



## Longitudinal modeling of adolescents' activity involvement, problem peer associations, and youth smoking

Aaron Metzger<sup>a,\*</sup>, Nickki Dawes<sup>b</sup>, Robin Mermelstein<sup>c,1</sup>, Lauren Wakschlag<sup>d,2</sup>

<sup>a</sup> West Virginia University, United States

<sup>b</sup> Arizona State University, United States

<sup>c</sup> University of Illinois at Chicago, United States

<sup>d</sup> Northwestern University, United States

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### ABSTRACT

Longitudinal associations among different types of organized activity involvement, problem peer associations, and cigarette smoking were examined in a sample of 1040 adolescents (mean age = 15.62 at baseline, 16.89 at 15-month assessment, 17.59 at 24 months) enriched for smoking experimentation (83% had tried smoking). A structural equation model tested longitudinal paths between three categories of involvement (team sports, school clubs and activities, and religious activities, measured at baseline and 15 months), problem peer associations (baseline and 15 months), and cigarette smoking behavior (baseline and 24 months). Multi-group analyses indicated pathways differed by type of activity and adolescent gender. Boys' baseline team sports and religious involvement predicted lower levels of smoking at 24 months via continued activity involvement at 15 months. Girls' involvement in school clubs and activities and religious activities indirectly predicted lower levels of smoking at 24 months via reduced exposure to problem peers at 15 months.

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### Introduction

Adolescent participation in organized activities has been associated with reduced involvement in delinquent behavior and substance use such as cigarette smoking (Eccles, Barber, Stone, & Hunt, 2003; Elder, Leaver-Dunn, Wang, Nagy, & Green, 2000; Fredericks & Eccles, 2006a; Mahoney, Harris, & Eccles, 2006; Metzger, Crean, & Forbes-Jones, 2009). According to one theoretical explanation, organized activities protect against problem behaviors because they facilitate adolescents' membership in prosocial peer groups (Eccles & Barber, 1999) and reduce the time that adolescents spend with deviant peers (Mahoney, 2000). Utilizing a sample intentionally recruited to have a higher proportion of smoking youth (current smokers and experimenters), the present study tested a structural model (Fig. 1) that examined longitudinal paths between three types of organized activity involvement (school clubs and activities, team sports, and religious activities), problem peer associations, and cigarette smoking. Multi-group analyses tested whether these longitudinal associations varied for males and females.

Adolescents are engaged in a wide-range of organized activities (Metzger et al., 2009) including clubs and organizations at schools (Marsh & Kleitman, 2002), team sports organized through schools

and community organizations (Hansen, Larson, & Dworkin, 2003; Mahoney & Cairns, 1997), and faith-based or religious activities (King & Farrow, 2004). These different activities are supervised and organized by distinct institutions (schools, community centers, religious organizations) and provide adolescents with different experiences including opportunities for skill development, variations in interactions with peers and adults, and different norms for expected behavior (Larson, Hansen, & Moneta, 2006; Rogoff, Baker-Sennet, Lacasa, & Goldsmith, 1995). Because of their distinct attributes, different activities may vary in their ability to reduce adolescents' involvement in risky behaviors (Eccles et al., 2003; Youniss, Yates, & Su, 1997).

Previous empirical studies on the protective effects of organized activities have distinguished between adolescents' involvement in team sports versus participation in other school-based clubs and extracurricular activities such as art/music, student leadership, and academic clubs (Eccles & Barber, 1999; Hansen et al., 2003; Larson et al., 2006; Metzger et al., 2009). Involvement in school clubs and activities has been consistently linked to positive educational outcomes including grades (Eccles et al., 2003) and subsequent college completion (Marsh & Kleitman, 2002), as well as lower levels of depression (Fredericks & Eccles, 2005). Research has not found consistent links between school clubs and substance use (Fredericks & Eccles, 2005) or involvement in risky behaviors (Eccles et al., 2003). However, less research has specifically examined associations between school clubs and cigarette smoking utilizing longitudinal data.

\* Corresponding author. Tel.: +1 304 293 2001x31672.

E-mail address: Aaron.Metzger@mail.wvu.edu (A. Metzger).

<sup>1</sup> Institute for Health Research and Policy.

<sup>2</sup> Feinberg School of Medicine. Department of Medical Social Sciences.

