

Enrichment in Pre-Kindergarten Life Predicts Initiation of Cigarette Smoking in Asian American and Hispanic/Latino Adolescents

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Abstract The risk of tobacco use during adolescence may be traced back to early childhood, the time when a child is most vulnerable to environmental influence. We examined daily-life enrichment during pre-kindergarten period as a predictor of initiation of cigarette smoking among Asian American and Hispanic/Latino children during adolescence. Survey data were collected from students in grades seven to nine in California. Among the 2,719 participants who completed the survey, 37% were Asian American and 44% were Hispanic/Latino. Five aspects of childhood life before kindergarten were assessed, including having lots of toys for the child, parents' read to the child often, having a plenty of good food for the child, bringing the child to travel, and parents spending adequate time with the child. Findings from our research indicate that children with more enriched early childhood are less likely to start smoking during adolescence. Consequently, enhancing daily life during early childhood may represent a new strategy for adolescent smoking prevention.

Keywords Enrichment in early childhood · Smoking initiation · Asian-American · Hispanic/Latino · Adolescents

Despite decades of tobacco control, cigarette smoking among adolescents in the United States increased from 27.5% in 1991 to 36.4% in 1997 before it started to decline in 1999 (SAMHA 2005). Currently, 58.4% of American adolescent have initiated smoking, 21.9% smoked at least on one day in the past 30 days, and 9.7% smoked on 20 or more days also in the past 30 days (CDC, 2005; SAMHA, 2005). Risk of tobacco use during adolescence may be traced back to early childhood, the time when a child is most vulnerable to environmental impact. Data from a number of laboratory studies indicate that deprivation in early childhood life may increase an individual's vulnerability to drugs, including nicotine. Isolation of infant animals

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from their mothers results in negative changes in neurobehavioral development toward increased likelihood of drug use (Coplan et al., 1996; Kosten, Miserendino, & Kehoe, 2000; Kosten, Sanchez, Zhang, & Kehoe, 2004; Meaney, Brake, & Gratton, 2002). Animals with maternal isolation during infancy often have difficulties responding to stressors, and are more likely to use drugs when reached adolescence and adulthood (Meaney et al., 2002; Middleton, Cass, & Dwoskin, 2004; Vazquez, Eskandari, Zimmer, Levine, & Lopez, 2002). Macaques raised in an environment where their mothers experienced difficulties in food access showed a number of social and emotional problems, leading to increased vulnerability to substance use (Coplan et al., 1996). Rhesus monkeys raised by peers instead of their mothers experience poor social and emotional capabilities, which may lead to increased likelihood for substance use (Suomi, 1997). However, there is a lack of human data regarding early childhood experience and adolescent tobacco use due to ethical and practical difficulties (Gordon, 2002). Several well documented survey studies have demonstrated that children and adolescents who have ever been suffered from verbal, physical, and sexual abuse are more likely than others to use tobacco and other drugs (Bensley, Spieker, Van Eenwyk, & Schoder, 1999; Bulik, Prescott, & Kendler, 2001; Harrison, Fulkerson, & Beebe, 1997; Kendler et al., 2000; O'Campo, Gielen, Faden, & Kass, 1994). Findings from these studies provide some indirect evidence that early childhood deprivation may have contributed to smoking in adolescence because abused children are often from families with low socioeconomic backgrounds (Bohn, Tebben, & Campbell, 2004; Jason & Anderock, 1983; O'Campo et al., 1994).

Asian Americans and Hispanics/Latinos are the two major ethnic minority groups in the United States. A number of studies targeted Asian American and Hispanic/Latino adolescents have demonstrated increased risk of smoking initiation with age among children from these two ethnic minority groups (Anderson & Burns, 2000; Chen & Unger, 1999; Chen, Unger, & Johnson, 1999; Kandel, Kiros, Schaffran, & Hu, 2004; Tang, Shimizu, & Chen, 2005; Unger et al., 2000), little is known about if such increase is associated with the enrichment of early childhood life. The purpose of our study was to assess the enrichment in daily life during the pre-kindergarten period as a predictor of cigarette smoking among Asian American and Hispanic/Latino adolescents. We hypothesize that adolescents who had a less enriched pre-kindergarten life are at greater risk to start smoking compared to those who had a more enriched life.

