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Ecodevelopmental and Intrapersonal Moderators of a Family Based Preventive Intervention for Hispanic Youth: A Latent Profile Analysis

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Abstract

Hispanic adolescents are disproportionately affected by externalizing disorders, substance use and HIV infection. Despite these health inequities, few interventions have been found to be efficacious for this population, and even fewer studies have examined whether the effects of such interventions vary as a function of ecodevelopmental and intrapersonal risk subgroups. The aim of this study was to determine whether and to what extent the effects of Familias Unidas, an evidence-based preventive intervention, vary by ecodevelopmental and intrapersonal risk subgroups. Data from 213 Hispanic adolescents (mean age = 13.8, SD = 0.76) who were enrolled in a randomized clinical trial evaluating the relative efficacy of Familias Unidas on externalizing disorders, substance use, and unprotected sexual behavior were analyzed. The results showed that Familias Unidas was efficacious over time, in terms of both externalizing disorders and substance use, for Hispanic youth with high family ecodevelopmental risk (e.g., poor parent-adolescent communication), but not with youth with moderate ecodevelopmental or low ecodevelopmental risk. The results suggest that classifying adolescents based on their family ecodevelopmental risk may be an especially effective strategy for examining moderators of family-based preventive interventions such as Familias Unidas. Moreover, these results suggest that Familias Unidas should potentially be targeted towards youth with high family ecodevelopmental risk. The utility of the methods presented in this article to other prevention scientists, including genetic, neurobiological and environmental scientists, is discussed.

Keywords

moderators; preventive intervention; ecodevelopmental risk; intrapersonal risk

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Externalizing disorders, substance use, and HIV risk behaviors represent major public health concerns, particularly for minority adolescents (Pantin et al., 2009; Wolchik et al., 2002). Hispanic adolescents have more externalizing disorders and report higher rates of substance use and HIV risk behaviors when compared to their non-Hispanic white and African American counterparts (Centers for Disease Control and Prevention, 2010). In spite of the health disparities Hispanic adolescents experience with respect to externalizing disorders, substance use, and HIV risk behaviors, few preventive interventions have been found to be efficacious for this population (Szapocznik, Prado, Burlew, Williams, & Santisteban, 2007). Although the dearth of efficacious preventive interventions for Hispanic adolescents is troublesome, even more disconcerting is the lack of knowledge with regard to understanding the mechanisms by which efficacious preventive interventions have their effects on outcomes, as well as understanding who benefits most (or least) from participating in preventive interventions.

What is particularly important to prevention scientists is how preventive interventions have their effects on outcomes (i.e., mediation) as well as for whom (i.e., moderators) interventions work best (Brown et al., 2008; Tein, Sandler, MacKinnon, & Wolchik, 2004). Previous research has been aimed at answering the former part of the question, “how?” For example, studies have demonstrated that family functioning (Prado et al., 2007), parental monitoring (Soper, Wolchik, Tein, & Sandler, 2010), inhibition of emotional expression (Tein, Sandler, Ayers, & Wolchik, 2006), and communication efficacy (Villarruel, Jemmott, & Jemmott, 2005), have all mediated the effects of preventive interventions on various outcomes, including substance use, externalizing disorders, and HIV risk behaviors. However, the latter part of the question, “for whom?” has not received much attention in general, nor among Hispanic populations in particular, and thus is not well understood. That is, attributes that are likely to predict who benefits the most from participating in preventive interventions remain unclear. From an intervention perspective, identifying moderators that are non-malleable to intervention (e.g., nativity status, gender) are important (Kraemer et al., 1997) because they can be used to select a subpopulation that is at risk (e.g., U.S. born Hispanic youth). However, identifying moderating factors that are amenable to interventions (e.g., parent-adolescent communication) is equally important because such moderators can be targeted in an intervention. The purpose of this study was to examine for whom is Familias Unidas most efficacious, and for whom it is not, based on both ecodevelopmental (e.g., parent-adolescent communication and peer substance use) and intrapersonal (e.g., attitudes toward substance use) risk factors.

Familias Unidas, a Hispanic-specific, parent-centered prevention intervention has been found to be efficacious in preventing/reducing externalizing disorders, substance use, and HIV risk behaviors in multiple randomized clinical trials (Pantin et al., 2009; Prado et al., 2007). Familias Unidas is informed by ecodevelopmental theory (Prado et al., 2010; Szapocznik & Coatsworth, 1999), which integrates Bronfennbernner’s ecological systems theory (1979) and classical developmental theory (e.g., Braveman & Barclay, 2009) to postulate that adolescents are embedded in multiple interconnected contexts that both influence and are influenced by the adolescent across time. Bronfenbrenner organized the multiple influences on adolescent development according to their proximity to the adolescent. Because the foci of this article are mostly on family risk factors and one peer

risk factor, we limit our discussion of ecodevelopmental theory (Prado et al., 2010; Szapocznik & Coatsworth, 1999) to family and peer microsystems. Specifically, microsystems refer to contexts in which the adolescent participates directly, such as the family and peer subsystems. Thus, family and peer ecodevelopmental factors can include family support for the adolescent (family microsystem), parent-adolescent communication (family microsystem), and peer drug use (peer microsystem; Cicchetti & Aber, 1998). Familias Unidas aims to prevent/reduce externalizing disorders, substance use and HIV risk behaviors by mainly improving family microsystemic factors, including parent-adolescent communication (Pantin et al., 2009; Prado et al., 2007). Although Familias Unidas has been found to be efficacious in preventing/reducing externalizing disorders, substance use and HIV risk behaviors in Hispanic adolescents, less is known about who benefited the most from the intervention, particularly when conceptualizing risk by ecodevelopmental and intrapersonal factors (Prado et al., 2009).

