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Social environment risk factors for violence, family context and trajectories of social-emotional functioning among Latinx adolescents

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Abstract

Introduction: High social-emotional functioning, including emotion regulation and non-violent conflict resolution, constitute developmental competencies of adolescence that promote health and wellbeing. We used prospective longitudinal data from a predominantly Latinx population to understand how family context and social environment risk factors for violence related to patterns of social emotional functioning during the transition between middle school and high school.

Methods: We prospectively interviewed 599 8th graders every six months for two years. We used trajectory models to explore longitudinal patterns of emotion regulation and nonviolent problem solving and multinomial regression to distinguish how these groups were associated with family context, partner and peer gang involvement, and neighborhood social disorder.

Results: Youth reporting lower neighborhood disorder in 8th grade were more likely to be in the high emotion regulation trajectory group. Youth without exposure to gangs through peers and partners in 8th grade were more likely to be in the high non-violent problem-solving skills trajectory group. Family cohesion was associated with being in the high trajectory groups for both emotional regulation and problem-solving skills.

Conclusion.—Emotion regulation and nonviolent problem-solving skills had different associations with the social environment risk factors for violence examined, indicating that mechanisms of influence and strategies for intervention may vary. The association between

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problem-solving skills and exposure to gangs through peers and partners shows that social norms may be important targets of change. Additionally, interventions with parents that build family cohesion during adolescence may buffer environmental exposures that shape adolescents' ability to practice protective social emotional behaviors.

Keywords

Adolescent; family support; violence; emotional functioning; nonviolent problem solving

Background:

High social-emotional functioning constitutes a critical developmental competency that contributes to positive health trajectories through adolescence. Social emotional development is multi-faceted and consists of an individual's experience, expression, and management of emotions as well as the ability to establish positive and rewarding relationships with others (California Department of Education, 2019). In this paper, we focus on two social emotional competencies that develop throughout adolescence, emotion regulation and use of nonviolent problem-solving strategies. Both have been identified as protective factors tied to improved mental health and wellbeing, higher academic engagement, lower risk-taking and decreased engagement in violence among adolescents (Bornstein et al., 2010; Denham et al., 2009; Hanson et al., 2015; Hessler & Katz, 2010; McMahon et al., 2013; Yurgelun-Todd, 2007).

Social emotional competencies and violence:

Social environments assume important influences on social emotional functioning and other health outcomes during adolescence. For example, impulsivity and problem-solving skills are related to living in a context where aggressive, antisocial or violent behavior is normalized by peers, school or community environments, reflected in neighborhood safety, gang activity or prevalence of violent crime (Forster et al., 2015; Huesmann & Guerra, 1997; Kliewer et al., 2004; Lenzi et al., 2019; McMahon et al., 2013; Salzinger et al., 2002). Exposure to community violence, including high rates of violent crime or witnessing violence, has been associated with anxiety, depression, disruptive and aggressive behavior, substance use, school disengagement, sexual risk and academic failure (Cooley-Quille et al., 2001; Cooley-Strickland et al., 2009; Gorman-Smith & Tolan, 1998; Lorion et al., 2009; Mendelson et al., 2010; Osofsky, 1999; Schwab-Stone et al., 1999; Voisin et al., 2014; Wilson et al., 2012). Social-emotional functioning develops throughout adolescence into early adulthood and can protect against the potentially negative effects of being in a social environment characterized by risk factors for violence (Blakemore & Choudhury, 2006; LeBlanc et al., 2011; Shorey et al., 2015; Yurgelun-Todd, 2007). As highlighted in a 2019 National Academies of Sciences report, the rapid brain development that occurs during adolescence presents an opportunity to redress negative consequences of adverse environmental exposures and establish skills and wellbeing that support thriving during and beyond adolescence (National Academies of Sciences Engineering and Medicine., 2019). There is a reciprocal relationship between violence and emotion regulation whereby youth who are exposed to violence develop chronic stress responses that make them hypersensitive to threats. This hypersensitivity can increase a child's likelihood of reacting aggressively in

ambiguous social situations or developing normalizing beliefs about aggression (Bradshaw & Garbarino, 2004; Foster & Brooks-Gunn, 2009; Guerra et al., 2003; Su et al., 2010). Similarly, the use of non-violent problem solving strategies are protective in the relationship between neighborhood violence and adverse outcomes by decreasing the distress associated with violence and have been shown to decrease violent behaviors in intervention studies (Farrell et al., 2001; LeBlanc et al., 2011).

