Research Article

Parent-Adolescent Interactions and Substance Use: A Prospective, Observational Study of Mexican-Origin Families

D Angus Clark[1]*, M Brent Donnellan[2] and Richard W Robins[3]

[1]Department of Psychology, Michigan State University, USA

[2]Department of Psychology, Texas A & M University, USA

[3]Department of Psychology, University of California, USA

*Corresponding author: D Angus Clark, Department of Psychology, Michigan State University, USA, Tel: 302-465-2089; E-mail: clarkd46@msu.edu

Abstract

The quality of the parent-adolescent relationship is an important predictor of adolescent substance use. Most research in this area however has relied on questionnaire-based assessments of both substance use and interpersonal family dynamics, and has typically focused on European American samples. These gaps are addressed in the current study by evaluating prospective associations between behaviour coded from parent-adolescent interactions in 7th grade and substance use in 9th and 12th grade, in a longitudinal sample of Mexican-origin youth (N = 674). Adolescents' observed behaviours towards parents, especially hostility, were significantly but weakly associated with future substance use. Parents' behaviours towards adolescents were generally not significantly associated with future substance use. Results add to the literature examining the relevance of family processes in the development of substance use, and offer converging evidence regarding the role of early aggressive tendencies and later substance use.

Introduction

Substance abuse is associated with many adverse mental and physical health outcomes [1-3]. An early age at initiation is a relatively strong predictor of later substance abuse [4-6], which suggests that a developmental perspective might provide important insights into the etiology of substance abuse. The present investigation examines how observed interaction patterns between early adolescents and their parents, and the overall quality of the parent-adolescent relationship, predict substance misuse in a longitudinal sample of Mexican-origin youth. Most developmental models of substance use implicate both dispositional and contextual factors [7-10]. For example, adolescents who are aggressive and lack self-control [9,11,12], as well as those who associate with deviant peers [7,8], are more likely to use substances. With most youth still living at home with their parent(s), the family environment is one important context to consider [7,13]. The quality of the parent-adolescent relationship is likely to be one especially consequential aspect of the family environment [14]. For example, a positive relationship may be crucial for instilling conventional, anti-substance use convictions in adolescents, whereas a negative relationship may push adolescents toward substance use [7,8]. Prior research supports the idea that a positive parent-adolescent relationship predicts less substance use, whereas a negative relationship puts youth at risk [13,14]. Meta-analytic evidence indicates that a positive parent-adolescent relationship predicts later initiation of alcohol use, and less problematic alcohol use later in life [14]. There is also evidence that parent-adolescent relationship quality predicts future use of tobacco, marijuana, and other illicit substances [15,16]. Moreover, intervention programs that improve the quality of the parent-child relationship have been shown to delay the onset and reduce the rate of substance use [17]. The overall quality of the parent-adolescent relationship is an important construct because it represents a holistic composite of many family processes. However, it is also important to consider specific aspects of the parent-adolescent relationship, such the specific behaviours that parents and adolescents exhibit toward each other. For example, higher levels of parental warmth, support, and positive communication in the context of parent-adolescent interactions appear to be protective factors against substance use, whereas conflict increases risk [13,14,18]. Although most frequently studied in majority European or European-American samples, these relations appear to generalize to other populations. For example, positive and warm communication patterns predict decreased substance use in Mexican origin and other ethnic minority samples [19,20]. Similarly, conflict between Mexican-origin youth and their parents predicts increased substance use [21,22].

Notably, most studies in this area rely on parent and/or adolescent reports of parent-adolescent interaction patterns, and adolescent reports of substance use. This raises concerns about shared method variance when interpreting associations between the two constructs. Moreover, even when there is not an issue with reporter overlap, there is a chance that youth that use substances (and their parents) may provide negatively biased reports of their interactions. Thus, it is important to supplement this report-based work with research in which parent-child interactions are directly observed and coded [23]. Observational assessments are more difficult and time consuming than questionnaire-based assessments to collect and score (e.g., coders must be trained and kept reliable with the coding system and other coders), however they offer a powerful compliment to questionnaires in that they are free of any potential respondent bias, and typically have established, standardized scoring schemes [23].