## Adolescents' Organized Activities and Smoking

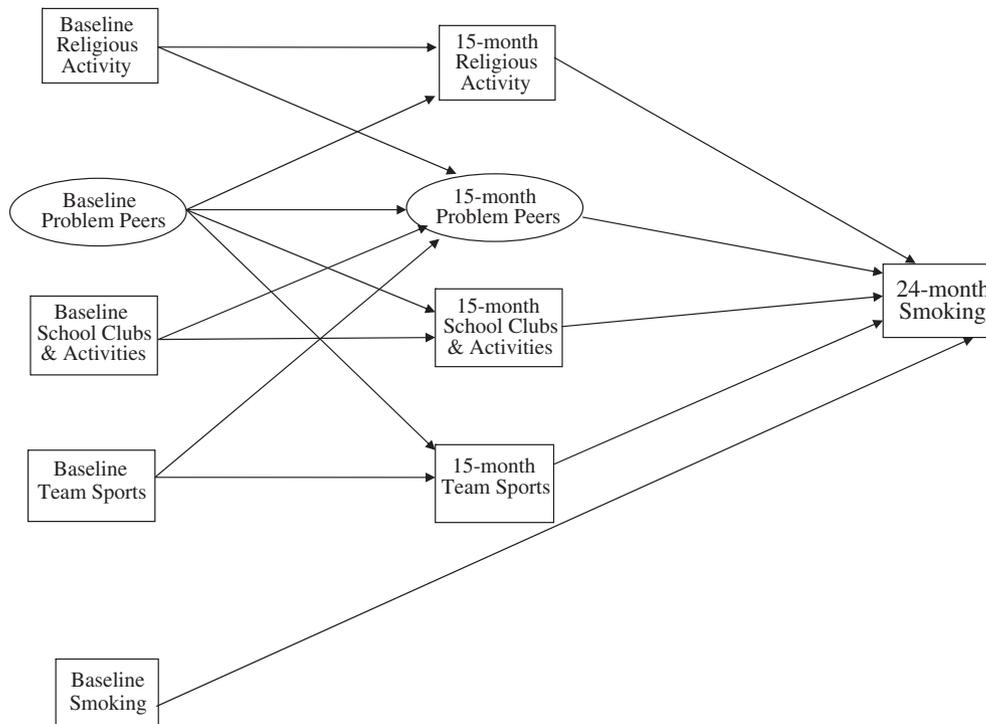


Fig. 1. Proposed model.

In contrast to school clubs, research on team sports involvement in adolescence points to both positive and negative outcomes. Team sports involvement has been associated with increased academic achievement (Eccles et al., 2003; Marsh & Kleitman, 2002), but also increased risky behavior such as alcohol use (Eccles & Barber, 1999). Similarly, in a sample of 9th–12th graders, Fredericks and Eccles (2005) found that organized sports involvement was related to both lower levels of depression and increased alcohol use. However, youth sports involvement has been specifically linked to lower levels of adolescent cigarette smoking (Page, Hammermeister, Scanlan, & Gilbert, 1998), and consistent sports involvement (involvement for multiple years in a row) has been found to reduce smoking behavior more than erratic participation (Rodriguez & Audrain-McGovern, 2004).

In addition to team sports and school-organized clubs and activities, adolescents participate through religious organizations including attending religious services and joining social or service groups organized by religious institutions (Mahoney et al., 2006; Metzger & Smetana, 2009), though research has differed in how religious involvement is measured. Some studies have grouped religious involvement into a cluster of “prosocial” activities (Bohnert & Garber, 2007; Eccles et al., 2003), and others have examined adolescents’ involvement in solely church-based or religious activities (Hodge, Cardenas, & Montoya, 2001; Metzger et al., 2009). Involvement in solely religious activities has been linked to lower levels of alcohol use (Hodge et al., 2001) and lower levels of delinquency and drug use (Metzger et al., 2009).

In this paper, we take advantage of longitudinal data from a cohort of youth oversampled for smoking to examine whether these varied associations between different types of organized involvement and problem behaviors are also present among youth with higher levels of problem behavior. Previous activity involvement research has used at-risk samples in research on high school drop-out (Mahoney, 2000) and depression (Bohnert & Garber, 2007). In the current study, 83% of

the sample had at least tried smoking—including adolescents who were regular smokers, current or former experimenters, or had never smoked at the time of screening into the study. Cigarette smoking is a strategic paradigmatic outcome because it is a less extreme risk behavior (e.g., compared to drug use and antisocial behavior) and more “normative” (in the sense that it is a developmentally restricted norm-violation). The majority of adult smokers started smoking earlier in adolescence (U.S. Department of Health and Human Service, 1994), but many youth who experiment with smoking do not go on to become regular smokers (Wakschlag, Metzger, Darlfer, & Mermelstein, 2009). Elucidating whether involvement longitudinally exerts a uniquely protective effect against smoking escalation for early adolescents who have experimented with smoking during this critical developmental period may be particularly informative for prevention.

Findings on the longitudinal effects of activity involvement on adolescent substance use have been mixed. Some studies have demonstrated a long term protective effect (Bohnert & Garber, 2007), while other studies have demonstrated concurrent but not longitudinal effects (Fredericks & Eccles, 2006b). However, less research has utilized multiple data points to test whether consistent involvement across adolescence is protective against problem behavior. The current study utilized three waves of data (baseline, 15 months, and 24 months) allowing for a comprehensive investigation of indirect effects from baseline activity involvement to smoking behavior at 24 months via activity involvement at 15 months.