Strategies to bolster social emotional competencies:

Understanding which factors may increase or decrease the protective benefits of social emotional functioning in youth exposed to violence offers a promising direction for promoting well-being in this age group. Intervention studies have provided some evidence that social-emotional skills are modifiable and that promoting such skills can strengthen educational engagement and decrease risky behaviors in adolescence (Bradshaw & Garbarino, 2004; Farrell et al., 2001; Flay et al., 2004; Hawkins et al., 2005; Houck et al., 2016; McMahon et al., 2013). Indeed, this evidence base has informed the inclusion of these social emotional competencies as key components of widely-adopted youth violence prevention interventions (Espelage et al., 2015). However, most of the research on risk and protective factors associated with social emotional functioning has been cross-sectional, with few studies examining the developmental trajectories of social emotional competencies on a population level over time besides an acknowledgment that they develop throughout adolescence (Cooley-Strickland et al., 2009; Gorman-Smith & Tolan, 1998; Salzinger et al., 2002). It is likely that groups may be distinguished by characteristics of their social environment (i.e., partner and peer gang involvement and neighborhood social disorder) with these factors comprising targets for interventions to increase social emotional functioning skills. Similarly, few studies have examined the effects of distinct facets of the social environment (neighborhood, peer, partner) on different developmental competencies and assessed what protective family factors influence these competencies and might mitigate adverse social environment effects during early and middle adolescence. Most evidence is from urban settings with few studies conducted outside of large metropolitan areas or with Latinx populations (Cooley-Strickland et al., 2009; Gorman-Smith & Tolan, 1998; Salzinger et al., 2002). Further, most research focuses primarily on direct violence victimization and perpetration although it is clear that living in a neighborhood with high safety concerns and exposure to violence can influence adolescent developmental skills (Forster et al., 2015; Huesmann & Guerra, 1997; Kliewer et al., 2004; Lenzi et al., 2019; McMahon et al., 2013; Salzinger et al., 2002). More research is needed to characterize the relationship between social-emotional functioning and social environment risk and protective factors for violence among youth residing in communities in which neighborhood safety comprises an important social determinant of health.

Researchers and public health practitioners have encouraged the use of an ecological approach to addressing community violence, recognizing the protective effects of other environmental contexts, including family structure and support, in moderating adverse effects of violence exposure among youth (Buka et al., 2001; Kliewer et al., 2004; Margolin, 2005; Overstreet et al., 1999; Salzinger et al., 2002). Family support has attenuated the effects of community violence on violence perpetration, aggressive behaviors and mental

health among adolescents (Gorman-Smith et al., 2004; Kliewer et al., 2006; Overstreet et al., 1999). Additionally, higher family cohesion and less family conflict have been associated with lower negative emotional reactivity and social and emotional health in emerging adulthood (Fosco et al., 2012; Morris et al., 2007; Rabinowitz et al., 2016). Families lower in cohesion may have poorer communication making family members less effective in decreasing distress among emotionally reactive youth in these contexts (Rabinowitz et al., 2016). Maternal communication, particularly supportive responses and expressivity, has also been shown to influence adolescent impulsivity, ability to express emotion and conflict resolution skills (Fosco et al., 2012; Ioffe et al., 2020; Morris et al., 2007).

Study objectives:

The goal of our study is to use prospective longitudinal data from a predominantly Latinx population to better understand the influence of protective family context and social environment risk factors for violence (partner and peer gang involvement; neighborhood social disorder) on population level patterns of two social emotional competencies during the transition between middle school and high school (grades 8 to 10), a time characterized by both normative and social transitions. We used group trajectory-based modeling to determine whether there are distinct groups of adolescents on a population average level who share common patterns in social-emotional functioning over time. We then explore how these trajectories are distinguished by protective family characteristics and social environment risk factors for violence.

Methods:

Study Population:

We analyzed data from *A Crecer*: The Salinas Teen Health Study. *A Crecer* is a prospective cohort study that was designed to understand the social and developmental transition between early and middle adolescence to identify opportunities to intervene on social and environmental factors with the objective of improved health and wellbeing. *A Crecer* enrolled 599 8th grade youth attending public middle school in Salinas, California. Salinas is an urban center of an agricultural county in California's central coast with a predominately Latinx population. Eligibility criteria included being aged 12 to 15 years old, enrolled in eighth grade, able to speak English or Spanish, intending to live in Salinas for the next year, and willing to provide contact information for a parent who could provide consent for study enrollment. Participants were followed prospectively for two years with study visits every six months for a total of five visits. At each visit, questionnaires were administered by bilingual interviewers at community-based locations, with sensitive behavioral questions including measures of social environment risk factors for violence completed independently using audio computer-assisted self-interviewing (ACASI). Youth provided written assent at their baseline study visit. The RTI Institutional Review Board approved all study procedures. Study retention was high over four waves of follow-up (92% completed the 2-year visit) and there were no differences in retention by participant characteristics (Minnis et al., 2022). Our analysis includes all adolescents enrolled in the original cohort for the duration of the study period who completed any study visits. Additional study details including about study recruitment strategy can be found elsewhere (Comfort et al., 2018).

