waves 1 and 2 subjective neighborhood violence in Models 1 and 2 in Step Three. Simple slopes show that when Mexican-origin adolescents perceived medium and high levels of ethnic discrimination, objective neighborhood disadvantage was associated with higher levels of subjective neighborhood violence (see example simple slope in Fig. 3, and detailed results in Table S3). However, when adolescents experienced low levels of ethnic discrimination, objective neighborhood disadvantage had no influence on how adolescents perceived subjective neighborhood violence. Furthermore, adolescents who experienced high levels of group discrimination were more likely to be influenced by objective neighborhood disadvantage and perceived their neighborhood as high in violence than adolescents who experienced low levels of group discrimination (see example simple slope in Fig. 4 and detail results in Table S3).

Conditional Indirect Effect of Objective Neighborhood Disadvantage on Adolescent Internalizing Symptoms and Parenting Practices Moderated by Adolescent Discrimination Experiences

Model 1

Given that objective neighborhood disadvantage influenced Wave 3 adolescent internalizing symptoms only via

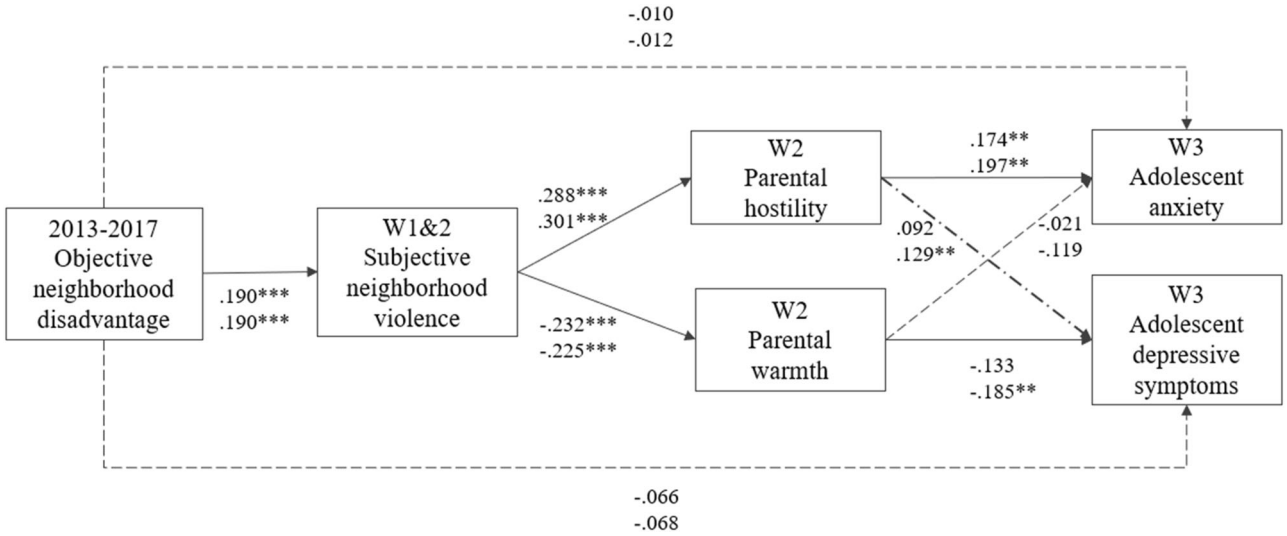

Fig. 1 Model 1: Standardized coefficients of the direct and indirect effect from objective neighborhood disadvantage to adolescent internalizing symptoms. *Note*. W1 = Wave 1, W2 = Wave 2, W3 = Wave 3. Maternal and paternal parenting practices were analyzed in separate models. Coefficients on the top are for the model with maternal parenting, and coefficients on the bottom are for the model with paternal parenting. Solid lines represent significant coefficients for both models with maternal and paternal parenting; dash-dot lines represent significant coefficients for the model with either maternal or paternal parenting; dash lines represent non-significant coefficients for both models with maternal and paternal parenting. $^{**}p < 0.01$, $^{***}p < 0.001$