Risk factors that may adversely influence adolescents to engage in externalizing behaviors, substance use and HIV risk behaviors can be conceptualized by two domains (Prado et al., 2009): intrapersonal (e.g., beliefs) and ecodevelopmental (i.e., contextual factors). The combination of these two risk factors and their impact on externalizing problems, substance use and HIV risk behaviors has received minimal attention (Hawkins, Catalano, & Miller, 1992; Pantin et al., 2005), although they have received much attention separately. Because intrapersonal and ecodevelopmental factors are modifiable, whereas for example nativity and gender are not, the integration of all these domains into a population-based approach to prevention necessitates their further examination in moderating the effects of preventive interventions. Therefore, examining whether the effects of an evidence-based intervention, such as Familias Unidas, are moderated by ecodevelopmental and intrapersonal factors is important for the prevention field. The aim of this manuscript is to empirically derive risk classes (or clusters) based on ecodevelopmental and intrapersonal factors and to determine whether these risk classes moderate the effects of condition (Familias Unidas versus a Community Practice control condition) on externalizing disorders, substance use, and unprotected sexual behavior.

This study is a secondary analyses of a major outcome study of Familias Unidas (Pantin et al., 2009), which found that Familias Unidas was efficacious in reducing the proportion of Hispanic adolescents with a current externalizing disorder as well as the proportion of Hispanic youth reporting current substance use and unprotected sexual behavior. However, it did not examine moderators of intervention efficacy, and consequently this manuscript addresses this important research question.

Methods

As described above, the present study uses data from a randomized clinical trial evaluating the relative efficacy of Familias Unidas in preventing/reducing substance use, externalizing disorders, and unsafe sexual behavior in Hispanic adolescents with behavioral problems (Pantin et al., 2009). The study was approved by the University's Institutional Review Board and Miami-Dade County Public School's Research Review Council. Below, we provide a brief summary on the study design, recruitment, participants, and conditions. Additional

details regarding all study procedures can be found in the primary outcome article (Pantin et al., 2009).

Study Design

The study consisted of a 2 (Condition) X 4 (Time) randomized controlled design. Participants were first assessed at baseline and then randomized to either Familias Unidas, the experimental intervention, or to a Community Practice control condition, and then reassessed at 6, 18 and 30 months after the baseline assessment.

Recruitment

Participants were recruited from one of three middle schools in Miami Dade County, Florida. School counselors were asked to identify Hispanic adolescents with at least mild behavior problems. Primary caregivers of identified youth were then sent letters explaining the study. Interested caregivers were screened to determine if their adolescent met the study's eligibility criteria. To be eligible for participation, adolescents had to be in the 8th grade, have one parent who was born in a Spanish speaking country of the Americas, reside within the catchment area of one of the three schools, and be at least 1 standard deviation above the clinical mean in at least one of three subscales from the Revised Behavior Problem Checklist (Quay & Peterson, 1993). Participants were excluded if there was an intention to relocate out of the catchment area during the intervention or out of South Florida during the 30 month study period.

Participants

The sample consisted of 213 Hispanic adolescents (mean age = 13.8, SD = 0.76) and their primary caregivers. Families primarily consisted of male adolescents (63.8%) and female caregivers (87.3%). The median annual family household income was $10,000 to $14,999. Of the 213 adolescent participants, 43.9% were foreign born with the predominant countries of birth being Honduras (26.9%), Cuba (20.4%) and Nicaragua (16.1%). Of foreign born youth, 36.6% had been living in the U.S. for less than 3 years. Most adolescents reported having at least one psychiatric disorder (73.7%). The prevalence of parent-reported adolescent externalizing disorders was 58.9% (Attention Deficit Hyperactivity Disorder; ADHD), 38.8% (Oppositional Defiant Disorder; ODD), and 20.6% (Conduct Disorder; CD), respectively.

Study Conditions

Familias Unidas—Familias Unidas, the experimental condition, is a Hispanic-specific, family based intervention that aims to reduce problem behaviors, including externalizing behavior problems, substance use and unsafe sexual behavior, by increasing family functioning. Familias Unidas is guided by ecodevelopmental theory (Prado & Pantin, 2011) and influenced by culturally specific models developed for Hispanic populations in the United States. Familias Unidas is delivered through multi-parent groups that place parents in the change agent role and through family visits. Parenting skills discussed and role-played in parent-group sessions are enacted with the parent and the adolescent in family visits.

Community Practice Control—Participants randomized to this condition were given referrals to agencies that both served their catchment area and worked with behavioral problem youth. Participants in this condition did not receive any intervention from study staff.

Measures

Youth completed the survey measures in the language of their choice (English or Spanish) using an audio, computer-assisted self-interviewing methodology.

Family Ecodevelopmental Risks—Six subscales, where greater scores reflected higher risk, were used to measure family ecodevelopmental risk. Lack of parental involvement (17 items, α= 0.87) and negative parenting (9 items, α = 0.85) were both measured using the Parenting Practices Scale (Gorman-Smith et al., 1996). Lack of family cohesion (6 items, α = 0.82) and poor family communication (3 items, α = 0.74) were measured using the Family Relations Scale (Tolan, Gorman-Smith, Huesmann, & Zelli, 1997). Poor parent adolescent communication (20 items, α = 0.86) was measured using the Parent-Adolescent Scale (Barnes & Olson, 1985) and lack of family social support (11 items, α = 0.90) was measured using the corresponding subscale from the Social Support Appraisal Scale (Dubow & Ullman, 1989).

Peer Ecodevelopmental Risk: Perceived Peer Use—Perceived peer use was measured using three items adapted from the Monitoring the Future Survey (Johnston et al., 2009). Specifically, “Have you” was replaced with “how many of your friends have” to ask about past 30 days smoking, drinking and marijuana use. A sample item was “How many of your friends have used marijuana or hashish ("pot", "grass", "hash") in the last 30 days?” Possible responses ranged from “None of them” (0) to “All of them” (4). For the present study, a binary variable was created to indicate whether any of the adolescent's friends used an illegal substance in the past 30 days.

Intrapersonal Risk for Substance Use—Two subscales from the University of South Carolina’s Health Behavior Survey (Pentz et al., 1989) were used to measure intrapersonal risk for substance use. The subscales included parent social norms regarding substance use (7 items, α = 0.80) and peer social norms regarding substance use (7 items, α = 0.64). Responses for both subscales were on a Likert point scale and ranged from “very much” to “not at all” on the basis of how much parents and peers disapproved of their use of illegal substances. Items included questions such as "How would your parents feel if they found out you used marijuana sometimes?" All subscales were scored so that higher scores on the variable corresponded to higher intrapersonal risk for substance use.