Longitudinal data also allows for a more comprehensive investigation of potential explanatory variables. Several mechanisms have been theorized to mediate the relationship between youth activities and reductions in substance use including non-familial adult support, identity development, and reductions in risky peer associations (Barber, Stone, Hunt, & Eccles, 2005; Fredericks & Eccles, 2005). Organized activity involvement influences adolescents’ peer associations because of the considerable time that participation in these activities demands and because of the types of youth who choose to

participate (Eccles et al., 2003). The characteristics of adolescents' peer groups may play an especially important mediating role between involvement and adolescent smoking given that youth smoking is highly related to the smoking behaviors of adolescents' social networks (Ennett & Bauman, 1994; Ennett et al., 2006; Kobus, 2003; Urberg, Degirmencioglu, & Pilgrim, 1997). Adolescent involvement in organized activities may lead to associations with peers who are less likely to be engaged in activities such as smoking, which, in turn, reduces adolescents' own risk of smoking. Adolescents' social worlds are multi-faceted and include close friends, clique members, and more distal peer associations (Brown, Mory, & Kinney, 1994). Organized activity involvement may influence whether adolescents choose close friends who smoke, or may reduce adolescents' exposure to a more generally delinquent peer group.

Different forms of activity involvement may differentially protect against problem peer associations. Larson et al. (2006) found that across a variety of organized activities, adolescents reported different levels of initiative and positive social relationships. Compared to other forms of participation, youth who engaged in faith-based youth groups reported more positive social relationships and higher levels of social capital. In contrast, participation in academic clubs and organizations was linked to fewer positive relationships and also lower levels of teamwork. Team sports involvement was unrelated to social relationships. Thus, adolescents' involvement in school clubs and activities, team sports, and religious activities may differentially protect adolescents from problem peer associations, which may, in turn, differentially predict smoking behavior.

It is important to consider gender-specific pathways between organized activity involvement, risky peers, and reduction in cigarette smoking (Hoffman, 2006). Involvement in school clubs has been found to decrease delinquency risk for boys but not for girls (Fredericks & Eccles, 2006b), while sports involvement has been linked to increased alcohol use in late adolescence for boys but not for girls (Eccles et al., 2003). Additionally, Eccles et al. (2003) found that girls (but not boys) who were involved in school clubs reported fewer risky peer associations. Thus, in addition to moderating longitudinal associations between activity involvement and substance use, gender may also moderate associations between involvement and problem peer associations.

Building on previous research, the goals of the current study were to examine longitudinal associations between organized activity involvement, problem peer associations, and cigarette smoking in a sample enriched for smoking experimentation. Utilizing an at-risk sample is a robust strategy for addressing potential selection effects (individuals who are at-risk for problem behaviors may be less likely to seek out organized activities), which may be superior to other methodological strategies such as controlling for demographic characteristics or including baseline measure of the youth adjustment outcome in analyses. These statistical strategies may not be sufficient to control for possible preexisting differences among adolescents (Paternoster, Bushway, Brame, & Apel, 2004). However, combining experimenters with more established smokers may confound distinct developmental progressions of smoking behavior. Thus, the current study tested whether organized activity involvement operated differently in limiting smoking initiation versus reducing smoking behavior among current users. We hypothesized that organized activity involvement would be similarly protective against smoking for non-smoking (lower rates of smoking initiation), experimenting (lower rates of smoking escalation), and regularly smoking adolescents (reduce smoking behavior).

To address the study's primary goals, a structural equation model tested predictive pathways from organized activity involvement (school clubs and activities, team sports, and religious activities) and problem peer associations measured at baseline and 15-month assessments to adolescent smoking measured at baseline and 24 months (Fig. 1). Multi-group analyses tested whether pathways

significantly differed for boys and girls. The model tests proximal direct effects (15-month activity involvement to 24-month smoking) and indirect effects (baseline activity to 24-month smoking via 15-month activity involvement). Based on previous research, it was hypothesized that compared to school clubs, involvement in religious activities and team sports would be more strongly related to cigarette smoking, but based on previous research, the association between team sports and smoking was hypothesized to vary by adolescent gender. We also hypothesized that organized activity involvement would be indirectly associated with reductions in adolescent smoking by lowering their exposure to problem peers, controlling for baseline exposure to problem peers. Based on Larson et al. (2006), we hypothesized that problem peer associations would specifically explain the relationship between religious activities and smoking. Based on Eccles et al.'s (2003) finding that girls' involvement in academic clubs was associated with fewer risky peer associations, we hypothesized that school club involvement would be indirectly linked to smoking via problem peer associations for girls, but not boys.

## Methods

### Participants

Data for this study come from a longitudinal study of social and emotional influences on adolescent smoking trajectories. The current study examined data from 1140 youth who completed self-report questionnaire measures at the baseline, 15-month, and 24-month waves.

Recruiting a sample of adolescents enriched for smoking behavior involved multiple steps. Prior to baseline assessment all 9th and 10th grade students from 16 Chicago-area high-schools completed a brief screener survey ( $N = 12,970$ ). Based on adolescents' responses to screening questions concerning their past experiences with cigarette smoking, four categories of smoking experience were developed: 1) never smokers; 2) former experimenters (smoked in the last 12 months, but not in the last 90 days, and have smoked fewer than 100 cigarettes in their lifetime); 3) current experimenters (smoked in the past 90 days but smoked fewer than 100 cigarettes in their lifetime); and 4) regular smokers (smoked in the past 30 days and have smoked more than 100 cigarettes in their lifetime). Invitation/recruitment packets were then mailed to eligible adolescents and their parents, including a random sample of the never smokers and former experimenters, and all current experimenters and regular smokers. Youth were enrolled into the longitudinal study after written parental consent and student assent was obtained. Of those invited, 1263 (34%) completed baseline measures. Of those that completed baseline measures, 1140 (the analytic sample for this study) participated and had complete data at 24 months (90.2%).