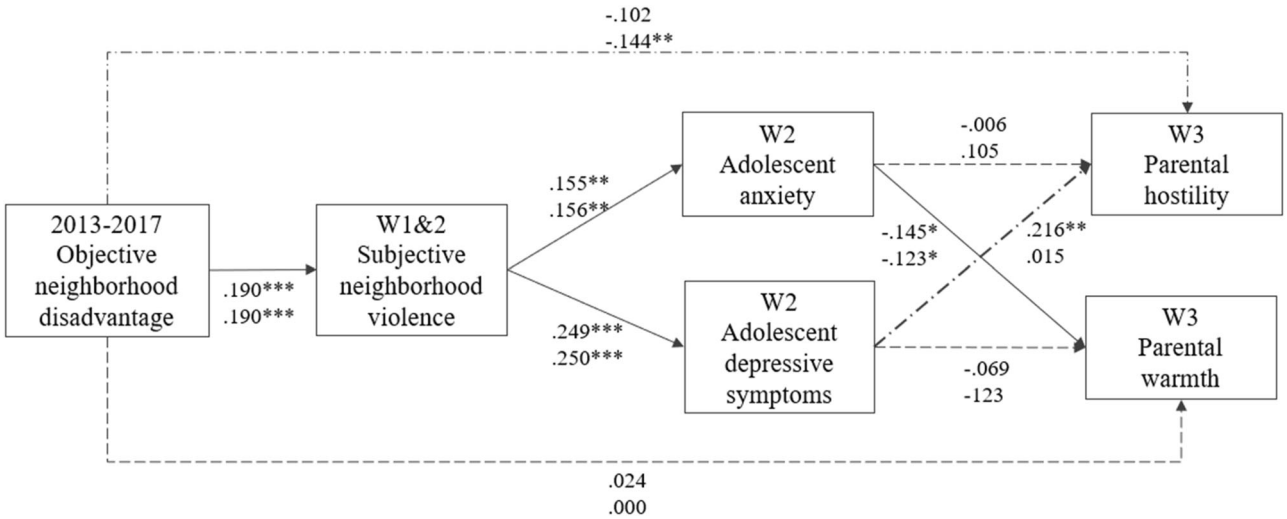

Fig. 2 Model 2: Standardized coefficients of the direct and indirect effect from objective neighborhood disadvantage to parenting practices. *Note*. W1 = Wave 1, W2 = Wave 2, W3 = Wave 3. Maternal and paternal parenting practices were analyzed in separate models. Coefficients on the top are for the model with maternal parenting, and coefficients on the bottom are for the model with paternal parenting. Solid lines represent significant coefficients for both models with maternal and paternal parenting; dash-dot lines represent significant coefficients for the model with either maternal or paternal parenting; dash lines represent non-significant coefficients for both models with maternal and paternal parenting. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}\ p < 0.001$

subjective neighborhood violence to Wave 2 parental hostility, Model 1 tested the moderating effect of Waves 1 and 2 adolescent discrimination experiences on this indirect pathway. The results show that the indirect association between objective neighborhood disadvantage and Wave 3 adolescent anxiety through subjective neighborhood violence to parental hostility was significant when adolescents experienced medium and high levels of ethnic or group discrimination (Table 2). However, objective neighborhood disadvantage did not indirectly influence Wave 3 adolescent anxiety when adolescents experienced low levels of ethnic or group discrimination. A similar pattern was found for Wave 3 adolescent depressive symptoms where objective neighborhood disadvantage

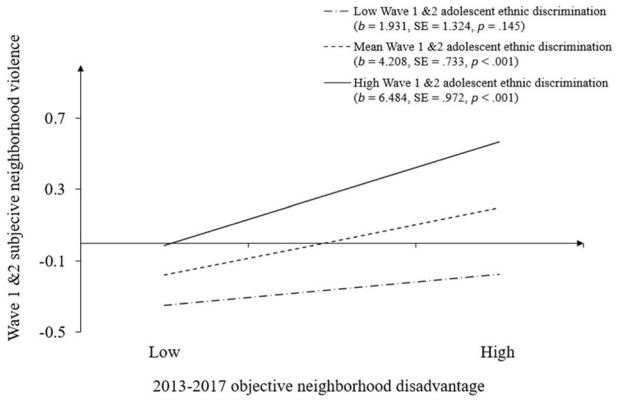

Fig. 3 Moderating effect of adolescent ethnic discrimination on the association between objective neighborhood disadvantage and subjective neighborhood violence. *Note*. 2013–2017 objective neighborhood disadvantage, Wave 1 and 2 subjective neighborhood violence, and Wave 1 and 2 adolescent group discrimination were centered around the mean. The association between 2013–2017 objective neighborhood disadvantage and Wave 1 and 2 subjective neighborhood violence was probed at low (1 *SD* below the mean), mean, and high (1 *SD* above the mean) levels of Wave 1 and 2 adolescent ethnic discrimination. The coefficients and the direction for this interaction were similar for Models 1 and 2; therefore, this figure uses data from Model 1