Measures:

Measures of social-emotional competencies: The outcome of use of non-violent problem solving strategies was defined using the validated Use of Nonviolent Strategies subscale from Beliefs About Aggression and Alternatives Scale (α=0.73) (Bettencourt & Farrell, 2013; Farrell et al., 2001). The scale includes 5 items, with four response options for each: “strongly agree”, “agree somewhat”, “disagree somewhat” and “strongly disagree.” Items include: “If I’m mad at someone I just ignore them;” “I try to talk out a problem instead of fighting;” “even if other kids would think I’m weird, I would try to stop a fight;” “when my friends fight, I try to get them to stop;” and “there are better ways to solve problems than fighting.” A continuous mean score was used in the analysis, with a high score indicating greater problem-solving skills. Emotion regulation was measured with four items adapted from the Middle School Survey for Social, Emotional, and Bullying Behavior, selected for alignment with the emotion regulation competency targeted with the Second Step middle school program (α=0.76) (Espelage et al., 2015). The scale includes 4 items on a 4-point Likert scale that asked participants to indicate how “true” each item was for them, from 1-“not true” to 4-“very true”. Example scale items include, “My emotions make me do things I regret later” and “I get carried away by my feelings.” A continuous mean score was used in the analysis and was coded so that a higher score indicated greater emotion regulation. For both scales, missing responses to items in the scale were imputed using the mean of all other items only if the participant answered more than half of the scale items.

Measures of partner and peer gang involvement, neighborhood disorder and family context: Protective family characteristics and social environment risk factors for violence were selected based on prior work from this study which has highlighted the importance of these measures for health and wellbeing in this population. (Boyce et al., 2020; Minnis et al., 2022; Raymond-Flesch et al., 2017, 2021). Social environment risk factors for violence included partner in a gang, peer gang involvement (any close friends or people regularly spending time currently affiliated with or in a gang), and neighborhood disorder. Peer and partner exposures were dichotomous measures (yes/no). Neighborhood disorder was measured by the frequency of experiencing 11 events in one’s neighborhood of residence (Ewart & Suchday, 2002). Items were drawn from the 11-item neighborhood disorder subscale of the city stress inventory, which was developed and validated for use in adolescents in a low-income urban setting. Items assess a spectrum of experiences related to neighborhood disorder or witnessing crime such as hearing adults arguing on the street, seeing people dealing drugs, encounters with law enforcement, a shooting or gunshots near one’s home and witnessing someone being robbed or mugged. Frequency was recorded on a 4-point scale that included: “never happened”, “once”, “a few times”, or “often”. A composite score reflected a count of the total number of events occurring at least once during the past year.

Measures of family context included both household structure and social factors. The structural measure assessed stability as whether at least one parent moved for work during the year (yes/no). Family support included two scales, one assessing maternal communication and one measuring family cohesion. Family support includes a cohesion measure that assesses the support and emotional closeness aspect of culturally-based

familism. Maternal communication was a continuous mean score developed based on a validated measure with 10 items that assess communication ease, parental attentiveness and satisfaction using a four-point Likert scale (α=0.81) (Miller et al., 2000). Example items include, “I can tell my mother how I feel about everything” and “I find it easy to discuss problems with my mother.” Family cohesion was a continuous mean score derived from 6 items measured with a four-point Likert Scale that assess the extent of emotional closeness, dependability and support and included items such as, “family members ask each other for help” and “family members feel very close to each other” (α=0.79) (Gorman-Smith & Tolan, 1998; Tolan et al., 1997). We also descriptively examined other sociodemographic characteristics at baseline including age, biological sex (male/female), mother’s education level, living situation (reside with both parents/mother only/other living situation), immigrant generation, country of origin, food insecurity, had a romantic partner in the last 6 months and alcohol use in the last six months.

Statistical Analysis: We used group-based trajectory modelling to identify trajectories of social emotion functioning (emotional regulation and non-violent problem solving). Trajectory modelling facilitates identification of latent groups of individuals whose outcomes of interest follow a similar trajectory over time. We then examined how these trajectories related to one another and to characteristics at enrollment.

