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Mediation effects of a culturally generic substance use prevention program for Asian American adolescents

Lin Fang and

University of Toronto, Factor-Inwentash Faculty of Social Work, 246 Bloor Street West, Toronto, ON M5S 1V4, Canada

Steven P. Schinke

Columbia University School of Social Work, 1255 Amsterdam Avenue, New York, NY 10027, USA

Abstract

In this paper, we examined the mediation effects of a family-based substance use prevention program on a sample of Asian American families. These families were randomized into an intervention arm or a non-intervention control arm. Using path models, we assessed the effect of the intervention on adolescent girls' substance use outcomes at 2-year follow-up through family relationships and adolescent self-efficacy pathways. Bias-corrected bootstrapping strategy was employed to assess the significance of the mediation effect by evaluating the 95% confidence interval of the standardized coefficient. The results show that receiving the intervention exerted a positive effect on girls' family relationships at 1-year follow-up. Such an improvement was associated with girls' increased self-efficacy, which in turn led to girls' decreased alcohol use, marijuana use, and future intention to use substances at 2-year follow-up. Considering the diverse cultural backgrounds, as well as languages, nationalities, and acculturation levels under the umbrella term "Asian Americans", we demonstrate that a universal web-based intervention that tackles the theoretical- and empirical-based risk and protective factors can be effective for Asian Americans. Despite its generic nature, our program may provide relevant tools for Asian American parents in assisting their adolescent children to navigate through the developmental stage and ultimately, resist substance use.

Keywords

Asian Americans; adolescents; Internet; universal prevention; family-based program

As demographics in North America continue to diversify, effective substance use prevention interventions that take into account diverse populations are needed more than ever before. Often delivered in family, school, or community settings, universal substance use prevention programs serve as a prevailing drug prevention strategy that focuses on the entire population (Robertson, David, & Rao, 2003) and are rendered prior to the onset of substance using behaviors. Despite the inclusive nature of universal prevention programs, Asian Americans,

however, have been underrepresented in the rich research evidence of such programs (Harachi, Catalano, Kim, & Choi, 2001; Miranda et al., 2005; Sharma, 2004). The presence of Asian Americans in the empirical literature is often buried within aggregate data, where they are represented by categories such as “non-white” or “others” (Miranda, Nakamura, & Bernal, 2003), or are simply excluded (Huey & Polo, 2008). The inadequacies in the existing literature are worth noting, as they point to an equity issue that research must address. In this paper, we summarize the risk and protective factors that are empirically proven to be relevant to Asian Americans, describe a culturally generic, web-based prevention program, examine the pathways that lead to substance use on an Asian American sample, and discuss the implications and challenges of such a program.

Factors Concerning Substance Use among Asian American Adolescents

Current thinking of prevention science believes that in order for prevention programs to be effective, they should be tailored to strengthen the identified protective factors and reduce the modifiable risk factors specific to the community of interest (Hawkins, Catalano, & Arthur, 2002). Substance use researchers have underscored that the level of acculturation (Choi & Lahey, 2006; Fu, Ma, Tu, Siu, & Metlay, 2003; Hofstetter et al., 2004; Lee, Sobal, & Frongillo, 2000; Maxwell, Bernaards, & McCarthy, 2005) and acculturative stress (Bhattacharya & Schoppelrey, 2004) are positively associated with substance use among Asian American adolescents. Moreover, the burgeoning literature on the etiology of Asian Americans substance use behaviors also suggests that Asian American adolescents share many risk and protective factors with American youth of other racial backgrounds. At the individual level, low self-esteem, poor self-concept and depression increase risks for substance misuse among Asian American adolescents (Guerrero et al., 2010; Otsuki, 2003), whereas emotional control is negatively associated with adolescent drinking (Liu & Iwamoto, 2007). Although the norms surrounding peer substance use influence the use of alcohol, tobacco, and other drugs (Fang & Schinke, 2011; Le, Goebert, & Wallen, 2009; Thai, Connell, & Tebes, 2010; Yang, Cheng, Ho, & Pooh, 2013), Asian Americans adolescents who exercise self-efficacy can effectively protect themselves from engaging in such risky behaviors (Fang, Barnes-Ceeney, & Schinke, 2011; Sharma, 2004).