Although there is a substantial body of research examining associations between parent-adolescent interactions and substance use

based on questionnaire methods (see above), we are aware of only a few studies that examine this topic via observational assessments of parent-adolescent interaction [23-26]. There is some evidence that observed parental warmth towards adolescents is associated with less substance use, whereas observed parental hostility towards adolescents is associated with more substance use [25,26]. Chaplin and colleagues [24], on the other hand, found no evidence linking observed behaviours in a parent-adolescent interaction task to adolescent substance use. Importantly, most existing studies in this vein have focused primarily on parents' observed behaviours towards adolescents. Hops and colleagues [23], however, considered both parents' and adolescents' observed behaviour during a problem solving task. They found that parents' observed behaviours were generally unrelated to adolescent substance use, but adolescents who demonstrated more aggression and irritability with their mothers and fathers were more likely to use alcohol, cigarettes, and marijuana. Although the existing observation-based work on parent-adolescent interactions is informative, there is a need for more research that evaluates associations between observed parent-adolescent interactions and substance use, especially using ethnically diverse samples. The existing studies were conducted using predominantly European-American families or using cross-sectional designs and relatively small samples. We add to this literature by testing associations between observed parent-adolescent interactions and substance use in a large, longitudinal sample of Mexican-origin adolescents. Mexican-origin adolescents are an important population to study given that they represent one of the largest and fastest growing ethnic groups in the United States, and may be at greater risk for the use of certain substances than other groups [27,28]. It is therefore advantageous to understand the factors that predict substance use in this population, and the extent to which certain such factors are universal or culture specific. In addition to considering observed interactions, we also examine how parent and youth reports of their overall relationship quality predict substance use; this provides a contrast between observational and report methods, and between specific interactive behaviours and family members' subjective experience of the family environment. This prospective, multi-method approach to studying family dynamics and adolescent substance use adds to the existing literature and offers a way to estimate how methodological factors influence associations between parent-child relationships and substance use.

Method

Participants and procedures

The data come from the California Families Project, a longitudinal study of 674 Mexican-origin youth (50% girls) and their parents. To recruit participants, children were drawn at random from rosters of students in the Sacramento and Woodland, CA, school districts. The focal child had to be in the 5th grade, living with her or his biological mother (82% of youth come from two parent households), and of Mexican origin (i.e., of Mexican ancestry); 29% of focal children were born in Mexico. The first assessment occurred when the youth were in 5th grade (M_{age} = 10.40 years, SD = 0.61). Participants were interviewed in their homes by trained interviewers in Spanish or English, depending on preference. The parents were not present when their child was interviewed. To collect the observational data, families participated in 20 min video recorded tasks. Parent-adolescent dyads (mother-adolescent, father-adolescent) were instructed by the interviewer to discuss their life together. Cue cards with relevant

questions were provided by the interviewer to facilitate discussion. During these sessions the interviewer and other parent (if a two-parent family) were absent. These sessions were rated by trained coders. Coders were trained over a 2-3 month period, and subsequently participated in recurring training sessions to prevent drift. Videos were randomly assigned to each coder, 20% of sessions were randomly selected to be rated by a second coder in order to gauge inter-rater reliability. The current study is based on observational and relationship quality data from the 7th grade assessment (M_{age} = 12.80 years, SD = 0.49), and substance use data from the 9th (M_{age} = 14.27 years, SD = 0.53) and 12th grade assessments (Mage = 17.69 years, SD = 0.48). Seventh grade substance use data were also included as control variables. The 7th grade observational and relationship quality data were used because they come from when participants were just entering adolescence. The 9th and 12th grade substance use data were used because these waves represent the beginning and end of high school. These are also major milestones of adolescence, and span a time in the lifespan when rates of substance use typically increase [29]. At the 7th grade assessment, 532 youth, 522 mothers, and 288 fathers participated in the observational assessments; 576 youth, 574 mothers, and 384 fathers provided reports on relationship quality. In 9th grade, 604 youths (90% of the original sample) provided information on substance use, and in the 12th grade, 600 did (89% of the original sample). The adolescents for whom fathers were present did not generally differ in their rates of substance use compared to those whose fathers were not (Cohen's ds range from 0.06 to 0.22).