Group-based trajectory modeling is a data-driven approach which uses study data to identify the number of groups that best fit the data and the shape of the trajectory for each group (Jones & Nagin, 2013; Nagin, 2014; Nagin et al., 2018). We first fit a series of unconditional trajectory models for each outcome to identify the most appropriate number of trajectory groups, considering up to six groups to allow for heterogeneity while maintaining interpretability. Model fit was determined using seven criteria: (1) how groups corresponded with substantive literature about trends; (2) average posterior class probabilities of class membership; (3) Akaike Information Criteria (AIC; smaller values indicating better fit); (4) Bayesian Information Criteria (BIC; smaller values indicating better fit); (5) entropy (use class probabilities for each variable and values closer to one indicate accurate classifications); (6) percentage and size of smallest trajectory group and (7) the log likelihood of each model (Nagin et al., 2018). After the best-fitting number of trajectories was selected, we then considered constant, linear, quadratic, and cubic shape specifications for each trajectory group, selecting a final model through visual inspection of the data and using fit statistics described above for fitting individual group trajectories (Appendix table 1). As an exploratory analysis, trajectories were fit separately but sex but were ultimately combined because patterns were generally within sex.

After fitting trajectories for each outcome, we considered how trajectories of emotional regulation and problem solving co-evolved over time. To examine the interrelationships, we used a dual-trajectory model (Jones & Nagin, 2013; Nagin et al., 2018). The dual-trajectory model relates all measurements of the outcomes of interest- emotional regulation and problem solving- in a single summary statistical model. This dual-trajectory model provides probabilities for membership in one trajectory class conditional upon classification in the other.

Models were then expanded to include baseline predictors of trajectory group membership. Baseline characteristics were included to distinguish how social environment risk factors for violence and family context related to membership in each trajectory group. The final model also included biological sex to control for potential differences by sex. Associations are modelled using a multinomial logistic regression model for trajectory outcomes. The group characterized by the lowest emotion regulation or use of non-violent strategies was chosen as the referent group for all models. Analyses were done using Stata version 16; trajectory models were estimated using the *traj* command. Due to the small number of missing (<10%), we did not impute missing data.

Results:

A total of 599 participants in grade 8 were enrolled with two years of follow up. The median age at enrollment was 13 (range 12–15). Most participants were Latinx (n=566, 94.5%) and of Mexican origin (n=531, 88.6%), were U.S. born with immigrant parents (n=422, 70.4%) and had a mother with educational attainment of less than high school (n=255, 42.6%) or high school (n=177, 30.0%) (Table 1). Approximately half the sample was female (n=316, 52.7%). Most participants lived with their mother (n=448, 74.8%), 14.5% had at least one parent move for work during the year (n=87) and measures of family context were relatively high for family cohesion (mean score 3.3 of 4), and maternal communication (mean score 2.8 of 4). At enrollment, about one fifth (n=126, 21.1%) of participants had a close friend or someone they hung out with who was in a gang, 9.2% had a partner in a gang (n=55), and the mean score of exposure to 5 types of neighborhood disorder events in the previous year (range 0–11).

Figures 1 shows the average trajectories and individual longitudinal patterns of emotion regulation and non-violent problem-solving skills over two years in the study (8^{th}-10^{th} grades for nearly all participants). As depicted, average patterns for both outcomes were relatively stable over time and, for the majority, scores were high overall (Figure 1A and 1B). We identified four trajectories of emotion regulation based on model fit statistics (BIC=−6583.93; AIC=−6548.78; Smallest group n=25; Entropy 0.78; Appendix A). The largest group, which comprised 48.8% of the population (group 3), had a stable mid- to high- trajectory, followed by a stable low emotion regulation group (Group 1=25.4%) and a stable high emotion regulation group (Group 4=21.4%). Only an estimated 4.3% (Group 2) belonged to an increasing trajectory from low to high emotion regulation over the time period (Figure 1A). As presented in the second set of trajectories in Figures 1C, there was more variation in individual longitudinal patterns over time with the largest variations in the larger low and middle trajectories.

We identified three trajectories of non-violent problem-solving skills (BIC=−6575.26; AIC=−6551.08; Smallest group n=41; Entropy 0.80; Appendix table 1). As depicted in Figure 1B, the largest group had a stable mid-level trajectory (Group 2, 57.8%), followed by a stable high (Group 3, 34.8%) and stable low trajectory (Group 1, 7.5%). Again, there was more variation in individual longitudinal patterns for the high and middle groups, which had the largest number of participants (Figure 1D).