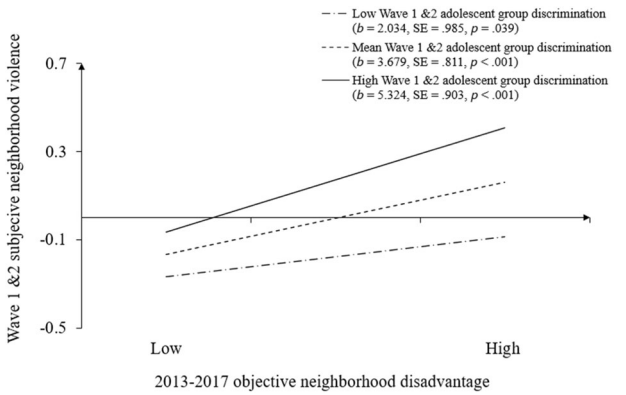

Fig. 4 Moderating effect of adolescent group discrimination on the association between objective neighborhood disadvantage and subjective neighborhood violence. *Note*. 2013–2017 objective neighborhood disadvantage, Wave 1 and 2 subjective neighborhood violence, and Wave 1 and 2 adolescent group discrimination were centered around the mean. The association between 2013–2017 objective neighborhood disadvantage and Wave 1 and 2 subjective neighborhood violence was probed at low (1 *SD* below the mean), mean, and high (1 *SD* above the mean) levels of Wave 1 and 2 adolescent group discrimination. The coefficients and the direction for this interaction were similar for Models 1 and 2; therefore, this figure uses data from Model 1

was indirectly associated with Wave 3 adolescent depressive symptoms through subjective neighborhood violence to Wave 2 paternal hostility when adolescents experienced medium and high levels of ethnic or group discrimination, but not when adolescents experienced low levels of ethnic or group discrimination.

Model 2

Given that objective neighborhood disadvantage influenced Wave 3 maternal hostility only via subjective neighborhood violence to Wave 2 adolescent depressive symptoms, Model 2 then tested the moderating effect of Wave 1 and 2 adolescent discrimination experiences on this indirect pathway. The result shows that the indirect effect of objective neighborhood disadvantage on Wave 3 maternal hostility was stronger when adolescents experienced medium and high levels of ethnic or group discrimination (Table 3). However, objective neighborhood disadvantage was not indirectly associated with Wave 3 maternal hostility when adolescents experienced low levels of ethnic or group discrimination.

Sensitivity Analysis Model: Conditional Indirect Effect of Objective Neighborhood Disadvantage on Adolescent Internalizing Symptoms and Parenting While Controlling for Earlier Waves of Outcomes

Sensitivity analysis further constrained Moldes 1 and 2 to first test the longitudinal influences of 2013–2017 objective neighborhood disadvantage on Wave 3 parenting practices and adolescent internalizing symptoms while controlling for Wave 2 parenting and adolescent internalizing symptoms (Fig. 5). The structural models with maternal parenting (RMSEA = 0.059 [90% CI: 0.046–0.074], CFI = 0.939, SRMR = 0.041) and paternal parenting (RMSEA = 0.058 [90% CI: 0.044–0.72], CFI = 0.940, SRMR = 0.041) fit the data well based on the acceptable cutoff values for model fit CFI ≥ 0.90, RMSEA ≤ 0.08. The same as Model 2, sensitivity analysis found that objective neighborhood disadvantage is directly associated with lower Wave 3 paternal hostility (Table S4). Moreover, the result found a long-lasting effect of objective neighborhood disadvantage on parenting and adolescent internalizing symptoms, through Waves 1 and 2 subjective neighborhood violence. However, there is no significant longitudinal cross-lagged effect.