Methods

Subjects and procedure

Data used for this analysis were derived from the Health Behavior Survey Study, a project funded by the University of California Tobacco-Related Disease Research Program to study acculturation and tobacco use among Asian American and Hispanic/Latino adolescents from public school students in southern California (Weiss & Weiss, 2002). Three thousand two hundred and sixty eight students in grades seven through nine were recruited from 4 junior high schools and 6 high schools in three school districts in Los Angeles County. This study focused on adolescents with Asian or Hispanic/Latino origin; adolescents with other ethnic backgrounds (African American and non-Hispanic White) were included as reference groups. Detailed sampling and data collection procedures have been reported elsewhere (Weiss & Weiss, 2002). Briefly, schools with high proportions of Asian American and Hispanic/Latino students were approached to obtain permission to access to classes. A paper-and-pencil questionnaire (consisting of 149 items) was administrated in classroom settings. Students

who presented both the signed parental consent and student assent forms were administered a questionnaire. The survey was anonymous and the research protocol was approved by the Institutional Review Board at the California School of Professional Psychology of Alliant International University.

Determination of ethnicity

Self-identified data were used to determine ethnicity based on participants' response to a checklist of (1) Native or Alaskan American, (2) Asian/Pacific Islander, (3) Black/African American, (4) White, non-Hispanic, (5) Hispanic/Latino. Each student was asked to select only one among these five options. This study focused on adolescents who identified themselves as Asians or Hispanic/Latino. One reason for this selection was that the Health Behavior Survey Study targeted these two ethnic groups. Another reason was that the sample size for Black/African and non-Hispanic Whites was limited for a robust estimation of many statistical parameters. However, students from these two groups were included as references. There were no students identified as Native or Alaskan American, this group was therefore excluded.

Measures

Smoking behavior

Standardized questions used in the California Youth Tobacco Survey were adopted in the Health Behavior Survey Study to collect information regarding cigarette smoking. Two measures used in this analysis were: (1) Smoking initiation: a subject was considered as having initiated smoking if he or she gave a positive answer to either or both of the following two questions, "Have you ever tried cigarette smoking, even a few puffs?," "Have you ever smoked a whole cigarette?" (2) 30-Day smoking: a subject was considered as a 30-day smoker if he or she smoked at least on one day during the 30 days preceding the survey, based on his or her response to the question, "Think about the last 30 days. On how many of these days did you smoke?" While these two variables were used to describe smoking behavior among the participants, the first variable was used in assessing the association between the enrichment in pre-kindergarten life and smoking initiation.

Enrichment of pre-kindergarten life

This variable was assessed using the Pre-Kindergarten Life Enrichment Scale (PKLES). PKLES is a five-item instrument developed and pilot-tested among middle school students in California with diverse ethnic backgrounds (unpublished data from the first author). The instrument taps information on life enrichment during the pre-kindergarten period by asking whether a child (1) had more toys to play than most other kids, (2) had parents read a lot to him/her, (3) always had a lot of good food to eat, (4) had chances to go places that other kids did not get to go, and (5) had parents spent as much time as he/she wanted. A five-level Likert rating scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) was used as answer options. These five items covered material, intellectual, mental and social aspects of pre-kindergarten life. The five items were imbedded in the questionnaire used for the Health Behavior Survey Study to collect the data. A composition score was computed by summing up scores from all five items at the individual level to create an index score, with the higher value indicating greater enrichment

in pre-kindergarten life. Correlation analysis indicated acceptable internal consistency of the PKLES (Cronbach alpha ranging from 0.74 to 0.76 across ethnic groups).