Trajectories of emotional regulation and problem solving overlapped in the same direction but were not completely identical (Table 2). Among the low problem-solving skills trajectory group most participants had low (50.0%) or mid-to-high (49.0%) emotion regulation with very few in the high group (4.9%). Among the high problem-solving trajectory group, most participants had mid-to-high (47.8%), or high (31.0%) emotion regulation with fewer in the low group (14.5%).

Table 3 shows the results from a multinomial logistic regression model examining baseline family context, and social environment characterized by risk factors for violence in relation to trajectory group membership (full results in Appendix B). Compared to low emotion regulation, the odds of membership in the highest trajectory group decreased for each increase in neighborhood disorder events (Odds Ratio (OR) 0.79; 95% confidence interval (CI) 0.71, 0.89) and increased for each one-point increase in maternal communication (OR 2.57; 95% CI 0.97, 6.81) and family cohesion (OR 3.20; 95% CI 1.45, 7.07). Compared to low non-violent problem solving, the odds of membership in the highest non-violent problem-solving skills trajectory group were lower in those who had a partner in a gang at enrollment (OR 0.11; 95% CI 0.02, 0.48) and who had friends in a gang (OR 0.30, 95% CI 0.11, 0.84). The odds of membership in the high problem-solving skills group increased with higher family cohesion scores (OR 3.10; 95% CI 1.12, 5.29). Females were less likely to be in the high emotion regulation group (OR 0.22 95% CI; 0.21, 0.41) but were more likely to be in the high nonviolent problem-solving group (OR 2.32; 95% CI: 1.02, 5.29), showing that competencies may vary by biological sex but that overall associations with exposure to violence and family context remain strong after controlling for sex.

Discussion:

Emotion regulation and non-violent problem-solving skills appeared generally high in this sample of 8th grade predominantly Latinx youth, with most (75%) classified within the moderate to high trajectory groups on these two measures of social emotional development. For most trajectories, the average scores did not change over the two-year follow-up period, although there was substantial variation in individual patterns within the trajectory groups. As anticipated, emotion regulation and non-violent problem-solving skills were related to one another. Trajectories for these measures nonetheless were distinct over time, reflected in the finding that membership in the high trajectory group for one factor did not necessarily align with high trajectory membership for the other. Likewise, they had slightly different associations with social environment characterized by risk factors for violence. Those reporting lower neighborhood disorder in 8^{th} grade had higher emotion regulation skills over the period of early to middle adolescence. Youth without interpersonal exposure to gangs through peers and partners in 8^{th} grade reported higher non-violent problem-solving skills that persisted over time. Family context, and stronger family cohesion, reporting support and emotional closeness with family, in 8^{th} grade, in particular, was associated with both higher emotion regulation and higher problem-solving skills over the subsequent two years.

We had anticipated that we would see greater change in the trajectories of these two social emotional competencies during this period, given participants' shifts from middle to high school alongside the cognitive changes and identity development that accompany growth in

early and middle adolescence (Dahl, 2004; Dahl et al., 2018). The group-based trajectories, however, suggested that the levels remained consistent, on average, over time. Nonetheless, in our exploration of individual patterns within the trajectory groups, we found that even though the groups were consistently high or low, for example, there was still considerable variation within group. This movement signals the opportunity for interventions to support improved behavioral outcomes and underscores continued potential for school-based delivery of universal group-based trauma-informed interventions (e.g., *Second Step* (Moy & Hazen, 2018)*; Project POWER* (Mendelson et al., 2015, 2020), which integrates education on the effects of stress, emotion regulation skills taught through mindfulness, and cognitive behavioral therapy and is currently being evaluated in a randomized controlled trial) during the early and middle adolescent years. Given the association of these social emotional competencies with multiple health outcomes (Bornstein et al., 2010; Denham et al., 2009; Hanson et al., 2015; Hessler & Katz, 2010; McMahon et al., 2013; Yurgelun-Todd, 2007), strengthening skills and the capacity to sustain high levels consistently may be important to realizing the positive benefits they afford. In particular, the middle group for both factors, which constituted approximately half the sample, showed considerable variation in emotion regulation and non-violent problem-solving skills over the two-year period. While our analysis focused on identifying multi-level factors at baseline that distinguished average trajectory groups, quantifying changes within these trajectories and additional examination of short-term effects that may be underlying individual changes using growth-mixture modeling could inform intervention strategies that address proximal exposures.