As well, family systems exert the same influence over Asian American adolescents as that over non-Asian adolescents (Au & Donaldson, 2000; Fang, Barnes-Ceeney, & Schinke, 2011; Kim, Zane, & Hong, 2002; Wang, Kviz, & Miller, 2012). Meaningful communication and close relations between Asian American parents and their adolescent children reduce adolescents' substance use (Fang, Barnes-Ceeney, & Schinke, 2011; Kim et al., 2002; Wu, Liu, Kim, & Fan, 2011). Moreover, parent-child bonding (Hahm, Lahiff, & Guterman, 2003), parental involvement and relations (Fang & Schinke, 2011; Guerrero et al., 2010; Kim et al., 2002), and family support (Guerrero, Hishinuma, Andrade, Nishimura, & Cunanan, 2006; Hishinuma et al., 2004; Kim et al., 2002) can protect Asian youth from misusing harmful substances. Parental monitoring (Chen et al., 2002; Fang, Barnes-Ceeney, & Schinke, 2011) and the imposition of family rules against substance use (Fang, Barnes-Ceeney, & Schinke, 2011) can lessen the likelihood of cigarette and alcohol use among Asian American adolescents.

The aforementioned risk and protective factors have been addressed in generic universal prevention programs. Studies show that prevention programs that integrate both parental involvement and adolescent social skills components not only increase parent and child competencies, but also reduce adolescent substance use (Lochman & Wells, 2002; Molgaard & Spoth, 2001; Schinke, Schwinn, & Fang, 2010). Notably, such programs have been tested with ethnic and racial minority populations, however mostly with Black and Latino youth (Brody et al., 2011; Schinke et al., 2010), not Asian Americans.

Culturally Generic vs. Culturally Adapted Programs

Although evidence-based universal programs can be well received by Asian American adolescents, one must consider the program's transferability and suitability to the Asian American population. Cultural adaptation, cultural sensitivity, or culturally responsiveness has been cited as one critical element that can facilitate promising prevention programs for ethno-racialized communities (Resnicow, Soler, Braithwaite, Ahluwalia, & Butler, 2000; Winters, Fawkes, Fahnhorst, Botzet, & August, 2007). Scholars have argued that interventions that are developed without incorporating the unique cultural values, norms, practice, and histories of ethno-racialized minorities may be unfit with the needs and preferences of the populations of interest, suggesting a need for culturally adapted interventions (Castro, Barrera, & Martinez, 2004; Kumpfer, Alvarado, Smith, & Bellamy, 2002; Resnicow et al., 2000).

Despite the legitimate and well-received notion of culturally adapted programs, empirical results concerning culturally adapted prevention programs have been inconsistent. Several programs show promise in delaying substance use among ethnic minorities. The Strong African American Families Program (SAAF; Brody et al., 2004; 2006) has shown significant efficacy in helping African American adolescents delay their alcohol use initiation, and decrease their alcohol intake. Bridges/Puentes (Gonzales et al., 2012), a family-focused program tailored for Mexican American adolescents and their parents, also demonstrated effects in lowering adolescent substance use at follow-up.

Also testing a family-centered culturally adapted program, Komro et al.'s study (2006) however revealed different results. The adapted program was made visibly appealing to Black and Latino youth, and was translated into Spanish, Chinese, and Polish languages. Despite the high participation rates, the program made no differences in changing adolescents' alcohol use and other protective factors when compared to the control arm. Additionally, Botvin et al. (1994) compared the relative effects of a culturally focused alcohol and drug abuse prevention program, as well as a generic skills training program for minority youth and found that the culturally-focused program had no better outcomes than a generic skills training program for minority youth. As well, Unger et al. (2004) and Johnson et al. (2005) compared the effects of a culturally-adapted smoking prevention program to those of a standard program among 6th grade students in Southern California. One-year follow-up results showed that relative to the standard program, the culturally-adapted program was effective only among Hispanic/Latino middle school students, but not among Asian students (Johnson et al., 2005; Unger et al., 2004).