Covariates

To assess the association between pre-kindergarten life and smoking initiation, variables with potential confounding effect (i.e., associated with both early childhood experiences and smoking initiation) were included as covariates. Four groups of variables included in the analysis were: (1) School performance (1 = mostly A's, 2 = mostly B's, 3 = mostly C's, 4 = mostly D's and 5 = mostly F's). (2) Parental smoking, including reported father and mother smoking by adolescents (0 = no, never smoked, 1 = used to smoke, but quit, 2 = smokes once in a while, 3 = smoke regularly). (3). Acculturation variables, including birth place of parents (1 = born in the US, 0 = otherwise), age when adolescents first coming to the US. (4) Demographic (gender and school grade) and socioeconomic (parental educational attainment) variables.

Statistical analysis

Descriptive statistics (mean, standard deviation, proportion and prevalence rate) were used to sum up characteristics of the study sample, including age, gender and ethnic compositions, school performance, and prevalence of cigarette smoking. Student *t*-test (continuous variables) and chi-square test (categorical variables) were used to assess differences between males and females and across ethnic groups on cigarette smoking and enrichment of pre-kindergarten life. Univariate and multiple logistic regression models were used to assess the association between pre-kindergarten experience and smoking initiation. In the regression analyses, initiation of cigarette smoking was used as the dependent variable and indexed enrichment of pre-kindergarten life was used as the independent variable. With the multiple logistic regression model, the association between the dependent and the independent variable was assessed without confounding effect from the covariates (Stevens, 2002; Szklo & Nieto, 2004). Statistical analyses were conducted by ethnic group and stratified by gender when needed. The commercial software SAS version 9.1 (SAS Institute, Cary, NC) was used for all the statistical analyses described above.

Results

Sample characteristics

There were 1,074 Asian Americans (52% male) and 1,279 Hispanics (47% male) in the study sample with a mean age of 13.7 (*SD* = 0.99) years. As shown in Table 1, approximately one-fifth of Asian Americans had already started smoking by the time of the survey; 7.2% reported that they smoked at least on one day during the 30 days preceding the survey. Approximately one-third of Hispanic/Latino adolescents had started smoking, 3.7% reported that they smoked at least on one day during the 30 days preceding the survey.

Psychometric characteristics of the pre-kindergarten life enrichment scale

Data in Table 2 showed that the mean score of responses to each of the five items ranging from 2.66 to 4.00 across subjects from the four ethnic groups. Correlation analysis indicates

Table 1 Characteristics of the study sample

	Male	Female	Total
Overall	1429 (100%)	1488 (100)	2917 (100)
Ethnicity, <i>N</i> (%)			
Asian American	563 (39%)	511 (34%)	1074 (37%)
Hispanic	595 (42%)	684 (46%)	1279 (44%)
Black	48 (3%)	67 (5%)	115 (4%)
White	223 (16%)	226 (15%)	449 (15%)
Grade, <i>N</i> (%)			
Seventh	229 (16%)	278 (19%)	507 (18%)
Eighth	286 (20%)	296 (20%)	582 (20%)
Ninth	908 (64%)	911 (61%)	1819 (62%)
Age (in years)			
Mean (<i>SD</i>)	13.77 (1.00)	13.67 (0.98)	13.72 (0.99)
Smoking initiators (proportion, %)			
Asian American	122 (21.6%)	108 (21.1%)	230 (21.4%)
Hispanic/Latino	206 (34.7%)	219 (32.0%)	425 (33.2%)
Black	7 (14.6%)	16 (23.9%)	23 (20.0%)
White	64 (28.7%)	55 (24.3%)	119 (26.5%)
30-Day smokers, (prevalence, %)			
Asian American	42 (7.5%)	35 (6.9%)	(7.2%)
Hispanic/Latino	21 (3.6%)	27 (3.9%)	(3.7%)
Black	2 (4.3%)	2 (3.2%)	(3.5%)
White	7 (3.2%)	9 (3.8%)	(3.5%)