The two factors measured are different social emotional competencies (emotion regulation and non-violent problem-solving skills). The predictors that characterized trajectory groups differed for these two measures, suggesting mechanisms of influence and effective approaches to strengthen these competencies may vary. Neighborhood violence exposure, as measured by a neighborhood disorder index, was associated with emotion regulation trajectory, with increases in exposure to neighborhood disorder associated with lower emotion regulation. In contrast, exposures through peers and partners were influential to non-violent problem-solving skills. Bandura's social cognitive theory (Bandura, 1971; Edberg, 2007), a widely-used behavioral theory that underpins the development of numerous evidence-based health interventions for adolescents, conceptualizes behavior change as occurring through reciprocal relationships between personal, behavioral and environmental factors. In the context of environmental and personal barriers tied to and exacerbated by community violence, social cognitive theory posits that individuals can learn to adopt healthy behaviors. At the personal level these include increasing knowledge, favorable attitudes, and outcome expectations that address the perceived value and consequences of, for example, use of non-violent strategies to resolve peer conflict. At the behavioral level these include increased skills and self-efficacy to practice healthy behaviors. As social cognitive theory recognizes the importance of environment on individual behavior, the findings here highlight the potential to engage peers to leveraging positive social influence and address social norms as targets of change in the social environment. Likewise, the strong protective influence of families – particularly embodied in the support and emotional closeness achieved through high family cohesion, found to support sustained higher levels of both social emotional competencies, underscores the opportunity for dyadic interventions

with parents and youth to buffer environmental exposures that shape adolescents' ability to practice protective social emotional behaviors (Gonzales et al., 2014). We found that family cohesion was associated with both outcomes and maternal communication was associated with emotion regulation, highlighting the importance of parents in setting norms related to expression and communication. These measures of family context may be more amenable to intervention than factors such as neighborhood disorder and should remain an important target (Gonzales et al., 2014)for future interventions to promote resilience and well-being. Research with Mexican-origin adolescents and their parents, for example, has elucidated a relationship between emotional coregulation, that is, connection in daily emotions of happiness and distress, tied to how well the parent-adolescent dyads got along, signaling mechanisms of effect for family-based intervention. (Mercado et al., 2019)

While group-based trajectory models are an informative way to examine longitudinal patterns over time, it is a data driven approach and therefore the trajectories that emerge are dependent on the time period of the study and sample size. Our study includes information from the period between 8th grade to 10th grade. It is likely that emotion regulation and non-violent problem-solving skills are still developing during this period and are affected by social context that may also be changing over time. The brain regions involved in these competencies undergo significant structural and functional development during adolescence and changes in these competencies vary with both sex and age and should be considered in future research (Ahmed et al., 2015; Bender et al., 2012; Theurel & Gentaz, 2018). Furthermore, the two-year follow-up period, while aligned with shifts from middle school to high school and growth in the importance of peer relationships and social identity, may have been insufficient in duration to observe large changes in competencies and skills. While we anticipated the social transition between middle and high schools might have been accompanied by more substantial changes for adolescents, we may have seen more dramatic changes had we followed adolescents later into high school and early adulthood. Some of the trajectories that were identified may have also begun at earlier ages or could vary with earlier exposure to violence and other social determinants of health.

Additionally, measures of family violence were not included in the study and measures of social environment exposure to risk factors for violence do not capture directly violence victimization, perpetration or witnessing violence directly. Maternal communication should be expanded upon in future work to better account for family structure and gender. Future studies should also examine additional parent-adolescent relationship qualities such as closeness, warmth, and conflict and other protective peer influences which were not included in this study. Lastly, our sample was primarily second-generation adolescents whose parents immigrated from Mexico or other Central American countries. Thus, we did not have sufficient variation in the sample to integrate these factors into this analysis. This remains an important area for further work.

Group-based trajectory models are a function of sample size; hence, with a larger sample, we may have identified subgroups with potentially more changes over time. The within-group movement observed for some of the trajectory groups that, on average, appeared relatively consistent over time, signals this possibility. Future analyses could use methods like growth mixture modeling to better understand variations within trajectory groups.

Lastly, the group characterized as moving from low to high emotion regulation was quite small, precluding analysis of factors associated with this trajectory in our sample.