Meta-analysis results also confirm the unsettled results of culturally adapted programs. In a meta-analysis of 10 culturally sensitive substance use prevention trials, Hodge et al. (2012) found a small pooled effect size for alcohol use, but not for marijuana use. Such results are similar to the findings of systematic reviews on psychosocial interventions for ethnic and racial minority youth (Huey & Polo, 2008; Wilson, Lipsey, & Soydan, 2003) as they underline the inconclusive utility of culturally sensitive interventions. In fact, based on available evidence, some scholars have argued that evidence-based youth programs can be equally effective for racialized and non-racialized youth even when the program contents are not tailored to subsequent audiences (Elliott & Mihalic, 2004; Miranda et al., 2005; Wilson et al., 2003). Elliott and Mihalic (2004) assert that our society is increasingly characterized by a blended, post-ethnic youth culture in which norms, beliefs, practices, and values are shared across cultural groups. As such, programs that focus on areas of basic development of youth, such as family relationships, may achieve the same results for different ethnic and racial groups (Elliott & Mihalic, 2004), which can be particularly true for universal prevention programs.

A Culturally-Generic, Family-Based Mother-Daughter Intervention

In 2006, our research team received support from the National Institute on Drug Abuse (NIDA) to conduct a randomized controlled trial of a mother-daughter substance use prevention on minority girls. Responding to the growing substance use among adolescent girls and their unique psychosocial needs (Amaro, Blake, Schwartz, & Flinchbaugh, 2001; Kulis, Marsiglia, & Hurdle, 2003; Kumpfer, Smith, & Summerhays, 2008; Poulin, Hand, Boudreau, & Santor, 2005), the study tested a computerized, family-based mother-daughter intervention, targeting American girls aged 10–14 years and their mothers. The study was innovative in that the program specifically targeted adolescent girls, and was delivered via Internet. Aiming to deliver engaging, interactive prevention programming, we designed a self-directed intervention that could be accessed through the Internet or via a CD-ROM. The computer medium also allowed flexible intervention delivery, as participants could access the intervention at their own pace, and were not constrained by location and scheduling incompatibilities.

The creation of this universal prevention program was based on our pilot data, empirical literature on the risk and protective factors associated with female adolescent substance use, and the family interaction theory (Brook, Brook, Gordon, Whiteman, & Cohen, 1990). As a backbone of our intervention, the family interaction theory hypothesizes that when family relationships – characterized by parent-child communication, parent-child closeness, and parental monitoring – is strengthened, it can enhance adolescents' individual strength, such as the capacity to resist peer influence, which in turn offsets adolescent substance use. In developing the program, we also consulted community advisory groups that consisted of mothers and adolescent girls from our target population, and community service providers with expertise serving youth and families.

Collaborating with our external technology vendor, Berlin Productions, our research team designed and developed all intervention modules, which were reviewed and approved by our advisory groups. A detailed description of the program can be found elsewhere (see Fang &

Schinke, 2013). Briefly speaking, the program has a total of nine modules and focus on improving the malleable protective factors (i.e., mother-daughter communication, mother-daughter closeness, parental monitoring, parental rules against substance use, self-efficacy, and self-esteem), and risk factors (i.e., normative beliefs and depression), which should determinate the decrease in adolescent use. Each module was 30- to 45-minutes long, and included four to five interactive activities such as games, simulations, and role plays that simultaneously engaged both mothers and their adolescent daughters. In light of the lack of empirical data on universal prevention intervention for Asian Americans, as well as the alarming substance use trend by Asian American adolescent girls (see Hahm, Lahiff, & Guterman, 2004; Nakashima & Wong, 2000), in 2007, we expanded the recruitment to Asian American families.