Measures

Observed warmth and hostility

Interactive sessions were rated using the Iowa Family Interaction Rating Scales [30]. The IFIR is a coding system designed to assess the nature of behavioural exchanges, and overall family processes. The IFIRS includes twelve dyadic interaction scales. Observers score each code on a 1-9 scale, 9 indicating stronger or more frequent evidence. These twelve scales were used to create two composites, warmth (coefficient αs between 0.85 and 0.86) and hostility (αs between 0.78 and 0.85). These composites were created by averaging together the scores of individual scales. Overall, four composites were created for each dimension: one from the adolescent to each of the parents (e.g., adolescents' hostility towards mothers), and one from each parent to the adolescent (e.g., mothers' warmth towards adolescents). For the 20% of videos that were double coded, the intra-class correlations between raters for the individual warmth scales ranged from 0.68 (adolescent to father) to 0.70 (mother to adolescent), and for the individual hostility scales ranged from 0.77 (father to adolescent) to 0.80 (child to father).

Relationship quality

Relationship quality was assessed with a 3 or 4 item scale (depending on informant; mothers and fathers completed a 4 item scale, youth completed the 3 item scale) that was originally developed for use within the Iowa Youth and Families Project (later the Family Transitions Project) [31]. This scale is meant to serve as an overall evaluative judgement of the relationship between parents and their children. Adolescents filled out this questionnaire in reference to both their mothers (α = 0.57) and fathers (α = 0.69), and mothers (α = 0.69) and fathers (α = 0.56) filled out this questionnaire in reference to the target adolescent. Participants responded on a four point scale ranging

from 1 "Very dissatisfied" to 4 "Very Satisfied". Sample items include "How satisfied are you with relationship with your mom / dad" and "During the past 12 months, has being a parent to [target adolescent] been an enjoyable experience"? Scores were computed by summing up the individual item responses.

Substance use

The 18-item Alcohol, Tobacco, and Other Drug Use scale, adapted from Elliott, Huizinga, and Ageton [32] for the California Families Project, measures lifetime use of a wide range of substances, as well as recent frequency of substance use. The first 9 items were used to measure lifetime substance use. Participants responded "yes" or "no" to questions such as, "Have you ever used or tried cigarettes?", and "Have you ever used or tried beer – more than just a few sips?" "Yes" responses were coded 1, and "no" responses were coded 0. In 9th and 12th grade, beer (9th grade, n = 168; 12th grade, n = 261) and marijuana (9th grade, n = 100; 12th grade, n = 193) were the substances most likely to have been used by participants, inhalants were the least (9th grade, n = 4; 12th grade, n = 4). Responses across all 9 items were summed to generate a total lifetime substance use score. The second set of 9 items was used to measure the frequency of substance use over the past 3 months. Participants responded to questions such as, "In the past 3 months, how many times have you used or tried cigarettes" on a 5 point scale that ranged from 0 ("never") to 4 ("almost every day"). In both 9th and 12th grade, marijuana was the substance most frequently endorsed as being used in the past three months (9th grade, n = 25; 12th grade, n = 50), whereas inhalants were the least (9th grade, n = 1; 12th grade, n = 1). Responses across these 9 items were summed to generate a total substance use frequency score.

Data Analytic Strategy

The data analytic strategy consisted of three major steps. First, prospective zero-order correlations were examined between observed behaviour and reports of relationship quality in 7th grade, and the substance use variables in 9th and 12th grade. Second, a series of prospective multiple regression models were run in which the substance use variables in 9th and 12th grade were each regressed on one of the interaction variables (i.e., warmth or hostility), and the corresponding substance use variable in 7th grade. This tests the extent to which family dynamics in 7th grade are related to future substance use controlling for prior substance use. Finally, a series of moderated multiple regression models were run to test whether the prospective associations between observed behaviour and reports of relationship quality, and future substance use, differed for boys vs. girls. In all analyses, we set an alpha level of 0.05 to determine statistical significance, but focused on effect sizes. We used the conventional rule of thumb whereby correlations (and standardized regression coefficients) around 0.10 are considered small and correlations around 0.30 are considered moderate [33].