Participants and non-participants at 24 months did not differ by age or race/ethnicity. However, nonparticipation was significantly higher among boys (11.5%) than girls (7.4%),  $p = .013$ . Compared to those who participated in the 24-month data collection wave, non-participants reported greater number of days smoked in the past 30 ( $M = 5.79$ ,  $SD = 9.18$  vs.  $M = 3.66$ ,  $SD = 7.51$ ),  $p = .004$ . Non-participants at 24 months also had lower grade point averages at baseline than completers ( $M = 3.53$ ,  $SD = 0.70$  vs.  $M = 3.73$ ,  $SD = 0.75$ ,  $p < .01$ ; where A = 5, B = 4, C = 3, D = 2, F = 1). However, levels of organized activity involvement (team sports, religious, and school clubs) did not differ for participants and non-participants. Additionally, 59 youth who participated at baseline and 24 months did not have data at 15 months, but these youth did not differ from youth who had complete data at all three time points. Given the small quantity of missing data (<2% across the three waves), 15-month data for these 59 adolescents was imputed using simple mean imputation.

As displayed in Table 1 the demographic composition of the sample remained stable from baseline to 24 months. The sample

**Table 1**  
Sample description at baseline and 24 months.

	Baseline (N = 1263)		24 months (N = 1140)	
	Age: 15.62 (.61)		Age: 17.59 (.60)	
	N	%	N	%
Gender (Girls)	715	56.6	650	57.8
Ethnicity				
Asian or Pacific Islander	50	4.0	50	4.2
African American	214	16.9	191	16.8
Hispanic	217	17.2	189	16.6
White	713	56.5	647	56.8
Other or unknown	69	5.5	63	5.6
Adolescent smoking status at study screening				
Never smokers	213	16.9	210	17.7
Former experimenters	304	24.1	278	24.4
Current experimenters	594	47.0	532	46.7
Regular smokers	152	12.0	128	11.2
Parents' education				
Mothers			Fathers	
Don't know/NA	60	5.9	154	13.5
High school degree or less	361	31.8	367	32.5
Some college	232	20.4	189	16.9
College degree	315	27.7	288	25.5
Post-graduate degree	168	14.8	142	12.6

contained roughly equal numbers of boys and girls and was diverse in terms of ethnicity (just over 50% of the sample was White). Additionally, as indicated by the attained educational level of participating youths' parents, the sample represented a wide-range of socioeconomic status levels.

## Measures

### Adolescent organized activity involvement (baseline, 15 months)

Participants completed a 9-item scale of organized and unstructured activity involvement (Table 2). Responses were presented in a Likert format ranging from 1 to 5. Two of the items measured number of activities (how many different clubs or school activities are you involved in? how many different sports teams are you involved in?) and were scaled from 1 (*no activities*) to 5 (*4 or more [activities]*). The other items measured frequency of involvement in different activities and were scaled from 1 (*never*) to 5 (*almost every day*). In addition,

**Table 2**  
Organized activity items and principal components analysis.

Activity items	Factor loadings		
1. How many different clubs (for example, drama, debate, computer, band, language) or school activities (for example, student government, newspaper, yearbook, homecoming committee) are you involved in?	.80	.14	.11
2. On average, how often do you participate in school clubs (for example, drama, debate, computer, band, language) or activities (for example, student government, newspaper, yearbook, homecoming committee)?	.85	.07	.07
3. How often do you attend church, temple, mosque, or other religious activities?	.12	-.15	.78
4. How important is religion in your life?	-.04	.11	.77
5. How many different sports teams are you involved in throughout the year? Include any teams run by your school or community groups.	.12	.88	.10
6. On average, how often do you participate in team sports where there is a coach?	.10	.78	.07
7. On average, how often do you participate in other sports without a coach?	.04	.25	.10
8. On average, how often do you go to music lessons, choir, dance, or band practice?	.36	-.05	.04
9. On average, how often do you participate in other clubs like the Boy or Girl Scouts, 4-H, or the Boys or Girls Clubs of America?	.16	-.08	.15

one item measured importance of religious involvement on a 4-point scale (1 = *not important*–4 = *very important*). In order to create meaningful sub-scales, principal components analysis was conducted on the baseline activity involvement items. The analysis identified three factors, composed of two items each: School clubs and groups, religious activities, and team sports (See Table 2 for factor loadings). A similar pattern of loadings was found at 15 months. The remaining three items (non-coached sports, community organizations such as boy scouts, and music involvement) did not significantly load onto any of the three organized activity scales and also occurred at relatively low rates in this sample; these were excluded from further analyses. The internal reliability of the three scales was good; alphas for the school clubs, religious, and team sports activity scales were .81, .75, and .82 at baseline, and .67, .60 and .70 at 15-month follow-up.