Note. Chi-square test indicated that: 1) significantly ($p < .01$) more subjects in grade nine than in other two grades; 2) proportion of smoking initiators in Hispanic/Latino adolescents was the highest among the four ethnic groups ($p < .05$); and 3) 30-day smoking prevalence for Asian American adolescents was the highest among the four ethnic groups ($p < .05$).

that each of the five items was positively associated with the total scale score (correlation coefficients varying from 0.42 to 0.59, data not shown in the table). The Cronbach α of the scale was 0.73 for Hispanic/Latino and non-Hispanic White adolescents, 0.74 for Asian American adolescents and 0.76 for African American adolescents. Item response analysis (data not shown) indicated that proportions of subjects corresponding to each of the five response levels approached a ‘S’ shaped curve with a few exceptions for the first item, “Had more toys than other kids.” Few subjects responded as “agree” and “strongly agree.” Results from the correlation analysis and item-response analysis indicated an acceptable level of internal consistency of the instrument in measuring enrichment of pre-kindergarten life.

Enrichment of pre-kindergarten life and initiation of cigarette smoking

The proportion of smoking initiators vs. enrichment score of pre-kindergarten life is plotted for each of the four ethnic groups in Fig. 1. There was a pattern between the enrichment score and the proportion of smoking initiators. As the enrichment score increased from less than 10 to 10–14, the proportion of smoking initiators declined rapidly. When the enrichment score further increased from 10–14 to 20 and above, no substantial changes were observed in the proportion of smoking initiators. This trend was consistent across ethnicity regardless

Table 2 Psychometric characteristics of the pre-kindergarten life enrichment scale

Item	Asian American mean score (<i>SD</i>)	Hispanic/Latino mean score (<i>SD</i>)	Black/African American mean score (<i>SD</i>)	Non-Hispanic White mean score (<i>SD</i>)
<i>N</i>	1,074	1,279	115	449
1. More toys than others	2.66 (1.16)	2.75 (1.20)	3.02 (1.48)	2.78 (1.19)
2. Mother read me a lot	2.97 (1.26)	2.96 (1.25)	3.32 (1.42)	3.18 (1.25)
3. Plenty good food	3.66 (1.16)	3.72 (1.18)	4.00 (1.18)	3.85 (1.18)
4. Traveling more places	3.15 (1.18)	3.17 (1.21)	3.33 (1.31)	3.46 (1.19)
5. Much time with parents	3.28 (1.19)	3.36 (1.21)	3.47 (1.33)	3.44 (1.17)
Cronbach α	0.74	0.73	0.76	0.73

of the overall levels of smoking initiation. The proportion of respondents with an enrichment score less than 10 was 7.2% for Asian Americans, 6.8% for Hispanic/Latinos, compared to 6.4% for Black/African Americans and 4.8% for non-Hispanic Whites.

Because data from Fig. 1 indicates that as the enrichment score increased from 10 and above, there was little change in levels of smoking initiation, we dichotomized the enrichment score using ≥ 10 as the cut-off point for logistic regression analysis. Results in Table 3 indicated that compared to students with enrichment scores less than 10, those with scores equal or greater than 10 were at declined risk of smoking initiation (odd ratio less than 1.00). The effect was statistically significant for Asian American and Hispanic/Latino adolescents with or without adjustment of the covariates. The adjusted odds ratio for Asian