Our earlier work suggests that the intervention engendered a significant reduction in Asian American participants' alcohol use, marijuana use, and substance use intention, and improved their mother-daughter closeness, mother-daughter communication, monitoring, parental rules, and adolescent self-efficacy (Fang & Schinke, 2013; Fang, Schinke, & Cole, 2010). However, it is not clear whether the intervention contributed to the decreased substance use through the mediation pathways as suggested by the family interaction theory. The assessment of the mediation analysis is important as our intervention was designed to change girls' substance use outcomes by targeting these family-level and individual-level mediators. In this paper, we test the hypothesis that participants who receive the intervention should have better family relationships at 1-year follow up compared to those who were in the control arm. Such improvements would lead to increase in self-efficacy among adolescent girls, which will in turn cause a decrease in their substance use at 2-year follow-up. Such findings can provide the evidence on whether a culturally generic intervention effects a change on Asian participants through family relationships pathways.

Method

Study Procedure

The study used a randomized control trial methodology. Understanding the difficulty of recruiting Asian American families (Kumpfer et al., 2002), we first hosted three focus groups with Asian American adolescents (see Fang, Barnes-Ceeney, Lee, & Tao, 2011) and consulted community key informants (e.g., service providers, parents) on ways to reach out to Asian American communities with restricted resources. We learned very valuable information from Asian American youth and our key informants. First, there is an urgent need to provide prevention programs to the Asian American community, and a parent-child prevention intervention can respond well to the needs of Asian American families. Second, in order to effectively reach and recruit Asian American participants, we need to send tailored messages to Asian American families, and emphasize the strength-based nature of the intervention. Third, despite the potential of a parent-child prevention program, the recruitment campaign should be directed to parents, rather than the adolescents, as parents may be more likely to see the benefits of such intervention than their children. Fourth, our recruitment methods should not be limited to traditional means such as community outreach or the use of print media. Rather, we should consider web-based recruitment, particularly

given that our intervention was delivered online. Lastly, meaningful incentives would help promote study participation.

Our recruitment strategies were guided by our prior experiences of conducting intervention trials, and the feedback from our focus groups and consultants. Given that we had limited resources, we decided to focus our recruitment efforts through posting recruitment messages on free-of-charge online venue (e.g., Craigslist), and advertising the program to service providers that had a large Asian American client base. As for online recruitment, our research assistants posted an online advertisement on Craigslist sites at both state and city levels. We also reviewed the Asian American Yearbook (TIYM Publishing Company, 2005) and identified 146 social service and healthcare agencies located in 19 states in the United States that had a significant clientele of Asian Americans. We contacted staff members of these agencies, explained the study purposes, and asked them if they were willing to help us distribute study recruitment flyers in the agency's waiting rooms or public areas. Out of the 146 agencies, all but seven agencies accepted our request. In our recruitment messages, we specified that: 1) a mother-daughter intervention study is seeking participation from Asian American families; 2) mothers and daughters would learn how to communicate with one another and resist drug use; 3) participation would be entirely online; 4) monetary incentives would be available for study participants; and 5) the intervention would be delivered in English only. The recruitment was carried out from September 2007 to January 2008. We recruited a total of 108 Asian American mother-daughter dyads, of which over two-thirds were recruited through online medium. All participants were randomized into a no-treatment control arm ($n = 52$) and an intervention arm ($n = 56$), and participating girls and their mothers from both arms completed self-report measurements at baseline, and 1- and 2-year follow-ups.

Participants

As reported earlier (Fang & Schinke, 2013), control- and intervention-arm participants did not differ in their demographic characteristics. Girls' average age was 13.10 ($SD = 0.96$) years and their mothers' average age was 39.73 ($SD = 6.81$) years. The majority of the girls (79%) were born in the United States, whereas close to 60% of mothers were born in a foreign country. Whereas more intervention-arm mothers than control-arm mothers had a post-secondary education (75% vs. 69.23%), the difference was not statistically significant. The participants resided in different geographical areas in the United States (30.6% from the West, 28.7% South, 26.8% Northeast, and 13.9% Midwest), and they consisted of eight ethnic backgrounds, including Chinese (30.6%), Asian Indian (20.4%), Japanese (13%), Vietnamese (13%), Korean (9.3%), Filipino (8.3%), Thai (2.8%), and Malaysian (2.8%). At 2-year follow-up, 93 mother-daughter dyads (control $n = 43$, intervention $n = 50$) stayed in the trial, resulting in a retention rate of 86.11%.