### Adolescent smoking (baseline, 24 months)

At each wave, adolescents reported the number of days they had smoked in the past 30 days. Responses were presented as nine distinct categories: 0 days, 1 day, 2 to 3 days, 4 to 5 days, 6 to 7 days, 8 to 10 days, 11 to 20 days, 21 to 29 days, and all 30 days. In order to convert these categories into a continuous scale with a normal distribution, the mid-point of each category was utilized (e.g., 2 to 3 days = 2.5), and the resulting values were treated as a continuous measure. The resulting scale was found to have normative distribution properties.

### Problem peer associations

Research has found that adolescents' tend to conflate their own smoking behavior with that of their friends. To address this issue, as well as more comprehensively measure adolescents' problem peer associations, the present study measured both friends' smoking behavior and teens' more general problem peer group.

### Exposure to smoking peers

One item measured the smoking behavior of adolescents' friends. Adolescents were asked: "How often are you around your friends while they are smoking." Responses were presented as three categories: 1 (*not at all*), 2 (*a little*), 3 (*a lot*), (baseline:  $M = 1.93$ ,  $SD = .74$ ; 15 months:  $M = 1.94$ ,  $SD = .79$ ).

### Peer associations problem behavior social network inventory (baseline, 15 months)

Adolescents completed a 16-item measure of their social support network (Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986). Adolescents were asked to think about the friends and people they go to in order to discuss problems or get advice, and then count how many of these people engaged in problem (e.g., smoke, get in trouble at school) and non-problem (e.g., get good grades) activities. Responses were measured on a 6-point, Likert scale ranging from 0 (0 people) to 5 (5 or more people). Principal components analysis derived two factors, one containing problem behaviors and the second containing non-problem behaviors. The problem peer support network was used in the present analyses, ( $\alpha$ 's: baseline = .85 ( $M = 1.43$ ,  $SD = 1.12$ ); 15 months = .82 ( $M = 1.30$ ,  $SD = 1.00$ )).

## Results

Adolescents' reported smoking on an average of 3.69 out of the last 30 days at baseline (57% reported smoking on zero days) and on an average of 6.49 out of the last 30 days at 24 months (57% reported smoking on zero days). This increase in days smoked from baseline to 24 months was statistically significant,  $t = 10.61$ ,  $p < .001$ ), a predictable trend given the at-risk nature of the sample. Level of smoking did not differ by gender at baseline, but at 24 months, boys reported significantly more days smoked in the past 30 days than girls (boys = 7.56, girls = 5.72;  $t = 2.89$ ,  $p < .01$ ). Significant gender differences also were found in youth organized activity involvement.

Boys were involved more in team sports than girls, at both baseline ( $t = 4.15, p < .001$ ) and 15 months ( $t = 4.56, p < .001$ ), while girls were more involved in school clubs and activities than boys (baseline:  $t = 4.79, p < .001$ , 15 months:  $t = 4.42, p < .001$ ). Among the three categories of organized activity involvement at baseline (team sports, school clubs and activities, and religious) only school clubs and team sports were significantly correlated (Table 3). At 15-month measurement, all three forms of involvement were significantly correlated. In addition, all three types of adolescent activity involvement at baseline and 15-month measurement were negatively associated with levels of adolescent smoking at both baseline and at 24 months (Table 3).

#### Activity involvement and smoking: Differences by youth smoking history

Additional zero-order correlations were run to examine whether the association between activity involvement and smoking at 24 months differed by adolescent smoking status at the study screening. The sample was divided into three groups based on their smoking status at screening into the study: Non-smokers ( $n = 202$ ), current or former experimenters ( $n = 810$ ), and regular smokers ( $n = 128$ ). Fisher Z transformations indicated no significant differences across the levels of smoking. Overall, these findings justified the combining of the study screening groups (non-smokers, experimenters, and regular smokers). However, to account for potential trend-level differences between the groups, adolescent baseline smoking was included as a control in all subsequent analyses.

#### Testing multiple paths between activity involvement, problem peers, and smoking

##### Measurement model

The smoking friends and problem peer support variables were specified as indicators of a *problem peers latent variable* at both baseline and 15 months using AMOS 16. Factor loadings for smoking friends and problem peer support network variables at baseline were .84 and .56, respectively and at 15 months were .86 and .54, respectively,  $\chi^2/df = 5.84, CFI = .94, RMSEA = .060$ .

##### Structural model

A structural model was tested (AMOS 16) that examined longitudinal associations between adolescents' involvement in each of the three activities (religious, team sports, and school clubs and activities), problem peer associations, and cigarette smoking. To improve the fit of the model, the error terms for the problem peer association indicators were allowed to covary. In addition, multi-group analyses tested whether model parameters were invariant for boys and girls as outlined by Byrne (2004). Multi-group analyses compared an unconstrained (free) model to one in which model parameters were constrained to be equal for boys and girls. The unconstrained model provided a good

statistical fit to the data:  $\chi^2/df = 1.90, CFI = .98, RMSEA = .028$ . Constraining structural weights and covariance to be equal for girls and boys adversely impacted the fit of the model,  $\chi^2/df = 53.71, p < .001, RMSEA = .20$ . Thus, study hypotheses were tested utilizing unconstrained model and both individual parameters and indirect effects were interpreted separately for boys and girls. Bootstrap procedures (Bollen & Stine, 1990) with bias-corrected confidence intervals were utilized to estimate direct and indirect effects (indirect effects isolated for 15-month problem peers and 15-month organized activities, separately). Standardized coefficients for girls and boys are presented in Figs. 2 and 3, respectively. The figures also illustrate the indirect pathways that were significant for boys and girls. The findings from the full model for each category of involvement are discussed in detail, below.