Results

Descriptive statistics and intercorrelations for observed warmth and hostility, and relationship quality, are reported in Table 1.

	1	2	3	4	5	6	7	8	9	10	11	12
Observed Warmth												
1. Adolescent to Mother												
2. Adolescent to Father	0.44*											
3. Mother to Adolescent	0.27*	0.24*										
4. Father to Adolescent	0.16*	0.30*	0.17*									
Observed Hostility												
5. Adolescent to Mother	-0.09*	0.02	-0.07	-0.03								
6. Adolescent to Father	-0.13*	0.03	-0.01	-0.05	0.50*							
7. Mother to Adolescent	-0.10*	0.13*	0.01	0.07	0.50*	0.26*						
8. Father to Adolescent	-0.11	-0.07	0.03	0.04	0.24*	0.35*	0.16*					
Relationship Quality												
9. Adolescent to Mother	0.28*	0.18*	0.15*	0.09	-0.13*	-0.07	-0.10*	-0.15*				
10. Adolescent to Father	0.19*	0.14*	0.10*	0.08	-0.18*	-0.14*	-0.20*	-0.15*	0.43*			
11. Mother to Adolescent	0.25	0.12*	0.17*	0.13*	-0.19*	-0.06	-0.17*	-0.11	0.28*	0.18*		
12. Father to Adolescent	0.13*	0.14*	0.11*	0.14*	-0.18*	-0.15*	-0.09	-0.05	0.18*	0.24*	0.29*	
M	30.97	30.96	40.23	30.95	20.43	20.09	20.84	20.58	100.38	90.87	140.61	140.8
SD	0.90	0.94	10.01	0.98	10.08	0.86	10.04	10.01	10.42	10.79	10.63	10.3

Note: M = Mean; SD = Standard Deviation. Values come from 7th grade assessment. * = p < 0.05

Table 1: Descriptive statistics for observed interactions and reported relationship quality.

	9th Grade		12th Grade	
	Lifetime Substance Use	**Substance Use Frequency**	**Lifetime Substance Use**	**Substance Use Frequency**
Adolescent to Mother				
Observed Warmth	-0.11* (-0.08)	-0.07 (-0.06)	-0.07 (-0.05)	-0.03 (-0.03)
Observed Hostility	0.12* (0.09*)	.07 (0.06)	0.11* (0.09*)	0.00 (0.00)
Relationship Quality	-0.10* (-0.04)	-0.12* (-0.10*)	-0.13* (-0.09*)	0.00 (0.01)
Adolescent to Father				
Observed Warmth	0.05 (0.06)	0.06 (0.07)	0.04 (0.04)	0.07 (0.08)
Observed Hostility	0.13* (0.12)	0.08 (0.08)	0.05 (0.04)	0.02 (0.02)
Relationship Quality	-0.14* (-0.02)	-0.14* (-0.09*)	-0.15* (-0.06)	0.02 (0.04)
Mother to Adolescent				
Observed Warmth	-0.01 (0.03)	0.01 (0.03)	-0.01 (0.02)	0.07 (0.09)
Observed Hostility	0.06 (0.05)	0.06 (0.06)	0.04 (0.02)	-0.01 (-0.01)
Relationship Quality	-0.15* (-0.06)	-0.13* (-0.09*)	-0.14* (-0.08)	-0.11* (-0.09*)
Father to Adolescent				
Observed Warmth	-0.02 (-0.02)	-0.01 (-0.02)	-0.08 (-0.08)	0.01 (0.01)
Observed Hostility	0.04 (0.03)	-0.04 (-0.04)	0.09 (0.08)	0.10 (0.09)
Relationship Quality	-.12* (-.08)	-0.12* (-0.10*)	-0.16* (-0.13*)	-0.16* (-0.15*)
M	1.06 (0.26)	0.66 (0.15)	1.98	1.27
SD	1.83 (0.87)	1.93 (0.94)	1.98	2.77
% No Use	63.90 (87.00)	81.10 (95.30)	45.00	68.20