Measures

All measures were administered in English at baseline (T0) and 2-year follow-up (T2) and consisted of questions concerning the target mediators and substance use outcomes. The mediators included factors at the familial (mother-daughter closeness, mother-daughter communication, parental monitoring) and individual (self-efficacy) levels. The outcome

variables consisted of alcohol use, marijuana use, and intention to use substances in the future.

Family relationships—To reduce the number of analyses, we created a composite measure of family relationships by using the summed scores of three study variables: 1) mother-daughter closeness (five items with a range of 1 to 5; Armsden & Greenberg, 1987); 2) mother-daughter communication (five items with a range of 1 to 5; McCubbin, Thompson, & McCubbin, 1996); and 3) parental monitoring (five items with a range of 1 to 5; Gorman-Smith et al., 1996). The composite measure has a range of 3 to 15, with higher scores indicating stronger family relationships. Average Cronbach's α from baseline to 2-year follow-up was .85.

Self-efficacy—Five items derived from the Self-Efficacy Scale (DiClemente, Prochaska, & Gibertini, 1985) were used to assess girls' levels of self-efficacy. Girls reported how confident they were that they could avoid using substances in situations associated with substance use. The response ranged from 1 = not at all to 5 = extremely, with higher scores representing better self-efficacy. Average Cronbach's α from baseline to 2-year follow-up was .89.

Girls' alcohol and marijuana use—We used items derived from the American Drug and Alcohol Survey (Rocky Mountain Behavioral Institute, 2003) to assess girls' past 30-day substance use behaviors. Specifically, girls reported the number of alcoholic drinks (i.e., beer, wine, malt liquor, wine coolers, sweet alcoholic drinks, mixed drinks, or hard liquor) they had and the number of occasions they used marijuana in the past 30 days.

Substance use intention—Girls reported their intention to drink, smoke, and use drugs in the future on the 8-item Commitment to Not Use Drugs scale (Hansen, 1996). Responses for the scale ranged from 1 = strongly disagree to 5 = strongly agree. Higher scores suggested greater commitment to use drugs. Average Cronbach's α from baseline to 2-year follow-up was .88.

Analysis

We used path analysis in Mplus 7.11 (Muthen & Muthen, 1998–2013) to assess the mediation effects of study outcomes. Full information maximum likelihood was used to handle missing data. Five pathways were examined simultaneously: 1) the path from intervention assignment to family relationships measured at 1-year follow-up (T1); 2) the path from intervention assignment to self-efficacy at T1; 3) the path from family relationships to self-efficacy at T1; 4) the path from self-efficacy (T1) to substance use outcomes at 2-year follow-up (T2); and 5) intervention assignment to substance use outcomes assessed at T2. To reduce measurement errors, baseline mediator scores (T0) were included as controls for mediator scores assessed at T1, and substance use outcome scores measured at T2 also control for baseline scores (T0) (Cole & Maxwell, 2003). The MODEL INDIRECT command in Mplus was used to estimate the indirect effects from intervention on substance use outcomes. We used bias-corrected bootstrapping method to assess the significance of the mediation effect by evaluating the 95% confidence interval (CI) of the

standardized coefficient. The bootstrapping method does not require normal distribution assumptions (MacKinnon, Lockwood, & Williams, 2004; Morera & Castro, 2013), which is appropriate for our data given that girls' substance use outcomes were skewed. The bootstrapping estimates were based on 2,000 samples. To understand the mediation effects, we examined the total, indirect, and direct effects in each path model. The mediation effect was considered significant if the bias-corrected 95% CI did not include a zero (Morera & Castro, 2013). Full mediation was established when the effects of the intervention on substance use outcomes took places only through the indirect pathway (i.e., via family and self-efficacy), and partial mediation occurred when both direct (i.e., intervention on substance use) and indirect pathways were significant (Morera & Castro, 2013). We checked chi-square values, comparative fit index (CFI), and Standardized Root Mean Square Residual (SRMR) to assess the modal fit.