Substance Use—Substance use was measured using 4 items from the Monitoring the Future Survey (Johnston et al., 2009). Respondents were asked whether or not they had smoked, drank, used marijuana, and used other illicit drugs in the past 30 days. Because base rates for other illicit drugs were extremely low, only marijuana use (in addition to cigarette and alcohol use) was included in the analyses reported here. This was the same outcome that was used in the major outcome publication of this study (Pantin et al., 2009).

Externalizing Disorders—Parent reports on the Diagnostic Interview Schedule for Children (DISC) predictive scales (Lucas et al., 2001) were used to assess externalizing behavior problems. Although the DISC predictive scales do not provide formal psychiatric diagnoses, there are established cutoffs (Lucas, et al., 2001) which have been found to be predictive of psychiatric diagnoses. In the study validating the DISC predictive scales against psychiatric diagnoses, diagnostic sensitivity and specificity for the disorders being assessed in this study ranged from .61 to .96. Additional details about the DISC predictive scales can be found in (Lucas, et al., 2001).

Sexual Behavior—Sexual risk behaviors were measured using items from the Sexual Behavior Instrument (Jemmott, Jemmott, & Fong, 1998). At each time point, adolescents were asked to indicate whether they had ever had sex (including vaginal, anal, and oral sex) in their lifetime and in the 90 days prior to assessment. Adolescents who reported having had sex were asked how often condoms were used, ranging from “1 = never” to “5 = always.”

Data Analytic Plan

The data analysis plan for the study involved three steps. First latent profile analysis was conducted using the baseline (i.e., prior to randomization) data to identify homogenous classes or subgroups with distinctive risk profiles. This was done on the six continuous family ecodevelopmental risk factors at baseline, the one dichotomous peer ecodevelopmental risk, and the two continuous intrapersonal substance use risk variables. Five methods were used to determine the number of classes (i.e., best class solution): (1) Bayesian Information Criterion (BIC) and the sample-size adjusted BIC, where smaller values represent a better fit; (2) Vuong-Lo-Mendell-Rubin test, a test which compares a model with K classes to a model with K-1 classes, and provides the p-value of the likelihood difference test; (3) entropy value with values close to 1 (indicating greater clarity in classification); (4) the sample size in each class; and (5) the clinical meaningfulness of the classes. Models were estimated with one to five classes. Once the optimal number of classes was determined, we conducted two types of analysis. First, each individual was assigned a class membership based on their highest posterior membership probability of belonging to each class. This procedure, however, is known to introduce biases in prediction of later outcomes (Bandeen-Roche, Miglioretti, Zeger, & Rathouz, 1997; Wang, Brown, Bandeen-Roche, & Jaccard, 2005), so to take the uncertainty of class membership into account, we tested regression coefficients within class in Mplus and also conducted analyses using the posterior membership probability of belonging to each class as a weighting variable.

The second step of the analytical plan was to determine whether condition effects (over time) differed by class. To accomplish this, we created dummy variables for class and condition separately. We then created the interaction by taking the cross-product of both dummy variables. All possible condition by class interaction comparisons were tested. Each condition by class interaction was tested for significance using a latent growth curve analysis framework by regressing it on the growth curve slope for each of our three outcomes. Main effects for condition and class were also entered in these models. Third, if a significant interaction was found, growth curve analyses were conducted separately for each

class. This was conducted to determine whether differences in trajectories of substance use, unprotected sexual behavior and externalizing disorders existed by condition for each class. For unprotected sexual behavior, a two-part growth curve was used because of the preponderance of zeroes among sexual behavior scores (Brown et al., 2005). The first part of the growth curve, modeled changes in whether adolescents had engaged in sexual intercourse during the 3 months prior to each assessment point (binary), whereas the second part of the growth curve accounted for the frequency of condom use (continuous) for those individuals who reported sexual intercourse in the past 3 months.

Results

Identification and Interpretation of Classes

As stated above, a latent profile analysis was conducted using six family ecodevelopmental risk factors, one peer ecodevelopmental risk factor, and two intrapersonal risk factors for substance use. To determine the optimal number of classes, one, two, three, four, and five class solutions were estimated. Latent profile analysis fit indices as well as sample sizes for the solutions with one, two, three, four, and five classes are summarized in Table 1. The results suggested that the three class solution (BIC = 9877.0, p-value of Vuong-Lo-Mendell-Rubin Likelihood Ratio test equals 0.049) provided a better fit to the data than did the two, four or five class solutions. Although the four and five class solutions had a slightly smaller BIC value than the three class solution (9855.5 and 9825.6, respectively), the Vuong Lo-Mendell-Rubin LRT test was not significant (p=0.48 and 0.21, respectively) thus suggesting that the three class model was an adequate fit. The three-class solution also had the highest entropy value of 0.94. Finally, the five class model had a class with a small sample size (n = 17 or 8.0% of the sample in the five class). For these reasons, the three-class solution was retained.

The three classes were quite distinct from each other, and class assignments appeared to be highly reliable. The average posterior class probabilities for each of the three classes were . 97, .99, and .98, once again suggesting the appropriateness of the three class solution.

We then compared the ecodevelopmental and intrapersonal risk subgroups across the three classes to ascertain whether indeed the classes differed on the ecodevelopmental and intrapersonal risks. As expected, the ANOVA results indicated significant between-class differences on the ecodevelopmental and intrapersonal risk factors across the three classes. As shown in Table 2, both ecodevelopmental risk and intrapersonal risk factors significantly differed by class (all *p*s < .005).

The first class (*n* = 71) consisted of 33.3% of the total sample. This “High Family Ecodevelopmental Risk” class was characterized by adolescents with high ecodevelopmental family risk, high peer ecodevelopmental risk, and low intrapersonal risk for substance use. The 2nd class, “Moderate Family Ecodevelopmental Risk” (*n* = 24, 11.3%) was characterized by adolescents with moderate ecodevelopmental family risk, high peer ecodevelopmental risk and moderate intrapersonal risk for substance use. The 3rd class (Low Family Ecodevelopmental Risk) was comprised of 55.4% of the sample (*n* = 118) and

was characterized by adolescents with low family ecodevelopmental risk, moderate peer ecodevelopmental risk and low intrapersonal risk for substance use.