The sensitivity analysis model then examined the moderating effect of Waves 1 and 2 adolescent discrimination experiences on the indirect pathway from objective neighborhood disadvantage to Wave 3 parenting and adolescent internalizing symptoms through previously identified significant indirect pathways. The results show that the indirect effect of objective neighborhood disadvantage on Wave 3 parental warmth, parental hostility, and adolescent depressive symptoms was stronger when adolescents experienced high levels of ethnic or group discrimination compared to when they experienced low levels of ethnic or group discrimination (Table 4). Moreover, the indirect association between objective neighborhood disadvantage and adolescent anxiety was significantly moderated by group

Table 2 Model 1: Conditional indirect effect of objective neighborhood disadvantage on adolescent internalizing symptoms moderated by adolescent discrimination experiences

	Adolescent Discrimination Experiences					
	W1 & 2 Adolescent Ethnic Discrimination *b* (*SE*)			W1 & 2 Adolescent Group Discrimination *b* (*SE*)		
	−1 SD	Mean	+1 SD	−1 SD	Mean	+1 SD
Conditional indirect effect of objective neighborhood disadvantage on W3 adolescent depressive symptoms						
Through W1 & 2 subjective neighborhood disadvantage to W2 maternal hostility	0.016 (0.017)	0.036 (0.023)	0.055 (0.032)	0.022 (0.019)	0.040 (0.026)	0.058 (0.035)
Through W1 & 2 subjective neighborhood disadvantage to W2 paternal hostility	0.034 (0.028)	**0.073* (0.034)**	**0.113* (0.050)**	0.036 (0.025)	**0.064* (0.032)**	**0.093* (0.043)**
Conditional indirect effect of objective neighborhood disadvantage on W3 adolescent anxiety						
Through W1 & 2 subjective neighborhood disadvantage to W2 maternal hostility	0.056 (0.046)	**0.123* (0.054)**	**0.189* (0.081)**	0.077 (0.051)	**0.140* (0.029)**	**0.202* (0.084)**
Through W1 & 2 subjective neighborhood disadvantage to W2 paternal hostility	**0.092 (0.070)**	**0.200* (0.088)**	**0.308* (0.138)**	**0.097 (0.065)**	**0.176* (0.084)**	**0.254* (0.113)**

Controlled for W1 adolescent gender, age, nativity, and maternal education. The following modifications were estimated: W1 adolescent age WITH W1 and 2 subjective neighborhood violence; W1 and 2 adolescent ethnic and group discrimination experiences WITH W2 parental warmth and hostility; W2 parental hostility WITH W2 parental warmth; W3 adolescent anxiety WITH W3 adolescent depressive symptoms. Bold represents significant coefficients

*$p < 0.05$

Table 3 Model 2: Conditional indirect effect of objective neighborhood disadvantage on parenting practice moderated by adolescent discrimination experiences

	Adolescent Discrimination Experiences					
	W1 & 2 Adolescent Racial Discrimination *b* (*SE*)			W1 & 2 Adolescent Group Discrimination *b* (*SE*)		
	−1 SD	Mean	+1 SD	−1 SD	Mean	+1 SD
Conditional indirect effect of objective neighborhood disadvantage on W3 maternal hostility						
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent depressive symptoms	0.100 (0.089)	**0.218* (0.097)**	**0.335** (0.126)**	0.145 (0.100)	**0.263* (0.118)**	**0.380* (0.148)**
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent anxiety	−0.001 (0.021)	−0.003 (0.045)	−0.004 (0.069)	−0.002 (0.030)	−0.004 (0.054)	−0.006 (0.078)
Conditional indirect effect of objective neighborhood disadvantage on W3 paternal hostility						
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent depressive symptoms	0.008 (0.044)	0.017 (0.093)	0.025 (0.142)	0.008 (0.045)	0.014 (0.081)	0.021 (0.117)
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent anxiety	0.037 (0.033)	0.080 (0.055)	0.123 (0.086)	0.039 (0.030)	0.070 (0.049)	0.101 (0.071)

Controlled for W1 adolescent gender, age, nativity, and maternal education. The following modifications were estimated: W1 adolescent age WITH W1 and 2 subjective neighborhood violence; W1 and 2 adolescent ethnic and group discrimination experiences WITH W3 parental warmth and W2 adolescent depressive symptoms; W3 parental hostility WITH W3 parental warmth; W2 adolescent anxiety WITH W2 adolescent depressive symptoms; W1 adolescent gender WITH W2 adolescent depressive symptoms. Bold represents significant coefficients