In conclusion, emotion regulation and nonviolent problem-solving skills were both associated with family context and being in a social environment characterized by risk factors for violence. Nonetheless these measures had slightly different associations with distinct exposures within these two domains, indicating that mechanisms of influence and approaches to strengthen these competencies may vary. Emotion regulation was more strongly associated with neighborhood disorder illustrating how chronic stress through environmental exposure can lead to aggressive reactions. Conversely, those with higher non-violent problem-solving skills were less likely to have interpersonal exposure to gangs through peers and partners. The association between problem solving skills and interpersonal exposure shows potential to engage peers to address social norms as targets of change in the social environment. Lastly, family context, family cohesion most prominently, was associated with both higher emotion regulation and higher problem-solving skills over the subsequent two years. This evidence supports the promise of dyadic interventions with parents and youth to buffer environmental exposures that shape adolescents' ability to practice protective social emotional behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability:

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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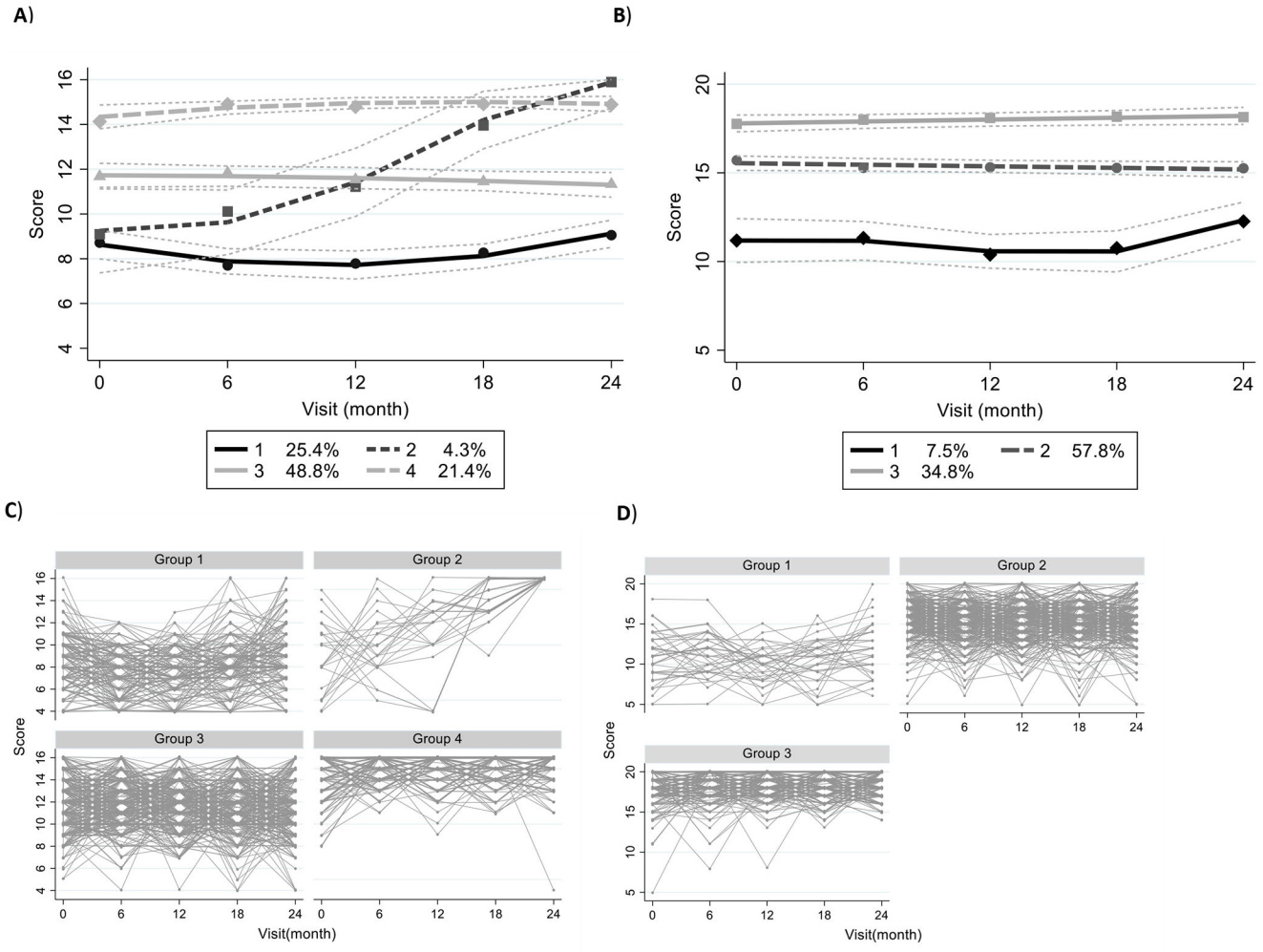

Figure 1:

Average trajectories of A) emotion regulation and b) non-violent problem solving and changes in all individual values over time for c) emotion regulation and d) problem solving

Table 1:

Participant baseline sociodemographic, interpersonal and environmental characteristics, A Crecer Study, Salinas, California (N=599)