Substance Use Latent Growth Cure Analysis by Ecodevelopmental and Intrapersonal Risk Subgroups

The substance use growth curve analyses with slope regressed on main effects of condition and class, and the condition by class interaction showed a significant interaction between the "High Family Ecodevelopmental Risk" and "Moderate Family Ecodevelopmental Risk" classes (b = 0.86, p=0.039). There were no significant interactions between the other classes (b = 0.20, p= 0.46; b = −0.66, p= 0.11, for high family ecodevelopmental risk class vs. low family ecodevelopmental risk class and moderate family ecodevelopmental risk class vs. low family ecodevelopmental risk class, respectively).

Because the interaction was significant, growth curve analyses were conducted separately for each class. The results showed a significant condition effect for the High Family Ecodevelopmental Risk class. Specifically, the results showed a significant intervention effect in past 30-day substance use between Familias Unidas and Community Practice (b = 0.41, p < .05). As can be seen from Figure 1, High Family Ecodevelopmental Risk adolescents randomized to Familias Unidas reported no increase in past-30 substance use over time, whereas High Family Ecodevelopmental Risk adolescents randomized to Community Practice reported almost a 2.8 fold increase (from 17.7% to 50.0%) in substance use between baseline and the 30-months post baseline assessment. There were no significant differences by condition in past 30-day substance use over time for the Moderate Family Ecodevelopmental Risk (b = −0.36, p = 0.19) or the Low Family Ecodevelopmental Risk classes (b = 0.33, p = 0.19).

Externalizing Disorders Latent Growth Curve Analysis by Class

The growth curve analyses with slope regressed on main effects of condition, class, and condition by class interaction showed a significant interaction between the High Family Ecodevelopmental Risk and Low Family Ecodevelopmental Risk classes (b = 0.49, p = 0.05). There were no significant interactions between the other classes.

Because the interaction was significant, growth curve analyses for each class were estimated separately. The results for the High Family Ecodevelopmental Risk class showed a trend toward a significant intervention effect in externalizing disorders between Familias Unidas and Community Practice (b = 0.89, p = 0.069). Although this result is not statistically significant (i.e., p <=.05), the trajectories over time are clinically relevant (see Figure 2), and hence are reported here. Specifically, the proportion of youth in Familias Unidas reporting an externalizing disorder decreased from 69.4% to 31.0% from baseline to 30-months post baseline, whereas the proportion of youth in Community Practice reporting an externalizing disorder decreased from 67.7% to 55.2% from baseline to 30-months post baseline. This represents a 3.1 fold decrease in the proportion of youth reporting an externalizing disorder in Familias Unidas (relative to Community Practice) for youth in the High Family Ecodevelopmental Risk class.

Unprotected Sexual Behavior Latent Growth Curve Analysis by Class

The two-part growth curve analyses for unprotected sexual behavior with slope regressed on main effects of condition, class, and the condition by class interaction showed no significant interaction between classes. Thus, separate growth curve analyses by class for unprotected sexual behavior were not conducted.

Discussion

The purpose of this study was to determine whether the effects of Familias Unidas on externalizing disorders, substance use, and unprotected sexual behavior were moderated by risk subgroups derived from ecodevelopmental and intrapersonal factors. The results from this study suggest that risk subgroups moderated the effects of Familias Unidas on externalizing disorders and substance use, but not unprotected sexual behavior. Moreover, the results suggest that Familias Unidas was efficacious (relative to Community Practice) for Hispanic adolescents reporting high family ecodevelopmental risk, but not for Hispanic adolescents reporting moderate or low family ecodevelopmental risk.

The “High Ecodevelopmental Family Risk” class was characterized by adolescents with the highest family ecodevelopmental risk. These youth, overall, reported poor parent-adolescent communication, low parental involvement, poor family cohesion, and low family support and thus it may not be totally surprising that such youth may benefit most from an intervention, such as Familias Unidas, which targets family ecodevelopmental factors and aims at improving parent-adolescent communication, parental involvement, and family support. These findings further provide evidence that Familias Unidas is impacting the targeted factors. Moreover, these findings are consistent with previous research which indicates that adolescents who are most at risk are more likely to benefit from preventive interventions (Tein et al., 2004).

Conversely, Familias Unidas was not found to have a significant effect on youth who reported low family ecodevelopmental risk. It is not surprising that youth with low family ecodevelopmental risk (who also had low intrapersonal risk) did not benefit from Familias Unidas as it is likely that youth with very low risk would probably have positive developmental outcomes irrespective of the type and intensity of intervention they receive. In fact, it is possible that such youth may have positive developmental trajectories even in the absence of any type of preventive intervention because they have high family support, high parental involvement, and good communication with family as well as negative attitudes towards drug use.

Familias Unidas was also not efficacious with youth reporting moderate family ecodevelopmental risk. It is important to note that this risk subgroup was also characterized by moderate levels of intrapersonal risk. Thus, it may be that youth with moderate family ecodevelopmental and moderate intrapersonal risk would benefit most from a preventive intervention that targets both family ecodevelopmental factors and intrapersonal factors or from a combination of interventions (i.e., Familias Unidas + Life Skills Training) involving family and school (Spoth, Randall, Shin, & Redmond, 2005). It is also possible that significant differences by condition were not observed for this class, because the sample size

was very limited (n = 24 across both conditions). Thus, it would be important to determine whether the (non-significant) findings replicate with a larger sample. If so, future research should examine the mechanisms by which families and individuals are exposed to both ecodevelopmental and intrapersonal risks and the short- and long- term health and behavioral consequences.