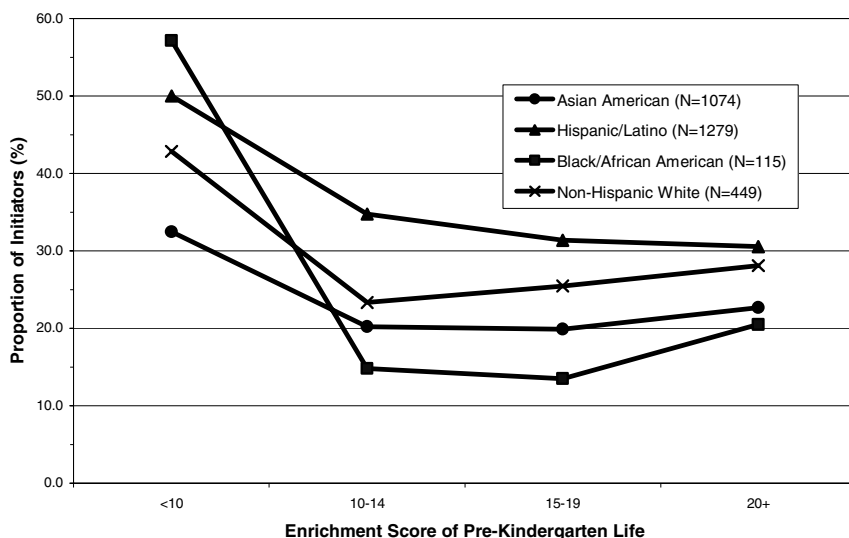


Fig. 1 Association between Enrichment of Pre-Kindergarten Life and Initiation of Cigarette Smoking among Adolescents in Southern California

Table 3 Association between pre-kindergarten enrichment and smoking onset among adolescents in California, United States

Group	Bivariate Analysis		Multiple Logistic Regression Analysis	
	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Overall (<i>N</i> = 2719)	0.48 (.36, .65)	<.01	0.56 (.39, .82)	<.01
Gender				
Male (<i>N</i> = 1429)	0.58 (.38, .90)	<.05	0.62 (.36, 1.00)	<.05
Female (<i>N</i> = 1488)	0.40 (.27, .62)	<.01	0.52 (.31, .87)	<.05
Ethnicity				
Asian (<i>N</i> = 1074)	0.54 (.33, .89)	<.05	0.55 (.29, 1.00)	<.05
Hispanic (<i>N</i> = 1279)	0.47 (.30, .74)	<.01	0.48 (.28, .83)	<.01
Black (<i>N</i> = 115)	0.15 (.03, .72)	<.05	0.13 (.01, 1.35)	> .05
White (449)	0.46 (.19, 1.12)	> .05	0.84 (.24, 2.89)	> .05

Note. One logistic regression model was used for each subgroup to estimate the odds ratio contrasting an enrichment score <10 to a score of 10 + . For the multiple logistic regression analysis, grade in school, school performance, age when first came to the U.S., if mother born in the U.S., if father born in the U.S., parental educational attainment and parental smoking were included as control variable.

American adolescents was 0.56 (95% CI = 0.39–0.82, $p < .05$); the adjusted odds ratio for Hispanic/Latino adolescents was 0.48 (95% CI = 0.28–0.83, $p < .01$). These findings indicate that the likelihood of smoking initiation for adolescents with a more enriched pre-kindergarten life was approximately half that for adolescents with a less enriched life. In addition to Asian American and Hispanic/Latino adolescents, significant negative association between the pre-kindergarten enrichment score and likelihood of smoking onset was also observed for the sample as a whole and stratified by gender. A significant association was observed for Black/African adolescents (odds ratio = 0.15, 95% CI: .03–.72, $p < .05$), such association was no longer significant ($p > .05$) after adjustment for confounding variables. No significant association between enrichment scores and smoking initiation was found for non-Hispanic White adolescents ($p > .05$) with or without adjustment of the confounding variables.