Baseline sociodemographic characteristics	**N (%)**
Age, years – *mean (range)*	13.7 (12.3, 15.2)
Male	283 (47.3)
Female	316 (52.7)
Immigrant Generation	
1st: born outside of the US	71 (11.9)
2nd: US born/immigrant parents	422 (70.4)
3rd+; US born and parents US born	97 (16.2)
US born; generation unknown	9 (1.5)
Mother's education level	
Less than high school	255 (42.6)
High School	177 (30.0)
More than high school	149 (25.9)
Unknown	18 (3.0)
Latino origin (at least one parent/grandparent)	566 (94.5)
Country of origin- Mexico (at least one parent/grandparent)	531 (88.6)
Food insecurity/hunger in past 6 months	46 (7.7)
Had boyfriend/girlfriend in past 6 months	291 (48.8)
Ever drank alcohol in past 6 months	78 (13.0)
Family context	
Living situation	
Live with both parents	448 (74.8)
Live with mother only	132 (22.0)
Other	19 (3.2)
At least one parent moves for work during the year	87 (14.5)
Maternal communication, 1–4: high – *mean score (range)*	2.8 (1.5, 3.6)
Family cohesion, 1–4: high – *mean score (range)*	3.3 (1.8, 4.0)

Baseline sociodemographic characteristics	N (%)
Social environment characterized by risk factors for violence	
Partners affiliated with or in a gang in past 6 months	55 (9.2)
Close friends or people spend time with are in a gang	126 (21.1)
Neighborhood disorder, number of events – *mean (range)*	5 (0,11)

Missing (N); Had a boyfriend (3); Gang affiliated partner (3); Gang social exposure (1);

Table 2:

Estimated percentage and standard error (SE) in each trajectory of emotional regulation conditional on problem solving group membership

	Emotional Regulation Trajectory Group				
	Low (25.4%)	**Mid-to-High (49.0%)**	**High (21.4%)**	**Increasing (4.2%)**	**Total**
	Percent (SE)	**Percent (SE)**	**Percent (SE)**	**Percent (SE)**	
Problem Solving Trajectory Groups					
Low (8.0%)	50.0 (10.0)	45.1 (10.1)	4.9 (4.2)	0.0 (0.0)	100
Middle (58.6%)	28.3 (3.9)	50.2 (4.1)	18.1 (3.0)	3.4 (1.6)	100
High (33.5%)	14.5 (3.9)	47.8 (5.1)	31.0 (4.2)	6.6 (2.5)	100

Table 3:

Odds ratios (OR) and 95% confidence intervals for the association between baseline characteristics and membership in each trajectory group of emotion regulation and non-violent problem solving, adjusted for sex

	Emotion Regulation		Non-violent Problem Solving	
Trajectory Group	**OR**	**95% (CI)**	**OR**	**95% (CI)**
Low	(Referent)		(Referent)	
Middle				
Social environment characterized by risk factors for violence				
Partner in a gang	0.73	(0.29,1.81)	**0.30**	**(0.11,0.8)**
Close friends or people spend time with are in a gang	0.78	(0.39,1.56)	0.53	(0.21,1.33)
Neighborhood disorder event count	**0.88**	**(0.8,0.97)**	0.92	(0.79,1.06)
Family context				
Maternal communication, mean score	1.44	(0.68,3.04)	0.77	(0.24,2.54)
Family cohesion, mean score	1.89	(0.98,3.65)	2.14	(0.82,5.58)
At least one parent moves for work during the year	0.87	(0.44,1.73)	1.53	(0.47,4.98)
Biological sex (reference=male)	**0.38**	**(0.22,0.65)**	1.45	(0.66,3.17)
High				
Social environment characterized by risk factors for violence				
Partner in a gang	0.36	(0.08,1.73)	**0.11**	**(0.02,0.48)**
Close friends or people spend time with are in a gang	0.67	(0.28,1.64)	**0.30**	**(0.11,0.84)**
Neighborhood disorder	**0.79**	**(0.71,0.89)**	0.88	(0.76,1.02)
Family context				
Maternal communication, mean score	**2.57**	**(0.97,6.81)**	2.42	(0.69,8.46)
Family cohesion, mean score	**3.20**	**(1.45,7.07)**	**3.10**	**(1.12,8.57)**
At least one parent moves for work during the year	0.89	(0.39,2.01)	1.80	(0.53,6.17)
Biological sex (reference=male)	**0.22**	**(0.12,0.41)**	**2.32**	**(1.02,5.29)**

Bold P<0.05; Note: The increasing group is not shown due to small sample sizes within this group (N=25 total). The full model is available in Appendix B.