Results

Table 1 shows the intercorrelations between study variables. All mediator and outcome variables assessed at the follow-up were significantly correlated with the intervention assignment at the expected direction. Seen in Figure 1, each of the three models fit the data well, as the chi-square value was not significant, CFI value was greater than .95, and the SRMR value was less than 0.08 (Hu & Bentler, 1999). Path analyses indicated that the intervention improved family relationships at T1 ($B = 0.37, p < .0001$, bias-corrected 95% CI = 0.23, 0.51), which was associated with increased self-efficacy ($B = 0.38, p < .0001$, bias-corrected 95% CI = 0.16, 0.60). Girls' increased self-efficacy at T1 in turn led to decreased alcohol use ($B = -0.95, p < .01$, bias-corrected 95% CI = -1.60, -0.29; [Figure 1A]), marijuana use ($B = -0.51, p < .05$, bias-corrected 95% CI = -0.99, -0.02; [Figure 1B]) and reduced intention to use substances ($B = -0.84, p < .0001$, bias-corrected 95% CI = -1.09, -0.59 [Figure 1C]) at T2.

Decomposition of the total, direct and indirect effects of the mediation analyses (see Table 2) further demonstrated that the pathway from intervention to family relationships and self-efficacy accounted for the decrease of substance use outcomes. In all three models, the total effects from the intervention to substance use outcomes were significant. Alcohol use and substance use intention outcomes were fully mediated by the family relationships mediator (Alcohol: $B = -0.13$, bias-corrected 95% CI = -0.22, -0.05, $p < .01$); substance use intention: $B = -0.12$, bias-corrected 95% CI = -0.21, -0.03, $p < .01$), as the direct effects of intervention on these outcome variables were not significant. The marijuana use outcomes were partially mediated by the family relationships pathway ($B = -0.07, p < .05$, bias-corrected 95% CI = -0.14, -0.01), as the intervention also exerts a significant direct effect on adolescent girls' marijuana use ($B = -0.16, p < .05$, bias-corrected 95% CI = -0.29, -0.03) at 2-year follow-up.

Discussion

The study findings suggest that a universal prevention program that does not incorporate specific cultural content can have promising effects on Asian American adolescent girls and their mothers through enhancing mother-daughter relationships. As the study participants

consisted of a diverse group of second-generation Asian American adolescent girls and their mothers who had no problem accessing intervention content in English, it is possible that these participants were more acculturated to American culture, and therefore found the culturally generic program meaningful. We, however, believe the key to our success is that the program addressed the essential, modifiable risk and protective factors that were relevant to Asian Americans and thus facilitated the program fit to this population.

Mediation analysis results affirm the premise of family interaction theory. Specifically, the study demonstrates that when a prevention program for Asian American adolescents can successfully addresses family-level mediators, it may not be necessary for such a program to incorporate cultural adaptation or tailoring. The intervention helped reduce girls' substance use at 2-year follow-up through enhancing girls' relationships with their mothers, and their self-efficacy. The intervention was designed to increase mother-daughter attachment, mother-daughter communication, parental supervision, and family rules concerning children's substance use. Subsequently, girls who received intervention had greater self-efficacy, which in turn led to decreased alcohol and marijuana use, and reduced intent to use substances at the follow-up. Such results contribute to the emerging outcome literature for Asian Americans, and underline the value and importance of family coherence and integrity in supporting adolescents and deterring them from using drugs. Indeed, our findings are consistent with the results of a recent study that examined parenting profiles and adolescent children outcomes using a sample of 444 Chinese Americans families (Kim, Wang, Orozco-Lapray, Shen, & Murtuza, 2013). These authors found that children of parents who exercised supportive parenting had better developmental outcomes than those whose parents who followed tiger parenting, easy-going parenting, or harsh parenting styles. In this study, "supporting parenting" – which was most common among participating families – refers to a parenting profile where parents scored high on positive parenting dimensions (parental warmth, inductive reasoning, parental monitoring, and democratic parenting) and low on negative parenting dimensions (parental hostility, psychological control, shaming, and punitive parenting). It is possible that our "generic" program tackled parenting behaviors consonant with Asian American parenting practice, and as a result encompassed relevant tools in supporting Asian American families.