Note: M = Mean; SD = Standard Deviation; % No Use = Percentage of adolescents reporting no substance use intentions or behaviours. Bolded correlations are significantly different across 9th and 12th grade. Zero order correlations outside of parentheses, betas controlling for 7th grade substance use variables inside of parentheses; Means, standard deviations, and % No Use for 7th grade substance use variables in parentheses. * = p < 0.05.

Table 2: Correlations between observed interactions and relationship quality in 7th grade and substance use in 9th and 12th grade.

Consistent with work that has used this observational paradigm in the past with different types of samples (e.g., European American families, young adult romantic couples), participants displayed more warmth towards each other than hostility [25,34]. However, in absolute terms the participants here demonstrated overall lower levels of warmth [34] and hostility [25] towards each other than has been observed in other samples. Descriptive statistics for the substance use variables can be found in Table 2. As would be expected, scores on the substance use variables increased over time. By 12th grade, more than 50% of participants reported having used at least one substance at some point, and around 40% reported using substances in the past 3 months.

Tables 2 shows the correlations between observed behaviour and substance use in 9th grade, as well as standardized regression coefficients controlling for prior substance use in 7th grade. Generally, observed youth behaviours were somewhat related to lifetime substance use, but not recent substance use frequency. Youth who exhibited warm behaviour toward their mothers during the 7th grade interaction task were less likely to have ever used substances in 9th grade. Conversely, youth hostility toward mothers and fathers was significantly associated with more lifetime substance use by 9th grade. After controlling for prior (7th grade) lifetime substance use and frequency, the findings for observed hostility remained significant (albeit attenuated) whereas those for observed warmth did not. Parents' observed behaviours towards their adolescents were only weakly associated with the 9th grade substance use variables, with correlations ranging from 0.01 to 0.06 (mean r = 0.03).

Table 2 also shows associations between observed behaviour in 7th grade and 12th grade substance use. In general, the effect sizes were smaller than those for 9th grade substance use, however these differences were not statistically significant (Table 2). Adolescent hostility towards mothers was significantly associated with lifetime substance use, and this association remained significant after controlling for 7th grade substance use. No other observed behaviours significantly predicted substance use. Correlations across all family members ranged in size from 0.00 to 0.11 (mean r = 0.05).

Relationship quality in 7th grade was negatively associated with both substance use outcomes in 9th grade, regardless of whether it was reported by adolescents, mothers, or fathers. Correlations ranged in size from 0.10 to 0.15 (mean r = 0.13), indicating small effects. In 12th grade, all informants' reports of relationship quality were again significantly, negatively associated with lifetime substance use, but only mothers' and fathers' reports predicted substance use frequency. Correlations ranged in size from 0.00 to 0.16 (mean r = 0.11), again indicating relatively small effects overall. Importantly, prospective correlations were often substantially reduced - several to non-significance - after controlling for 7th grade substance use (Table 2).

Finally, sex differences were considered. Males and females on the whole did not differ substantially in their degree of reported substance use (Cohen's ds between 0.02 and 0.28), nor were there notable sex differences in the amount of warmth (Cohen's ds between 0.04 and 0.27) and hostility (Cohen's ds between 0.03 and 0.11) observed, or the overall reports of the quality of the relationship (Cohen's ds between 0.10 and 0.15). Multiple regression models with interaction terms (e.g., adolescent warmth to mother X adolescent sex) were run to test whether the main results reported above were moderated by adolescent sex. Although there was some evidence of significant moderation, effects were sporadic, and no clear pattern emerged across grades and variables (full results available upon request). The one exception was that adolescent sex moderated the association between observed adolescent warmth towards fathers and lifetime substance use in 9th and 12th grade, and substance use frequency in 9th grade. Specifically, girls' observed warmth towards fathers was significantly more predictive of future substance use than boys' observed warmth.