*$p < 0.05$, **$p < 0.01$

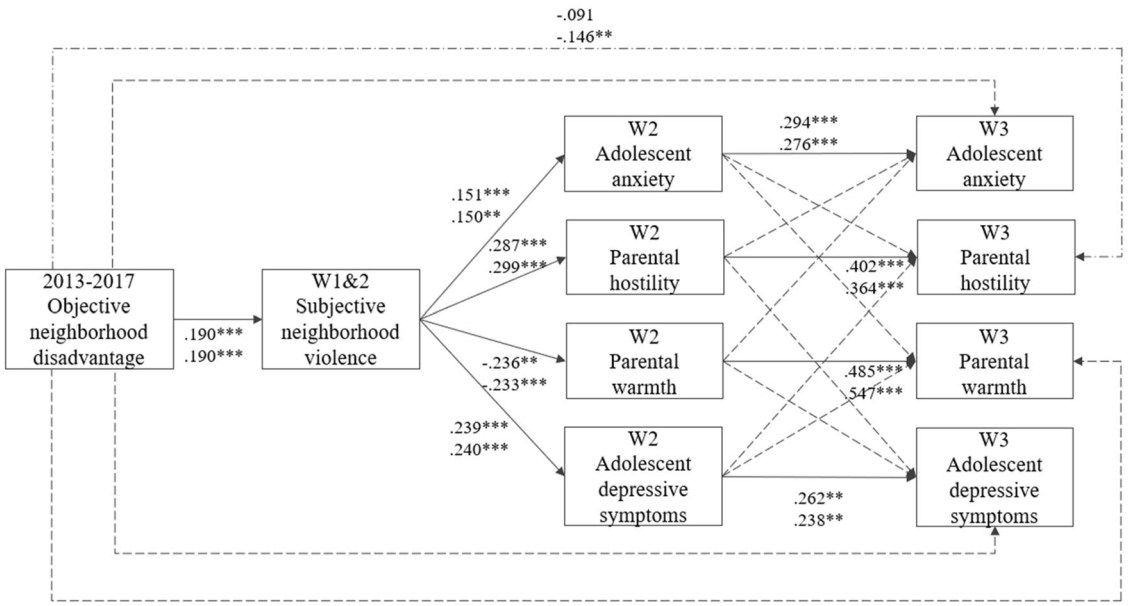

Fig. 5 Sensitivity analysis model: Standardized coefficients of the direct and indirect effect from objective neighborhood disadvantage to adolescent internalizing symptoms and parenting practices. *Note*. W1 = Wave 1, W2 = Wave 2, W3 = Wave 3. Maternal and paternal parenting practices were analyzed in separate models. Coefficients on the top are for the model with maternal parenting, and coefficients on the bottom are for the model with paternal parenting. Solid lines represent significant coefficients for both models with maternal and paternal parenting and; dash lines represent non-significant coefficients for both models with maternal and paternal parenting. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

discrimination but not ethnic discrimination (Table 4). Specifically, objective neighborhood disadvantage was indirectly associated with adolescent anxiety when adolescents experienced medium and high levels of group discrimination, but not when adolescents experienced low levels of group discrimination.

Given the complexity of the three models, only significant results were reported in the text to maintain clarity. However, coefficients for all mediational paths can be found in Figs. 1, 2, 4 and Tables S1, 2, 4.

Discussion

While previous research suggests that objective neighborhood disadvantage negatively impacts parenting and adolescent mental health (McBride Murry et al., 2011), few studies have explored how such influence may vary across cultural factors (i.e., discrimination experiences). The current study extends existing research by demonstrating that the influence of objective neighborhood disadvantage on Mexican-origin adolescent internalizing symptoms (i.e., anxiety and depressive symptoms) and parenting practices (i.e., parental hostility and warmth) via subjective neighborhood violence depends on adolescent's discrimination experiences (i.e., ethnic and group discrimination). The findings reveal that the negative impact of objective neighborhood disadvantage on adolescent internalizing symptoms and parenting through subjective neighborhood violence is most pronounced when adolescents face high levels of ethnic or group discrimination. Conversely, when adolescents encounter low levels of discrimination, neighborhood disadvantage has minimal or no impact on adolescent internalizing symptoms and parenting. Taken together, future policies should not only provide financial aid to address neighborhood deprivation but also implement psychoeducation to advocate diversity and reduce discrimination experiences particularly for Mexican immigrant families who reside in disadvantaged communities.