By not incorporating visible social and behavioral characteristics of Asian populations into the intervention content, our program did not essentialize the experiences of Asian Americans. Rather, it accounted for the needs of the diverse Asian American populations through focusing on the common developmental needs. Notably, our program did not include content related to acculturation and acculturative stress, both considered a risk factor for substance use among Asian American adolescents. Interestingly, empirical studies have shown that the association between acculturation and Asian American adolescent substance use disappears after controlling for family-related variables (Hahm et al., 2003; Kaplan & Marks, 1990). Such findings suggest that acculturation per se may not increase adolescent substance use risk unless it is accompanied by poor parent-child relationships (Hahm et al., 2003), or high family conflicts (McQueen, Greg Getz, & Bray, 2003). Given that our program facilitated strength building among study participants, allowing mothers and daughters to share quality of time with one another, learn skills in a supportive environment, and have open conversations related to the use of drugs, it might indirectly assist these

adolescent girls to receive proper support from their mothers in negotiating with tasks associated with their acculturation process and learn from their mothers salient behavioral codes and values.

Web-Based Interventions: Strengths and Challenges

Our study contributed to the vast developing literature on web-based interventions (Barak, Hen, Boniel-Nissim, & Shapira, 2008; Bersamin, Paschall, Fearnow-Kenney, & Wyrick, 2007; Mathieu, McGeechan, Barratt, & Herbert, 2012). Web-based intervention is particularly relevant when the intervention target population consists of children and youth as today's young generation relies heavily on the use of online technologies to stay informed and connected. We believe that web-based intervention has a huge potential for Asian Americans given their high prevalent use of and high literacy level in communication technologies (Junco, Merson, & Salter, 2010; Rainie, 2011). In addition, we should also highlight that rather than using trained facilitators to deliver program content, our web-based program provided self-directed content where our participants only interacted with predetermined computer programmed activities. Such design assured program fidelity, allowed the program to be less labor intensive, and avoided the issue of cultural mismatch between facilitators and the participants.

Notwithstanding the promising program effects and the enormous opportunities offered by web-based programs, today's rapid pace of technology advancement presents as a challenge for scholars to replicate and disseminate evidence-based programs that rely on technology. As a result of the fast-developed online interfaces and software capacities, what appeared innovative yesterday easily becomes outdated today. The evolving nature of the technology directly suggests a short half-life of web-based prevention interventions. Although the information and intervention modules of our intervention remain relevant, it would be hard to make the program stay appealing without ongoing technology updates and "facelifts". The design and development of web-based prevention programs can be costly. Without ongoing financial support from funding bodies and collaborations with technology-based private sectors, it would be difficult to maintain and sustain such programs.

The Potential of Online Recruitment and the Importance of Recruitment Messages

Based on limited resources, we were able to attract sufficient numbers of participants from different geographical locations in the United States in a relatively short period of time. Both online recruitment and culturally tailored recruitment messages contributed to our recruitment success given that over two-thirds of the study participants were recruited online. The vast potential of online recruitment for health related trials has been documented (Graham, Milner, Saul, & Pfaff, 2008). In the digital era where the Internet has quickly evolved into one of the primary means of communication, online recruitment should be considered as an essential recruitment method for intervention studies. This is particularly critical considering the difficulties in recruiting ethnic and racial minority participants (Han, Kang, Kim, Ryu, & Kim, 2007; Paskett et al., 2008; Yancey, Ortega, & Kumanyika, 2006). Moreover, our experience demonstrates that Asian Americans can respond well to online recruitment when it is coupled with a recruitment message tailored for them (e.g., "Asian American mothers and daughters needed!"). We should emphasize that although our study

results support a culturally generic program for Asian Americans, our experience suggests that the recruitment messages still need to specifically target Asian Americans to attract their participation. In our other work where we only inserted a generic recruitment message, we received very few inquiries from Asian American families.