Discussion

We evaluated behaviour coded from parent-adolescent interactions prospectively predicted substance use behaviours using data from a large, multi-informant and longitudinal study of Mexican-origin youth and their families. Observed behaviours, as well as global reports of relationship quality, were assessed when the adolescents were in 7th grade, and the substance use variables were measured when the adolescents were in the 9th and 12th grades.

Observed behaviours during the 7th grade parent-adolescent interactions were significantly associated with future substance use, but effect sizes were generally small and varied across family member (though effects largely did not systematically vary across boys and girls). Adolescents' observed behaviours towards parents were more strongly associated with substance use than parents' observed behaviours towards adolescents in 9th grade (mean rs 0.09 versus 0.03), but not necessarily in 12th grade (mean rs 0.05 versus 0.05). This suggests that when it comes to patterns of interactions between adolescents and parents, adolescent behaviours may be more likely to be predictive of substance use than parents' behaviours. This is similar to what was found by Hops and colleagues [23]. Specifically, they reported that the observed behaviours of adolescents were more predictive of substance use than parents' behaviours. Our study extends these findings by demonstrating that the observed behaviours of adolescents still modestly predict substance use several years into the future.

Adolescent behaviour in 7th grade was more weakly associated with the substance outcomes in 12th grade than 9th grade, though generally not significantly so. The relation between observed hostility towards the mother and lifetime substance use was persistent across high school, even when controlling for 7th grade substance use. This compliments other work suggesting that higher levels of aggression in early life, and increased parent-adolescent conflict, are associated with more substance use [11,21]. This result also mirrors what was found by Hops and colleagues [23] when using a similar observational task. Taken together, all of these findings begin to paint a multi-method picture in which adolescent aggression and hostility is longitudinally predictive of substance use. It is intriguing though that in the current study hostility towards the mother was more predictive of substance

use than hostility towards the father. Some of this may stem from the overall lower rates of hostile behaviours exhibited towards fathers (Table 1). Youths may be less inclined to act hostile towards their fathers than their mothers, regardless of aggressive tendencies. Also, it should be reiterated that fewer fathers participated in the interactive sessions than mothers, reducing statistical power.

The lack of any meaningful association between parents' observed behaviours and future substance use is intriguing, and runs counter to much of the aforementioned literature suggesting links between parenting practices and substance use [11,13,14,18]. However, the association between parenting behaviour and substance use is somewhat less reliable when observational assessments are used [23,24]. One possible explanation is that the brief interaction used here to assess parenting behaviour simply did not provide enough information about parents' typical patterns of behaviour towards their adolescent. To be sure, it is difficult to obtain a complete impression of the parent-adolescent relationship in 20 minutes. Questionnaire based assessments of parent-child interactions may be better at providing overall ratings of how parents and adolescents generally behave towards one another across time and contexts. Further, it may be that parents' and adolescents' perceptions of their interactions are more important in predicting future substance use than the actual, objective behaviours themselves [11,35,36].

In keeping with this idea, reports of relationship quality were associated with the substance use outcomes more consistently and to a somewhat greater magnitude than were observed behaviours. These reports supplement the variables based on individual behaviours by capturing broad, overarching impressions of the parent-adolescent relationship. The quality of the parent-adolescent relationship was measured in 7th grade, and we found that a positive relationship at this point was associated with less substance use through the end of high school. Furthermore, this relation held regardless of which family member served as an informant of relationship quality. However, relationship quality was much more weakly associated with substance use when concurrent (i.e., 7th grade) substance use was controlled for. In other words, the variance in relationship quality that predicted later substance use tended to be shared with early substance use. This study thus provides some support for the notion that the parent-adolescent relationship in early adolescence can be predictive of later substance use [14-16], and that prior work on the topic, mostly based on European American or European samples, generalizes to Mexican-origin youth.