Based on the results of this study, it appears that including the intrapersonal risk factors in these analyses has little utility given that it does not follow a pattern that is consistent with the emerging groupings of high, moderate, and low ecodevelopmental risk. In fact, when we remove the intrapersonal risk variables from the analyses, a three class solution fits the data best and the results are very similar to those reported in the current manuscript - i.e., Familias Unidas is most efficacious for families with highest ecodevelopmental risk. Our rationale for including the intrapersonal factors comes from our prior theoretical (Pantin et al., 2005) and empirical work (Prado et al., 2009) that shows that ecodevelopmental and intrapersonal factors are not directly correlated to each other or to substance use and unsafe sexual behavior. In fact, in a cross-sectional study (Prado et al., 2009) we found similar classes to those found in the current study and furthermore found that a larger proportion of youth with high ecodevelopmental risk (irrespective of the intrapersonal risk for substance use) report lifetime and past 90 day cigarette and illicit drug use, whereas a larger proportion of youth with high intrapersonal risk (irrespective of ecodevelopmental risk) report early sex initiation and unsafe sexual behavior. It should be noted, however, that the intrapersonal risk factors used in this study all focused on substance use, and that this may have had an influence on the findings (or lack therefore). For example, it may be that if the intrapersonal risk factors would have been specific to unsafe sexual behavior, the effects of Familias Unidas on unprotected sexual behavior might have varied by class.

This study is not without limitations. First, the present sample is not representative of the U.S. Hispanic population, and hence the results may not generalize to all Hispanic adolescents. A second limitation is the reliance on self-report measures. It is possible that behaviors such as unprotected sexual behavior and substance use may have been under or over-reported. However, A-CASI, the data collection method used in this study is the gold standard for collecting sexual risk behavior and substance use data (e.g., Turner et al., 1998; Webb et al., 1999), and studies show that participants using A-CASI report significantly higher and more accurate levels of risk behavior, including sexual risk and drug use, than those interviewed face-to-face. Another limitation is that the number or type of ecodevelopmental×intrapersonal classes were empirically derived based on the data from this study, and these would not necessarily replicate across other samples/studies. A third limitation is with our measurement of peer substance use. These data were collected from the adolescent's perspective and not the peer themselves, and thus potentially bias these results. Nonetheless, these analyses yielded important information as to for whom the Familias Unidas intervention was most efficacious.

The methods reported in this article were utilized to answer a significant question in prevention science: "what works for whom?" The answer to this question is considerably important to researchers, communities, and key stakeholders that are responsible for implementing evidence-based preventive interventions. Although there are a number of

evidence-based preventive interventions ready for implementation and dissemination (O'Connell, Boat, & Warner, 2009), communities often lack the knowledge base to implement such prevention services. The use of innovative methodology, such as the one reported in this article, has utility for communities who want to implement prevention programs in a cost-effective and impactful way. For example, the use of these methods can yield important data on which segments of the population benefit most from specific preventive interventions.

The methodology presented in this article can also be generalized to include genetic and neurobiological factors. Although the purpose of this article was to examine the extent to which environmental factors (e.g., family ecodevelopmental factors) moderate the effects of Familias Unidas, extant research has shown that differences in individuals are influenced not only be environment, but by genetics and neurobiological factors. Hence, it would be important to examine whether genetics or neurobiological factors moderate the effects of interventions on health-related outcomes (Brody et al., 2009). For example, it is well established that the neurobiological mechanisms underlying impulse inhibition and decision making are not fully developed until late adolescence (Luna and Sweeney, 2004). Assessing the status of these executive function domains is important because impulse inhibition and decision making impact adolescent behavior in substance use situations (Lopez, Scwhartz, Prado, Campo, & Pantin, 2008). The methods in this article can be coupled with innovative discoveries in prevention science associated with genetics and neurobiology to determine whether and to what extent genetic, neurobiological, and/or environmental factors moderate the effects of prevention interventions.

In summary, the present results suggest that Familias Unidas is efficacious in preventing/reducing externalizing behaviors, substance use and HIV risk behaviors among Hispanic youth characterized by high family ecodevelopmental risk. The present study suggests that classifying adolescents based on their family ecodevelopmental risk may be an especially effective strategy for examining moderators of family-based preventive interventions. Such strategies can consequently lead to the tailoring of family-based preventive interventions. Equally important is the fact that the methods used in this study to examine moderators of intervention efficacy can provide similar utility to other prevention scientists, including geneticists and neurobiologists.

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References

Barnes HL, Olson DH. Parent-adolescent communication and the circumplex model. Child Development. 1985; 56:438–447.

Bandeen-Roche K, Miglioretti DL, Zeger SL, Rathouz PJ. Latent variable regression for multiple discrete outcomes. Journal of the American Statistical Association. 1997; 92:1375–1386.

Braveman P, Barclay C. Health disparities beginning in childhood: A lifeourse perspective. Pediatrics. 2009; 124:S163–S175. [PubMed: 19861467]

Brody GH, Beach SR, Philibert RA, Chen Y, Lei M, Murry VM, Brown AC. Parenting moderates a genetic vulnerability factor in longitudinal increases in youths' substance use. Journal of Consulting and Clinical Psychology. 2009; 77:1–11. [PubMed: 19170449]

Bronfenbrenner, U. The ecology of human development: Experiments by nature and design. Cambridge, UK: Cambridge University Press; 1979.

Brown CH, Wang W, Kellam SG, Muthén BO, Petras H, Toyinbo P, Windham A. Methods for testing theory and evaluating impact in randomized field trials: Intent-to-treat analyses for integrating the perspectives of person, place, and time [Supplement]. Drug and Alcohol Dependence. 2008; 95:S74–S104. [PubMed: 18215473]

Brown EC, Catalano RF, Fleming CB, Haggerty KP, Abbott RD. Adolescent substance use outcomes in the Raising Healthy Children Project: A two-part latent growth curve analysis. Journal of Consulting and Clinical Psychology. 2005; 73:699–710. [PubMed: 16173857]

Centers for Disease Control & Prevention. Youth Risk Behavior Surveillance - United States, 2009. MMWR Surveillance Summaries. 2010; 59(SS-05):1–142. Retrieved from http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5905a1.htm.