##### School clubs and activities

Involvement in school clubs and activities at 15 months was not associated with cigarette smoking at 24 months for both boys and girls. Controlling for baseline problem peer associations, baseline involvement in school clubs and activities predicted lower associations with problem peers at 15 months for girls but not boys. Bootstrapped indirect effects indicated that girls' involvement in school clubs at baseline predicted lower levels of smoking at 24 months via reductions in problem peer associations at 15 months ( $\beta * \beta = -.03, p = .038$ ). Over and above baseline involvement, associations with negative peers at baseline predicted lower levels of involvement in school clubs and activities at 15 months for both boys and girls.

##### Religious activity

Involvement in religious activity at 15 months was associated with reduced cigarette smoking at 24 months for boys but not girls. Bootstrapped indirect effects indicated that boys' (but not girls') religious activity involvement at baseline was associated with reduced smoking at 24 months via boys' involvement in religious activities at 15 months ( $\beta * \beta = -.09, p = .010$ ). Controlling for baseline problem peer associations, baseline involvement in religious activities predicted lower associations with problem peers at 15 months for girls but not boys. Bootstrapped indirect effects indicated that girls' religious involvement at baseline predicted lower levels of smoking at 24 months via reductions in problem peer associations at 15 months ( $\beta * \beta = -.03, p = .046$ ). Controlling for baseline involvement, associations with negative peers at baseline predicted reduced involvement in religious activities at 15 months for girls, but not boys.

##### Team sports

Baseline team sports involvement did not predict problem peer associations at 15 months for both boys and girls. Boys' (but not girls') involvement in team sports at 15 months predicted lower levels of smoking at 24 months. Bootstrapped indirect effects indicated that boys' team sports involvement at baseline predicted lower levels of

**Table 3**  
Correlations for all study variables.

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Smoking-BL	-.06*	-.15***	-.12***	.51***	.29***	-.13***	-.12***	-.15***	.41***	.28***	.54***
2. School clubs-BL	1.00	.04	.10**	-.11***	-.12***	.53***	.04	.07*	-.11***	-.14***	-.09**
3. Religious-BL		1.00	.05	-.18***	-.07*	.05	.77***	.06*	-.19**	-.13***	-.16***
4. Team sports-BL			1.00	-.08*	-.02	.09**	.00	.64***	-.07*	-.01	-.06*
5. Friend smoking-BL				1.00	.45***	-.15***	-.16***	-.15***	.52***	.37***	.38***
6. Problem peers-BL					1.00	-.13***	-.05	-.07*	.31***	.42***	.19***
7. School clubs-15mo						1.00	.09**	.15***	-.20***	-.13***	-.14***
8. Religious-15mo							1.00	.06*	-.21***	-.15***	-.16***
9. Team sports-15mo								1.00	-.16***	-.05	-.14***
10. Friend smoking-15mo									1.00	.47***	.48***
11. Problem peers-15mo										1.00	.32***
12. Smoking-24mo											1.00

Note: BL = baseline assessment, 15mo = 15-month assessment, 24mo = 24-month assessment.  
\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