Overall, the results presented here contribute to the literature on associations between the family environment and substance use, and specifically build on the small body of research using observational techniques to examine how specific family dynamics relate to substance use. Nonetheless, there are limitations to the current study that must be acknowledged. First and foremost, our observational variables were based on a single, 20 minute interaction session between adolescents and one of their parents. Indeed, this provides only a very narrow window into family dynamics and may contribute to smaller effect size estimates. Longer sessions, and / or more of them, would be preferable, and likely make it easier to detect any associations between substance use and patterns of interaction. Also, we relied exclusively on youth reports to measure substance use.

In closing, we found evidence in a longitudinal study of Mexican origin families that observed parent-adolescent interactions, and parents' and adolescents' reports of the parent-adolescent relationship quality, prospectively predict substance use outcomes in 9th and 12th grade to a mild degree. Particularly noteworthy is the finding that adolescent hostility towards parents during a 20 minute interaction session in 7th grade is predictive of substance use years into the future. This further emphasizes that interpersonal aggressiveness may be an early emerging risk factors for substance use [11,37]. In sum, these findings methodologically extend work on the associations between the family climate and substance use in adolescents, and provide evidence that previously investigated associations along these lines generalize to Mexican origin youth.

Acknowledgement

References

1. Mathers M, Toumbourou JW, Catalano RF, Williams J, Patton GC (2006) Consequences of youth tobacco use: a review of prospective behavioural studies. Addiction 101: 948-958.

2. Rooke SE, Norberg MM, Copeland J, Swift W (2013) Health outcomes associated with long-term regular cannabis and tobacco smoking. Addict Behav 38: 2207-2213.

3. Steinhausen HC, Eschmann S, Metzke CW (2007) Continuity, psychosocial correlates, and outcome of problematic substance use from adolescence to young adulthood in a community sample. Child Adolesc Psychiatry Ment Health 1: 12.

4. Flory K, Lynam D, Milich R, Leukefeld C, Clayton R (2004) Early adolescent through young adult alcohol and marijuana use trajectories: early predictors, young adult outcomes, and predictive utility. Dev Psychopathol 16: 193-213.

5. Georgiades K, Boyle MH (2007) Adolescent tobacco and cannabis use: young adult outcomes from the Ontario Child Health Study. J Child Psychol Psychiatry 48: 724-731.

6. Tucker JS, Ellickson PL, Orlando M, Martino SC, Klein DJ (2005) Substance use trajectories from early adolescence to emerging adulthood: A comparison of smoking, binge drinking, and marijuana use. The Journal of Drug Issues 35: 307-332.

7. Conger RD (1997) The social context of substance abuse: A developmental perspective. In Rural Substance Abuse: State of Knowledge and Issues, pp: 6-36.

8. Petraitis J, Flay BR, Miller TQ (1995) Reviewing theories of adolescent substance use: organizing pieces in the puzzle. Psychol Bull 117: 67-86.

9. Wills TA, Dishion TJ (2004) Temperament and adolescent substance use: a transactional analysis of emerging self-control. J Clin Child Adolesc Psychol 33: 69-81.

10. Wills TA, Sandy JM, Yaeger A (2000) Temperament and adolescent substance use: an epigenetic approach to risk and protection. J Pers 68: 1127-1151.

11. Clark DA, Donnellan MB, Robins RW, Conger RD3 (2015) Early adolescent temperament, parental monitoring, and substance use in Mexican-origin adolescents. J Adolesc 41: 121-130.

12. Stautz K, Cooper A (2013) Impulsivity-related personality traits and adolescent alcohol use: a meta-analytic review. Clin Psychol Rev 33: 574-592.

13. Wills TA, Yaeger AM (2003) Family factors and adolescent substance use: Models and mechanisms. Current Directions in Psychological Science 12: 222-226.

14. Ryan SM, Jorm AF, Lubman DI (2010) Parenting factors associated with reduced adolescent alcohol use: a systematic review of longitudinal studies. Aust N Z J Psychiatry 44: 774-783.

15. Branstetter SA, Low S, Furman W (2011) The Influence of Parents and Friends on Adolescent Substance Use: A Multidimensional Approach. J Subst Use 16: 150-160.