Influence of Objective Neighborhood Disadvantage on Subjective Neighborhood Violence Varies by Levels of Adolescent Discrimination Experiences

Consistent with previous literature (Stevens & Thijs, 2018; Taylor et al., 1990), the study reveals that adolescents tend to report lower levels of ethnic discrimination ($M = 1.367$, $SD = 0.428$) than group discrimination ($M = 3.176$, $SD = 0.783$). Although there is a discrepancy between adolescent-reported ethnic and group discrimination, both types of discrimination moderate the association between objective neighborhood disadvantage and subjective neighborhood violence. Specifically, Mexican-origin adolescents who experience higher levels of ethnic or group discrimination tend to be more vulnerable to objective neighborhood disadvantage and perceive the neighborhood as more violent. Adolescents exposed to higher levels of ethnic discrimination may become more sensitive to

Table 4 Sensitivity analysis model: Conditional indirect effect of objective neighborhood disadvantage on parenting practices and adolescent internalizing symptoms moderated by adolescent discrimination experiences

	Adolescent Discrimination Experiences					
	W1 & 2 Adolescent Racial Discrimination *b* (*SE*)			W1 & 2 Adolescent Group Discrimination *b* (*SE*)		
	−1 SD	Mean	+1 SD	−1 SD	Mean	+1 SD
Conditional indirect effect of objective neighborhood disadvantage on W3 adolescent anxiety						
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent anxiety	0.028 (0.029)	0.060 (0.043)	0.093 (0.062)	0.058 (0.036)	**0.105* (0.047)**	**0.152* (0.065)**
Conditional indirect effect of objective neighborhood disadvantage on W3 adolescent depressive symptoms						
Through W1 & 2 subjective neighborhood disadvantage to W2 adolescent depressive symptoms	0.035 (0.031)	**0.077* (0.036)**	**0.118* (0.050)**	**0.050* (0.036)**	**0.105* (0.047)**	**0.152* (0.065)**
Conditional indirect effect of objective neighborhood disadvantage on W3 maternal hostility						
Through W1 & 2 subjective neighborhood disadvantage to W2 maternal hostility	0.218 (0.146)	**0.474*** (0.121)**	**0.730***(0.198)**	**0.300* (0.148)**	**0.543*** (0.139)**	**0.786***(0.173)**
Conditional indirect effect of objective neighborhood disadvantage on W3 maternal warmth						
Through W1 & 2 subjective neighborhood disadvantage to W2 maternal warmth	−0.273 (0.163)	**−0.592*** (0.169)**	**−0.912** (0.319)**	**−0.354* (0.165)**	**−0.642*** (0.160)**	**−0.930*** (0.217)**
Conditional indirect effect of objective neighborhood disadvantage on W3 paternal hostility						
Through W1 & 2 subjective neighborhood disadvantage to W2 paternal hostility	0.210 (0.150)	**0.457*** (0.131)**	**0.704*** (0.196)**	0.256 (0.136)	**0.463** (0.143)**	**0.671*** (0.183)**
Conditional indirect effect of objective neighborhood disadvantage on W3 paternal warmth						
Through W1 & 2 subjective neighborhood disadvantage to W2 paternal warmth	**−0.372* (0.241)**	**−0.807** (0.236)**	**−1.242** (0.409)**	**−0.448* (0.209)**	**−0.812*** (0.226)**	**−1.175*** (0.322)**

Controlled for W1 adolescent gender, age, nativity, and maternal education. The following modifications were estimated: W1 and W2 adolescent ethnic and group discrimination experiences WITH W2 adolescent depressive symptoms, W2 adolescent anxiety, W2 parental hostility, and W2 parental warmth; W2 adolescent anxiety and depressive symptoms WITH W2 parental warmth and hostility and W3 adolescent anxiety and depressive symptoms; W2 and W3 parental warmth WITH W2 and W3 parental hostility. Bold represents significant coefficients

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

systemic inequities linked to their identity, such as inadequate infrastructure and limited community resources, which may lead to a predominant focus on the negative aspects of their community, reinforcing negative perceptions of their neighborhood (Hipolito-Delgado, 2010; Sue & Lambert, 2021). Similarly, heightened levels of group discrimination may reinforce systemic inequities associated with an individual's ethnic or cultural group, fostering feelings of neglect and insecurity that contribute to negative perceptions of their community (Sykes et al., 2017). On the other hand, when adolescents experience low ethnic or group discrimination, objective neighborhood disadvantage has less or no influence on their perception of the neighborhood. This protective effect of low ethnic or group discrimination may stem from reduced exposure to and internalization of negative societal messages regarding their racial or ethnic identity and group (Hipolito-Delgado, 2010). With fewer such negative narratives, adolescents may be more likely to focus on positive aspects of their community, such as social support from individuals with similar cultural and socioeconomic backgrounds, fostering a more favorable perception of their neighborhood environment (Ornelas & Perreira, 2011). These results underscore the complex interplay between personal discrimination experiences and structural neighborhood disadvantage in shaping youth perceptions of neighborhood and developmental consequences. Implementing policies that allocate resources and establish programs promoting inclusivity is crucial for addressing systemic inequities and reducing discrimination among Mexican-origin communities.