Cicchetti D, Aber JL. Contextualism and developmental psychopathology. Development and Psychopathology. 1998; 10:137–141. [PubMed: 9635218]

Dubow EF, Ullman DG. Assessing social support in elementary school children: The Survey of Children's Social Support. Journal of Clinical Child Psychology. 1989; 18:52–64.

Gorman-Smith D, Tolan PH, Zelli A, Huesmann LR. The relation of family functioning to violence among inner-city minority youths. Journal of Family Psychology. 1996; 10:115–129.

Hawkins J, Catalano R, Miller J. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychological Bulletin. 1992; 112:64–105. [PubMed: 1529040]

Jemmott JB, Jemmott LS, Fong GT. Abstinence and safer sex HIV riskreduction interventions for African American adolescents. Journal of the American Medical Association. 1998; 279:1529–1536. [PubMed: 9605896]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the future: National survey results on drug use, 1975–2008: Volume I, secondary school students (NIH publication no. 09-7402). Bethesda, MD: National Institute on Drug Abuse; 2009.

Kraemer HC, Kazdin AE, Offord DR, Kessler RC, Jensen PS, Kupfer DJ. Coming to terms with the terms of risk. Archives of General Psychiatry. 1997; 54(4):337–343. [PubMed: 9107150]

Lopez B, Schwartz SJ, Prado G, Campo AE, Pantin H. Adolescent Neurological development and its implicataions for adolescent substance use prevention. The Journal of of Primary Prevention. 2008; 29:5–35.

Lucas CP, Zhang H, Fisher PW, Shaffer D, Regier DA, Narrow WE, Friman P. The DISC Predictive Scales (DPS): Efficiently screening for diagnoses. Journal of the American Academy of Child and Adolescent Psychiatry. 2001; 40:443–449. [PubMed: 11314570]

Luna B, Sweeney JA. The emergence of collaborative brain function: fMRI studies of the development of response inhibition. Annals of the New York Academy of Sciences. 2004; 1021:296–309. [PubMed: 15251900]

O'Connell, ME.; Boat, T.; Warner, KE. Preventing mental, emotional, and behavioral disorders among young people: progress and possibilities. Washington, DC: The National Academies Press; 2009.

Pantin H, Prado G, Lopez B, Huang S, Tapia MI, Schwartz SJ, Branchini J. A randomized controlled trial of Familias Unidas for Hispanic adolescents with behavior problems. Psychosomatic Medicine. 2009; 71(9):987–995. [PubMed: 19834053]

Pantin H, Prado G, Schwartz S, Sullivan S. Methodological challenges in designing efficacious drug abuse and HIV preventive interventions for Hispanic adolescent subgroups. Journal of Urban Health. 2005; 82:iii92–iii102. [PubMed: 15933335]

Pentz MA, Dwyer JH, MacKinnon DP, Flay BR, Hansen WB, Wang EY, Johnson CA. A multicommunity trial for primary prevention of adolescent drug abuse. Journal of the American Medical Association. 1989; 261:3259–3266. [PubMed: 2785610]

Prado G, Pantin H. Reducing substance use and HIV health disparities among Hispanic youth in the U.S.A.: The Familias Unidas program of research. Psychosocial Intervention. 2011; 20(1):63–73. [PubMed: 21743790]

Prado GJ, Pantin H, Briones E, Schwartz SJ, Feaster D, Huang S, Szapocznik J. A randomized controlled trial of a parent-centered intervention in preventing substance use and HIV risk behaviors in Hispanic adolescents. Journal of Consulting and Clinical Psychology. 2007; 75:914–926. [PubMed: 18085908]

Prado GJ, Schwartz SJ, Maldonado-Molina M, Huang S, Pantin HM, Lopez B, Szapocznik J. Ecodevelopmental×intrapersonal risk: Substance use and sexual behavior in Hispanic adolescents. Health Education & Behavior. 2009; 36:45–61. [PubMed: 18326053]

Prado G, Shi H, Maldonado-Molina M, Bandiera F, Schwartz SJ, de la Vega P, Pantin H. An empirical test of ecodevelopmental theory in predicting HIV risk behaviors among Hispanic youth. Health Education & Behavior. 2010; 37:97–114. [PubMed: 20130302]

Quay, HC.; Peterson, DR. The Revised Behavior Problem Checklist: Manual. Odessa, FL: Psychological Assessment Resources; 1993.

Soper AC, Wolchik SA, Tein J-Y, Sandler IN. Mediation of a preventive intervention's 6-year effects on health risk behaviors. Psychology of Addictive Behaviors. 2010; 24:300–310. [PubMed: 20565156]

Spoth R, Randall GK, Shin C, Redmond C. Randomized study of combined universal family and school preventive interventions: Patterns of long-term effects on initiation, regular use, and weekly drunkenness. Psychology of Addictive Behaviors. 2005; 19:372–381. [PubMed: 16366809]

Szapocznik, J.; Coatsworth, JD. An ecodevelopmental framework for organizing the influences on drug abuse: A developmental model of risk and protection. In: Glantz, MD.; Hartel, CR., editors. Drug abuse: Origins & interventions. Washington, DC: American Psychological Association; 1999. p. 331-366.

Szapocznik J, Prado G, Burlew AK, Williams RA, Santisteban DA. Drug abuse in African American and Hispanic adolescents: Culture, development, and behavior. Annual Review of Clinical Psychology. 2007; 3:77–105.

Tein J-Y, Sandler I, Ayers T, Wolchik S. Mediation of the effects of the Family Bereavement Program on mental health problems of bereaved children and adolescents. Prevention Science. 2006; 7:179–195. [PubMed: 16775760]

Tein J-Y, Sandler IN, MacKinnon DP, Wolchik SA. How did it work? Who did it work for? Mediation in the context of a moderated prevention effect for children of divorce. Journal of Consulting and Clinical Psychology. 2004; 72:617–624. [PubMed: 15301646]

Tolan PH, Gorman-Smith D, Huesmann LR, Zelli A. Assessment of family relationship characteristics: A measure to explain risk for antisocial behavior and depression among urban youth. Psychological Assessment. 1997; 9:212- –223.

Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer survey technology. Science. 1998; 280:867–873. [PubMed: 9572724]

Villarruel AM, Jemmott LS, Jemmott JB. Designing a culturally based intervention to reduce HIV sexual risk for Latino adolescents. Journal of the Association of Nurses in AIDS Care. 2005; 16:23–31. [PubMed: 16438123]

Wang C-P, Brown CH, Bandeen-Roche K, Jaccard J. Residual diagnostics for growth mixture models: Examining the impact of a preventive intervention on multiple trajectories of aggressive behavior. Journal of the American Statistical Association. 2005; 100:1054–1076.

Webb PM, Zimet GD, Fortenberry JD, Blythe MJ. Comparability of a computer-assisted versus written method for collecting health behavior information from adolescent patients. Journal of Adolescent Health. 1999; 24:383–388. [PubMed: 10401965]

Wolchik SA, Sandler IN, Millsap RE, Plummer BA, Greene SM, Anderson ER, Haine RA. Six-year follow-up of preventive interventions for children of divorce. The Journal of the American Medical Association. 2002; 288:1874–1881.

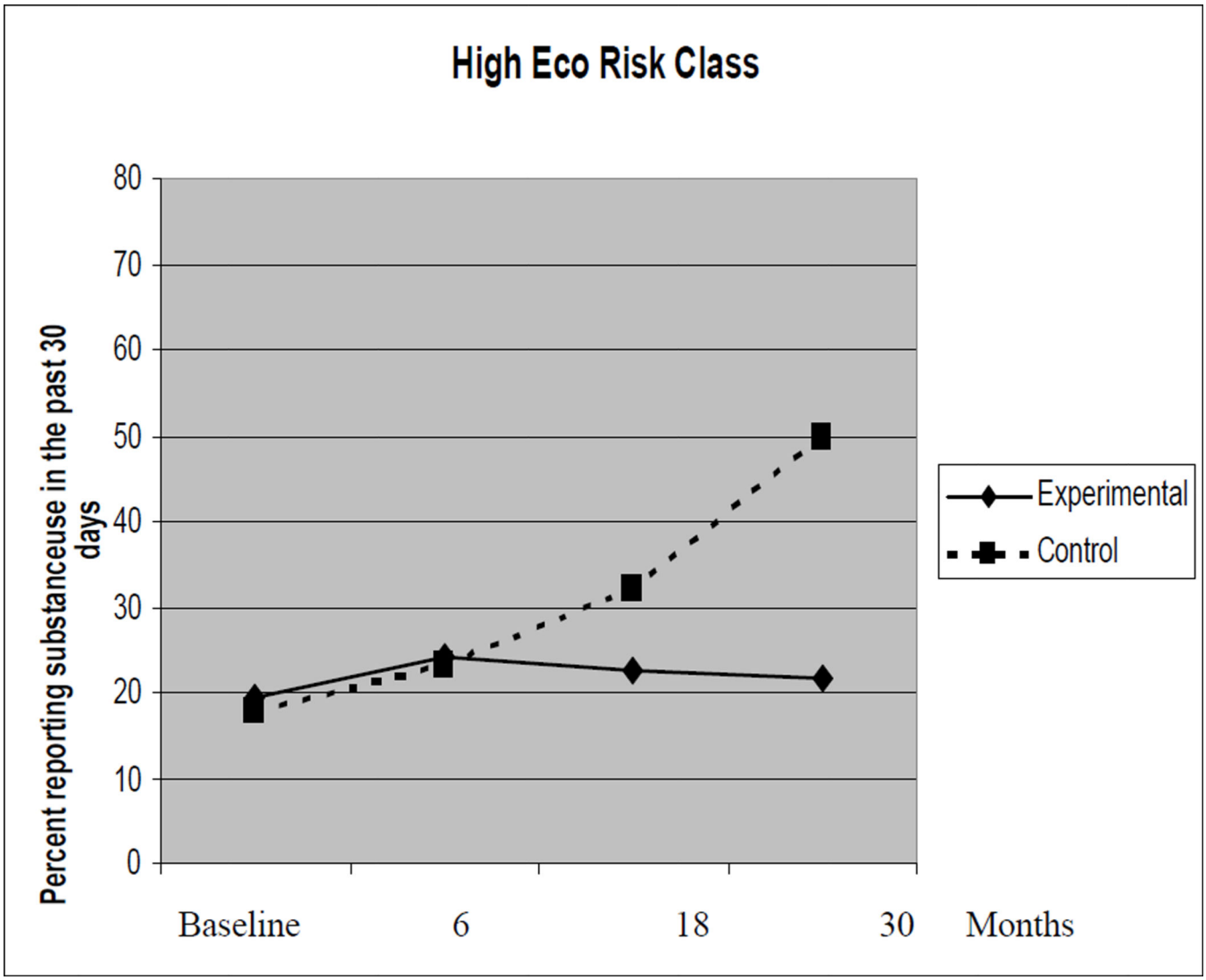

Figure 1.
Substance use by Condition for High Family Ecodevelopmental Risk Class.