16. Ledoux S, Miller P, Choquet M, Plant M (2002) Family structure, parent-child relationships, and alcohol and other drug use among teenagers in France and the United Kingdom. Alcohol Alcohol 37: 52-60.

17. Spoth RL, Redmond C, Shin C (2001) Randomized trial of brief family interventions for general populations: Adolescent substance use outcomes 4 years following baseline. Journal of Counseling and Clinical Psychology 69: 627-642.

18. McMaster LE, Wintre MG (1996) The relations between perceived parental reciprocity, perceived parental approval, and adolescent substance use. Journal of Adolescent Research 11: 440-460.

19. Griffin KW, Botvin GJ, Scheier LM, Diaz T, Miller NL (2000) Parenting practices as predictors of substance use, delinquency, and aggression among urban minority youth: moderating effects of family structure and gender. Psychol Addict Behav 14: 174-184.

20. Marsiglia FF, Nagoshi JL, Parsai M, Castro FG (2014) The effects of parental acculturation and parenting practices on the substance use of mexican-heritage adolescents from southwestern mexican neighborhoods. J Ethn Subst Abuse 13: 288-311.

21. Marsiglia FF, Kulis S, Parsai M, Villar P, Garcia C (2009) Cohesion and conflict: family influences on adolescent alcohol use in immigrant Latino families. J Ethn Subst Abuse 8: 400-412.

22. Pasch LA, Deardorff J, Tschann JM, Flores E, Penilla C, et al. (2006) Acculturation, parent-adolescent conflict, and adolescent adjustment in Mexican American families. Fam Process 45: 75-86.

23. Hops H, Tildesley E, Lichtenstein E, Ary D, Sherman L (1990) Parent-adolescent problem-solving interactions and drug use. Am J Drug Alcohol Abuse 16: 239-258.

24. Chaplin TM, Sinha R, Simmons JA, Healy SM, Mayes LC, et al. (2012) Parent-adolescent conflict interactions and adolescent alcohol use. Addict Behav 37: 605-612.

25. Conger RD, Lorenz FO, Elder GH, Melby JN, Simons RL, et al. (1991) A process model of family economic pressure and early adolescent alcohol use. Journal of Early Adolescence 11: 430-449.

26. Scaramella LV, Conger RD, Simons RL (1999) Parental protective influences and gender-specific increases in adolescent internalizing and externalizing problems. Journal of Research on Adolescence 9: 111-141.

27. Eaton DK, Kann L, Kinchen S, Shanklin S, Ross J, et al. (2008) Youth risk behaviour surveillance---United States, 2007. Morbidity and Mortality Weekly Report 57: 1-131.

28. Mercado-Crespo MC, Mbah AK (2013) Race and ethnicity, substance use, and physical aggression among U.S. high school students. J Interpers Violence 28: 1367-1384.

29. U.S. Department Of Health And Human Services (2014) Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings.

30. Melby JN, Conger RD (2001) The Iowa Interaction Rating Scales: Instrument summary. In: Family Observational Coding Systems: Resources for Systematic Research. Mahwah, NJ: Erlbaum.

31. Elder GH, Conger RD (2000) Children of the Land: Adversity and success in rural America. IL: University of Chicago Press, Chicago.

32. Elliott DS, Huizinga D, Ageton SS (1985) Explaining delinquency and drug use. Beverly Hills, CA, Sage.

33. McCartney K, Rosenthal R (2000) Effect size, practical importance, and social policy for children. Child Dev 71: 173-180.

34. Lorenz FO, Melby JN, Conger RD, Surjadi FF (2012) Linking questionnaire reports and observer ratings of young couples' hostility and support. Journal of Family Psychology 26: 316.

35. Fergusson DM, Boden JM (2008) Cannabis use and later life outcomes. Addiction 103: 969-976.

36. Neighbors BD, Clark DB, Donovan JE, Brody GH (2000) Difficult temperament, parental relationships, and adolescent alcohol use disorder symptoms. Journal of Child & Adolescent Substance Abuse 10: 69-86.

37. Merikangas KR, McClair VL (2012) Epidemiology of substance use disorders. Hum Genet 131: 779-789.