Conclusion

Aiming to address developmentally related risk and protective factors, universal prevention programs not only dissuade adolescents from using substances, but also enhance their psychosocial strengths, minimize the psychological risks, and eventually promote positive youth development. Based on a sufficient enrolment of study participants, we found that a culturally generic prevention program that focuses on building family resilience and individual strength can be efficacious for Asian Americans. Our experience shows the feasibility of recruiting and retaining Asian American participants, while suggesting program compatibility for this diverse racial group. Given the rapid growth of the Asian Americans and their limited presence in prevention literature, we assert that focusing on the common risk and protective factors may aid in responding to the their needs.

Our study also suggests several areas for future research. Although our work contributes to the ongoing discussions of the utilities between culturally generic and culturally sensitive interventions, it does not answer the question on whether a culturally generic program demonstrates more efficacies when compared to a culturally adapted program. Despite the overall positive results, our program fell short in modifying several individual-level risk and protective factors (i.e., depression, self-esteem, and peer substance use normative beliefs). It is possible that a refined program that incorporates nuanced material may enhance program outcomes on these areas. In addition, as our program was provided only in English, it may be worthwhile to translate our program into different Asian languages and examine if the program will have similar effects on Asian American mother-daughter participants who prefer to access the program in a language other than English. Future studies that tackle these research questions will advance the science and program development for the growing Asian population in the United States.

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Figure 1. Mediation analysis using mediators at 1-year follow-up and substance use outcomes at 2-year follow-up

Note. Standardized regression coefficients and bias -corrected 95% CIs are presented . All models controlled for pretest (T0) scores.

* $p < .05$. ** $p < .01$. **** $p < .0001$.

Table 1

Intercorrelations of Study Variables

	1	2	3	4	5	6	7	8	9	10	11
1. Intervention (0 = Control; 1 = Intervention)	1										
2. Family relationships (T0)	-.07	1									
3. Family relationships (T1)	.38	.67	1								
4. Self-efficacy (T0)	-.02	.50	.41	1							
5. Self-efficacy (T1)	.34	.41	.53	.49	1						
6. Alcohol use (T0)	-.11	-.29	-.29	-.29	-.46	1					
7. Alcohol use (T2)	-.32	-.25	-.37	-.17	-.60	.62	1				
8. Marijuana use (T0)	-.12	-.13	-.05	-.22	-.31	.13	.29	1			
9. Marijuana use (T2)	-.27	-.19	-.38	-.11	-.37	.26	.38	.04	1		
10. Substance use intention (T0)	-.10	-.43	-.35	-.75	-.57	.29	.28	.29	.36	1	
11. Substance use intention (T2)	-.23	-.46	-.59	-.46	-.67	.43	.68	.32	.42	.58	1

Note. Corrections greater than .20 are significant at $p < .05$

Table 2

Decomposition of total, direct and indirect effects

	Alcohol		Marijuana		Substance use intention	
	B	Bias-corrected 95% CI	B	Bias-corrected 95% CI	B	Bias-corrected 95% CI
Total effects	−0.27***	−0.41, −0.13	−0.27***	−0.41, −0.13	−0.26*	−0.06, −0.46
Direct effects (Tx → substance use)	−0.07	−0.24, 0.11	−0.16*	−0.29, −0.03	−0.08	−0.23, 0.07
Indirect effects	−0.21*	−0.40, −0.01	−0.11*	−0.22, −0.01	−0.18*	−0.35, −0.01
Tx → self-efficacy → substance use	−0.07	−0.26, 0.12	−0.04	−0.13, 0.06	−0.06	−0.23, 0.11
Tx → family relationship → self-efficacy → substance use	−0.13**	−0.22, −0.05	−0.07*	−0.14, −0.01	−0.12**	−0.21, −0.03

Note. Standardized regression coefficients are presented.

* $p < .05$.** $p < .01$.*** $p < .0001$.