Interplay between Discrimination and Objective Neighborhood Disadvantage on Parenting and Adolescent Internalizing Symptoms via Subjective Neighborhood Violence

Supported by the family stress model (Conger et al., 2010), the current study revealed that subjective neighborhood violence puts Mexican-origin adolescents at a higher risk of internalizing symptoms through parenting practices (Model 1). Specifically, Mexican-origin adolescents who perceived their neighborhoods as violent reported experiencing higher levels of parental hostility in early adolescence, subsequently leading to higher adolescent anxiety and depressive symptoms in late adolescence. In accordance with family systems theory (Brown, 1999), the study further demonstrates the bidirectional association between parenting and adolescent internalizing symptoms. Specifically, adolescents who perceive higher levels of neighborhood violence are more likely to show depressive symptoms, which in turn increases their perception of maternal hostility (Model 2). While the current study shows that both maternal and paternal parenting contribute to adolescent internalizing symptoms (Model 1), the influence of adolescent internalizing symptoms on parenting is observed only for mothers but not for fathers (Model 2). This may indicate that the effect of parenting on adolescent internalizing symptoms is more stable than vice versa. It could be due to the fact that adolescents are still in a developmental period where their psychological functioning and cognition are easily influenced by their parents (Merikangas et al., 2010). In contrast, parents have established beliefs and values that are relatively stable (Arnett, 2000), so their parenting practices may be less likely to be influenced by their adolescent children.

While Models 1 and 2 demonstrate the longitudinal impact of neighborhood disadvantage on Mexican-origin adolescent internalizing symptoms and parenting, sensitivity analysis indicates that such indirect influence no longer exists when accounting for baseline levels of adolescent internalizing symptoms and parenting. This could suggest that the potential bidirectional influence between parenting and adolescent internalizing symptoms may occur in a shorter time period, rather than across four years as captured in the current study. This may be because the bidirectional influence relies on parents and adolescents engaging in immediate feedback loops, where they promptly respond to each other's behaviors or emotions (Fite et al., 2006). More importantly, the current study focused on adolescent-perceived parenting and adolescents' perceptions of parenting may evolve over time as their cognition matures, which can influence how they process and respond to parental behaviors, ultimately altering the dynamics of the feedback loop in the long term (Williams & Ciarrochi, 2020). Future studies may benefit from using daily diary or intensive longitudinal designs to examine how neighborhood disadvantage influences the dynamic of parenting and adolescent internalizing symptoms in a shorter time frame.

Moving beyond family systems theory (Brown, 1999), the current study also reveals that the indirect influence of objective neighborhood disadvantage on Mexican-origin parenting and adolescent internalizing symptoms differs across levels of adolescent ethnic and group discrimination. Specifically, high levels of adolescent ethnic or group discrimination amplify the indirect effect of objective neighborhood disadvantage on Mexican-origin parenting and adolescent internalizing symptoms through subjective neighborhood violence. Families living in disadvantaged neighborhoods may already experience economic stress. Heightened ethnic and group discrimination further reinforces systemic inequities that are pronounced in disadvantaged neighborhoods, creating cumulative stress that adversely affects family members' mental health and undermines parents' ability to provide supportive parenting (Sue & Lambert, 2021; White et al., 2012). Conversely, when adolescents experience low levels of discrimination,

perceived maternal hostility and internalizing symptoms are not affected by objective neighborhood disadvantage via subjective neighborhood violence. This may be because, without the additional stress imposed by discrimination, Mexican-origin families are better able to manage and cope with the challenges of living in disadvantaged neighborhoods, making them less likely to be influenced by the adverse effects of neighborhood disadvantage (Barnett et al., 2016; Umaña-Taylor & Updegraff, 2007). The findings suggest that reducing adolescent discrimination experiences based on their ethnic group could be crucial for minimizing the negative impact of neighborhood disadvantage on parenting and adolescent internalizing symptoms in Mexican immigrant families. Enhanced psychoeducation to promote diversity and anti-discrimination practices may be particularly effective for Mexican-origin adolescents living in disadvantaged neighborhoods (Parra-Cardona et al., 2019). Future policy efforts should not only provide financial support to reduce neighborhood deprivation but also incorporate strategies to mitigate discrimination experiences to promote better adolescent mental health and positive parenting among Mexican immigrant families.