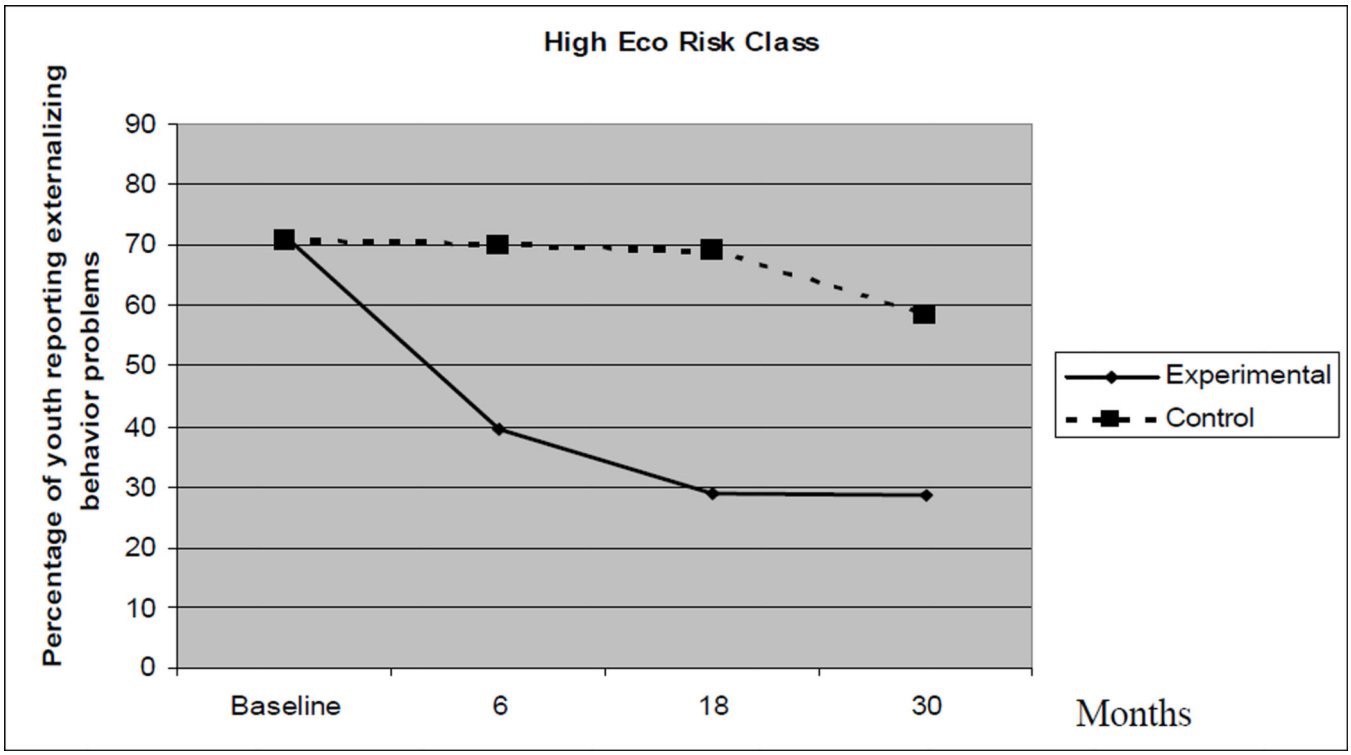

Figure 2.
Externalizing Disorders by Condition for High Family Ecodevelopmental Risk Class.

Table 1

Latent profile analysis model fit indices and sample size for 1- to 5-class solutions

# of class	BIC	Adjusted BIC	Vuong-Lo-Mendell-Rubin Likelihood Ratio test p value	Entropy	Sample Size for each class
1	10492.51	10438.64	-	-	213
2	9999.578	9914.023	<0.001	0.907	86/127
3	9877.01	9759.77	0.049	0.941	71/24/118
4	9855.49	9706.56	0.478	0.869	41/63/24/85
5	9825.64	9645.02	0.206	0.893	17/17/39/83/57

Note: BIC=Bayesian information criterion.

Table 2

Means and Standard Deviations of Ecodevelopmental × Intrapersonal Risk Subgroup on Clustering Variables.

Variables[1]	**Risk Subgroup**				**F (2, 210)**	**p-value**
	Overall Sample	**Class1 n=71 (High risk)**	**Class2 n=24 (Moderate risk)**	**Class3 n=118 (Low risk)**		
Eco Risk						
Lack of parental involvement	25.39 (6.63)	31.29[a](5.70)	29.30 [a] (6.95)	22.01 [b] (4.36)	61.63	<0.001
Negative parenting	9.15 (5.81)	13.71[a] (4.93)	10.98[b] (7.02)	6.12[c] (3.82)	59.51	<0.001
Lack of family cohesion	12.91 (3.85)	16.27[a] (2.90)	14.13[b] (4.05)	10.64[c] (2.51)	89.07	<0.001
Poor family Communication	6.71 (2.26)	8.56[a](1.87)	7.50[b] (2.21)	5.43[c] (1.52)	75.69	<0.001
Poor parent-adolescent communication	54.68 (13.91)	67.65[a] (10.65)	56.96[b] (8.06)	46.64[c] (10.03)	92.63	<0.001
Lack of family social support	23.43 (9.29)	32.51[a] (7.37)	25.25[b] (8.08)	17.60[c] (5.12)	124.72	<0.001
Peer substance use	52.7%	62.3%[a]	65.2%[ab]	44.0%[b]		0.034
Substance Use Intra Risk						
Parent substance use social norms	8.54 (2.95)	7.87[a] (1.38)	15.88[b] (2.47)	7.46[a] (0.98)	395.62	<0.001
Peer substance use social norms	12.23 (4.66)	12.96[a](4.76)	16.71[b] (4.25)	10.87[c] (4.00)	19.96	<0.001

[1] A higher mean score represents higher ecodevelopmental and intrapersonal risk for all variables.

Note: Same letter superscripts denote non-significant differences.

Table 3

Substance Use, Externalizing Disorder, and Condom Use Outcomes by Class and Condition over Time

	Class1 n=71 (High risk)		Class2 n=24 (Moderate risk)		Class3 n=118 (Low risk)	
	Familias Unidas	**Community Practice**	**Familias Unidas**	**Community Practice**	**Familias Unidas**	**Community Practice**
% Substance use in the past 30 days						
Baseline	21.62	17.65	18.18	30.77	9.84	7.02
6 months	26.47	26.67	18.18	44.44	18.52	8.16
18 months	22.58	36.00	11.11	37.50	18.00	26.83
30 months	24.14	50.00	50.00	20.00	22.45	26.83
% Externalizing Disorders						
Baseline	69.44	67.65	72.73	84.62	66.67	58.18
6 months	41.18	70.00	54.55	66.67	49.09	50.00
18 months	31.25	65.52	33.33	50.00	39.62	41.67
30 months	31.03	55.17	28.57	55.56	34.00	28.89
Frequency of condom use in the past 90 days						
Baseline	3.08	3.90	2.50	3.00	2.87	3.31
6 months	2.57	3.31	3.00	3.13	2.53	3.13
18 months	2.10	3.38	5.00	2.00	2.87	2.86
30 months	2.88	2.44	3.75	3.00	2.72	2.32