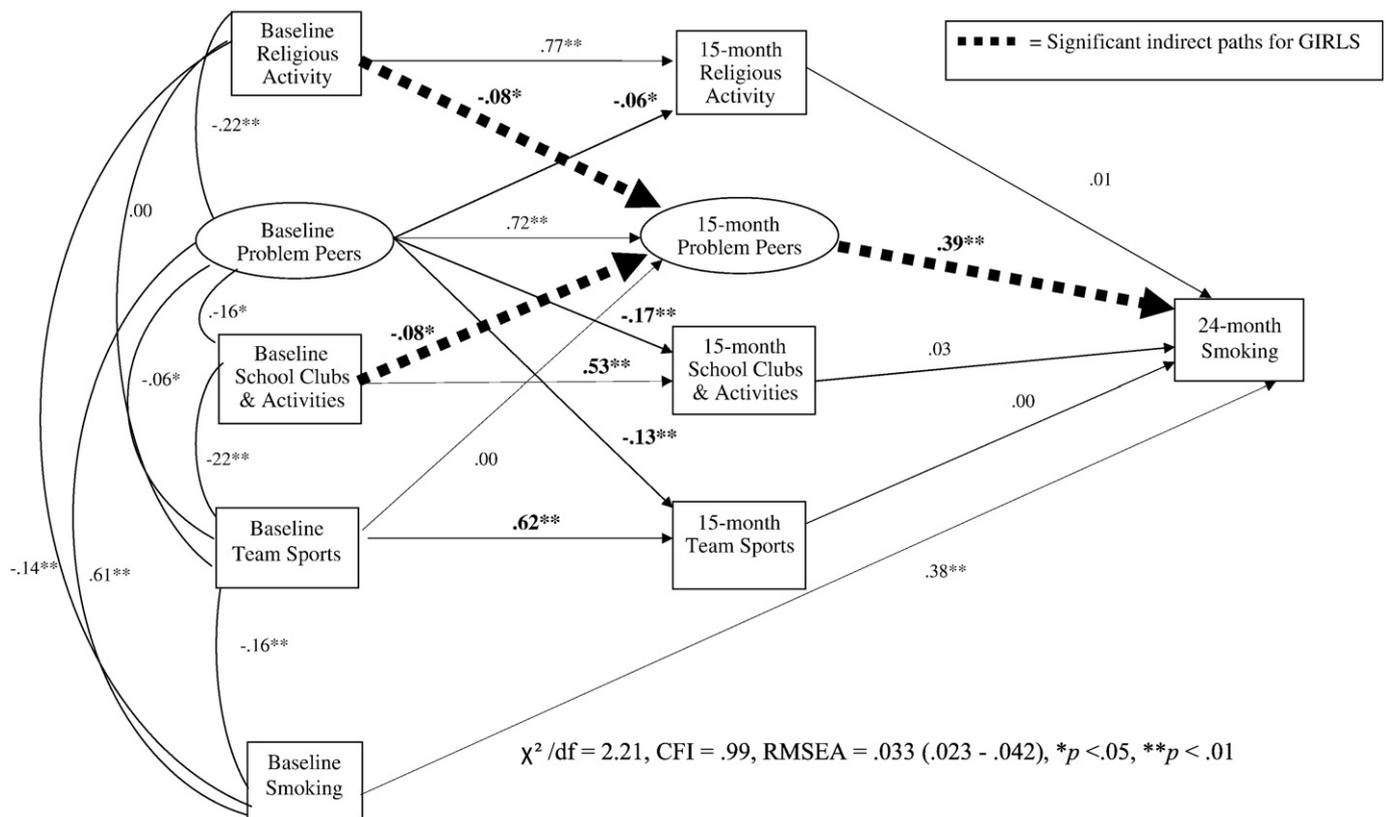


Fig. 2. Full model with significant indirect pathways illustrated for girls.

smoking at 24 months via teams sports involvement at 15 months ( $\beta * \beta = -.05, p = .034$ ). Controlling for baseline involvement, associations with problem peers at baseline predicted lower levels of team sports involvement for both boys and girls.

## Discussion

This study examined the longitudinal relationship between adolescent involvement in organized activities, exposure to problematic peers, and cigarette smoking in a sample of adolescents enriched for smoking behavior and experimentation. Organized activity involvement protected against adolescent smoking at 24 months, but the associations varied by gender and type of involvement. For boys, over and above problem peer associations and baseline smoking, team sports and religious involvement at baseline were indirectly associated with lower levels of smoking at 24 months via involvement at 15 months. In contrast, involvement in religious and school club activities was indirectly related to girls' smoking patterns via links to reductions in associations with problem peers.

Adolescent smoking poses a significant societal health problem, due both to the direct impact on adolescents' health and the potential for adolescent smoking to influence adult smoking (Centers for Disease Control and Prevention, 2001). The vast majority of smoking adults either initiated or experimented with smoking when they were adolescents (U.S. Department of Health and Human Service, 1994). The current study found activity involvement to be similarly associated with smoking across three levels of adolescent smoking: Non-smokers, experimenters, and regular smokers. These findings indicate that organized activities may be equally effective at both reducing risk of smoking initiation among non-smoking youth and

reducing risk of persistence or escalation among currently smoking adolescents.

The current study also investigated the relationship between organized activity involvement and adolescent problem peer associations. One way in which organized activities are theorized to be protective against problem behavior is that they provide adolescents with exposure to positive peer groups and reduce exposure to potentially negative peer groups (Barber et al., 2005; Mahoney, 2000). Involvement in team sports, religious organizations, and school clubs requires adolescents to spend a great deal of time with other engaged adolescents, which increases contact with groups of adolescents who share prosocial, pro-academic values (Barber, Eccles, & Stone, 2001; Brown et al., 1994), and who are less likely to be involved in deviant behavior such as cigarette smoking. Reducing exposure to problematic peers mitigates the likelihood that adolescents themselves will engage in delinquent behavior. However, previous research has not investigated whether these relationships vary by gender.