Limitations

Although the current study makes many contributions, it also has some limitations. First, the participants of the current study were recruited from Texas, United States, so results may not apply to other states or countries. Second, all measured variables with the exception of neighborhood disadvantage are based on adolescents' reports. This may lead to reporting bias, as parents may perceive neighborhood violence, their parenting practices, and adolescent internalizing symptoms differently from their children. Discrepancies between parents and adolescents may also influence the results. Future studies may need to consider including reports from both parents and adolescents to avoid reporting bias and also examine how reporter discrepancies may impact research results. Third, the study did not address other economic variables that could confound the impact of objective neighborhood disadvantage. Future studies should consider controlling for economic stress-related variables, such as family economic stress, as a covariate to avoid confounding influences and provide a more precise examination of how neighborhood disadvantage affects Mexican immigrant families. Fourth, the current study utilized ZIP code tabulation areas rather than census tracts for variable clustering. Census tracts have better statistical uniformity, given that a single census tract has a population of 4000 but a single ZIP code has a population of 10,000 (Aydin & Morefield, 2011). This means that census tracts may provide more specific information about a smaller area. Future studies may need to consider using census tracts for neighborhood clustering to verify whether the results differ from studies using ZIP codes. Fifth, parenting practices may vary based on parental gender roles. For example, Mexican-origin fathers who adhere to machismo values tend to demonstrate higher levels of both warmth and hostility, while mothers who internalize marianismo values tend to exhibit higher levels of warmth but lower levels of hostility (Chen et al., 2021). Due to the complexity of the current study, the role of parental gender in shaping parenting practices was not examined. Future research, however, should consider investigating whether the indirect effect of neighborhood disadvantage on adolescent internalizing symptoms through subjective neighborhood violence to parenting may differ based on parental gender. Finally, approximately 15.3% ($n = 91$) of adolescents in Wave 1 of the current study had parents who were neither married nor cohabiting in a marriage-like relationship. This lack of parental co-residence may affect the accuracy of adolescents' perceptions of parenting practices due to reduced parent-child interaction. Future research should consider controlling for parental marital status as a covariate to mitigate its potential influence on the studied variables.

Conclusion

Mexican immigrant families experience a high level of objective neighborhood disadvantage, which negatively impacts parenting practices and adolescent internalizing symptoms. The current study utilized a longitudinal design to observe the longitudinal indirect influences of objective neighborhood disadvantage on Mexican-origin adolescent internalizing symptoms and parenting practices from early to late adolescence and how such association may vary across youth discrimination experiences. The study shows that objective neighborhood disadvantage indirectly increases maternal hostility and adolescent internalizing symptoms in late adolescence through subjective neighborhood violence and such indirect associations were stronger when adolescents experienced higher levels of ethnic or group discrimination in early adolescence. As such, more policy efforts to reduce neighborhood disadvantage are needed in Mexican-origin communities to promote adolescent mental health and positive parenting. Future interventions should also consider cultural influences to develop culturally sensitive approaches that address the discrimination experiences Mexican-origin adolescents may encounter.

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Authors' contributions Y.D. conceptualized the study, conducted statistical analyses, interpreted the results, and drafted the manuscript; W.W. provided guidance in conducting statistical analyses, interpreted

the results, and provided a critical review of the manuscript; S.C. interpreted the results and provided reviews of the manuscript; S.Y.K. designed the larger project, collected data, conceptualized the study and interpreted the results, and provided reviews of the manuscript. All authors contributed to the review of the manuscript and approved the final manuscript.

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Data Sharing Declaration The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process During the preparation of this work, the authors used Grammarly to clean up typos and fix grammatical mistakes. After using this tool/service, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All study materials and procedures were approved by the institutional review board at the University of Texas at Austin (2015010006).

Informed Consent Informed consent was obtained from all individual participants included in the study.

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