Discussion

To our knowledge, this is the first study to examine the effects of enrichment of the pre-kindergarten life on adolescent smoking initiation among Asian American and Hispanic/Latino populations. Our findings support the hypothesis that more enriched early childhood life is associated with reduced risk of initiation of cigarette smoking during adolescence. Compared to adolescents who reported lower enrichment score during the pre-kindergarten period, the likelihood of smoking initiation was reduced approximately 50% for adolescents who reported higher enrichment score during the same period. The protective effect is consistent across ethnicity and gender; and exists after adjustment for a number of covariates, including school performance, parental smoking, socioeconomic status and acculturation. The association between enrichment of early childhood life and reduced risk of smoking initiation is consistent with the findings from laboratory studies with rodents

and primitive animals. As these studies have demonstrated that deprivation and maternal isolation are risk factors for substance use because they affect the brain development leading toward craving for drugs, including nicotine (Copeland, 2003; Harrison et al., 1997; Meaney et al., 2002; Suomi, 1997).

Another finding from this analysis is that the association is not linear between the enrichment of pre-kindergarten life and the initiation of cigarette smoking. The protective effect exists primarily for those subjects whose enrichment score is greater than 10; further increases in the enrichment score results in little change in the protective effect. Although we do not have data to examine the detailed mechanism underlying this phenomenon, this finding appears to suggest an enrichment threshold of 10 points from the PKLES instrument to benefit from the enriched pre-kindergarten life for risk reduction of smoking initiation during adolescence.

There are several limitations to this study. First, although the association between enrichment of pre-kindergarten life and initiation of cigarette smoking during adolescence was observed across gender and ethnicity, the data used for this analysis are cross-sectional in nature. The usual cautions about cross-sectional results apply because it would be practically difficult to carry out a longitudinal study with the duration from kindergarten to adolescence. Second, the measure of enrichment of pre-kindergarten life is based on self-reports of experience occurred years ago, recall bias may exist (Bernstein, Whittlesea, & Loftus, 2002; Bradburn, Rips, & Shevell, 1987). Although the PKLES is psychometrically reliable, the recall bias may limit the accuracy of the instrument in measuring enrichment of life during the pre-kindergarten period. Third, the relatively small sample sizes for ethnic groups other than Asian American and Hispanic/Latino make the inference less strong for these groups, especially for African Americans. Despite these limitations, the consistent pattern in the study findings demonstrates that enrichment in pre-kindergarten life may be an important protective factor to reduce risk of initiation of cigarette smoking. Findings from this study is therefore of great importance for devising programs for adolescent tobacco prevention intervention. In addition, findings from this study can be used as a basis supporting further research to look into living enrichment in early childhood life and its relationship with parenting and family functioning, and to search for method to improve early childhood life.

Approximately 40,000 adolescents start smoking every year in the United States (CDC, 2000). Findings from this analysis suggest the importance of enrichment of early childhood life in adolescent smoking prevention. In addition to adequate amount of healthy food, lots of toys, spending much time with children, reading to them a lot, and bring children to travel around during the pre-kindergarten period will make children less vulnerable to tobacco when they become adolescents. As has been discussed in the introduction section, such enriched environment during the pre-kindergarten period may enhance the brain and behavioral development, resulting in increased resistance to nicotine. It is our anticipation that such enriched nurturing environment may also reduce risk of tobacco use for subjects who are born to be vulnerable to nicotine by modifying the impact from their genetic make-ups. Parents and family are essential for enriched early childhood of their children. With the available resources, increasing parents' knowledge and improving family functioning (Weiss & Garbanati, 2003) would be a promising alternative strategy for adolescent smoking prevention.

Findings from this analysis further suggest that tobacco use prevention should start before kindergarten. Although early prevention of tobacco use has been recognized as an important strategy (CDC, 2001; US DHHS, 1994), the age range for smoking prevention has been early adolescence when the hazard of smoking onset reaches its peak. However, this strategy ignores the underlying causes for the increased likelihood of initiation of

smoking during the teenage period. Since findings from different sources suggest that early deprived experiences make human brain develop toward smoking, the primary prevention intervention should focus on those that attempt to promote a brain that does not crave for nicotine.

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