The current study provides evidence that the proposed path from involvement to reduced associations with problem peers to lower levels of smoking may vary by type of involvement and by adolescent gender. For instance, the structural model indicated that after controlling for baseline smoking behavior, girls' involvement in school clubs and activities indirectly reduced smoking at 24 months by lessening girls' exposure to problem peers at 15 months. This finding is consistent with previous research, which found that girls who were involved in school clubs reported fewer problem peer associations (Eccles et al., 2003). Similarly, girls' religious involvement was indirectly associated with their smoking at 24 months through reduced problem peer associations at 15 months. These indirect paths were not significant for boys, as boys' involvement did not significantly predict reduced problem peer

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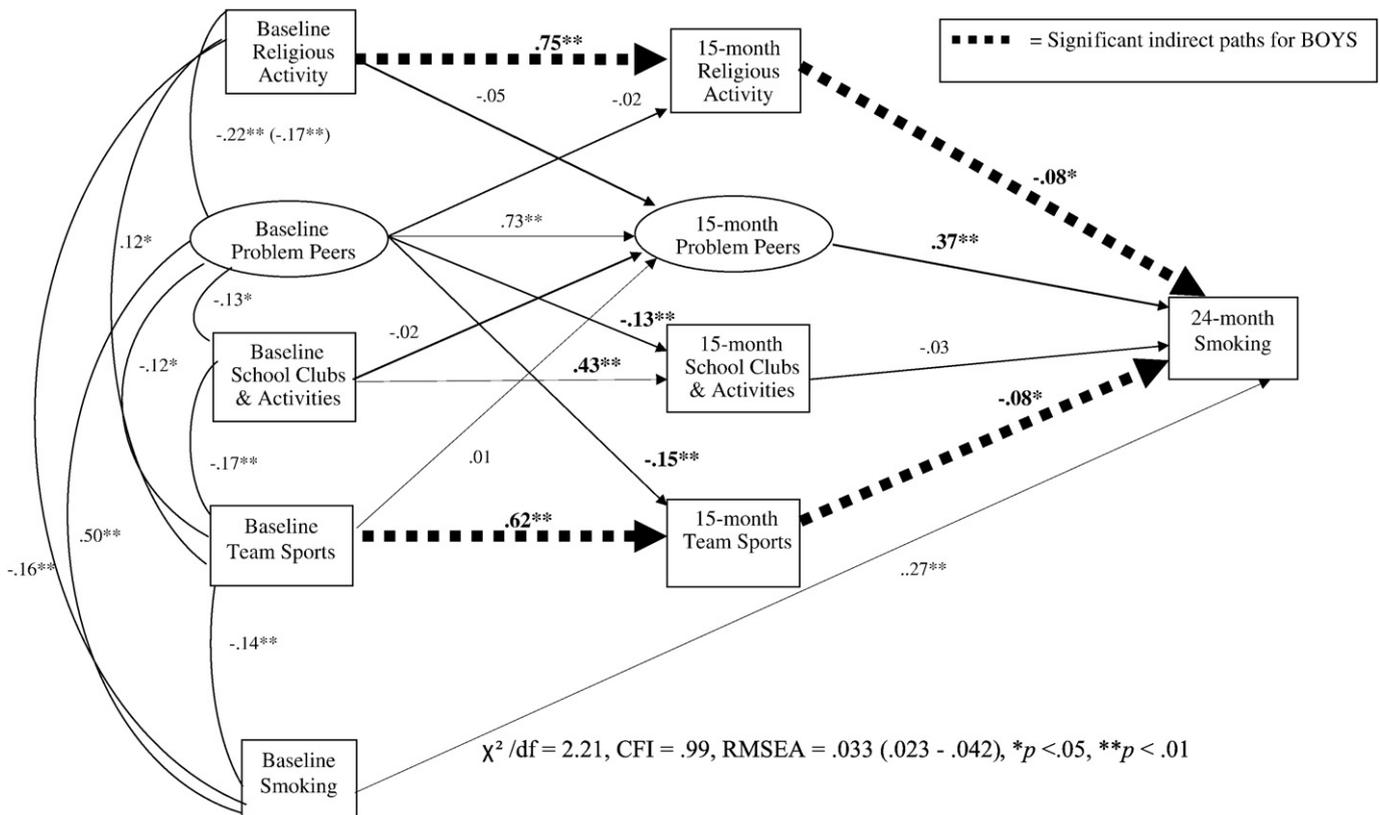


Fig. 3. Full model with significant indirect pathways illustrated for boys.

associations at 15 months over and above baseline problem peer association.

Interestingly, girls' problem peer associations at baseline also predicted reduced involvement in all three organized activities over and above baseline involvement while boys' problem peer associations predicted lower involvement in team sports and school clubs. Increased involvement with negative peer groups may draw adolescents away from organized activities as they move through high school. This process may be especially problematic for adolescent boys involved in team sports given that boys' team sports involvement was directly associated with reduced smoking at 24 months. Conversely, girls who continue to be actively involved in school clubs or religious activities may withdraw from problem peer associations thereby decreasing the possibility that they will engage in problem behavior such as cigarette smoking. The bi-directional associations between girls' activities and problem peers could indicate that organized involvement and peer associations are more closely linked for girls than boys.

While peer associations did not mediate the relationship between involvement and smoking for boys, two categories of organized involvement were longitudinally protective against smoking over and above problem peer associations. For instance, boys' baseline religious involvement indirectly predicted lower levels of smoking at 24 months via religious involvement at 15 months, which was directly related to lower levels of smoking. Beyond positive and risky peer associations, several other mechanisms have been theorized to mediate the relationship between youth activities and positive benefits including non-familial adult support and identity development (Eccles et al., 2003; Roth & Brooks-Gunn, 2003). Researchers have also posited that religious involvement may lead to different sets of values and beliefs about appropriate behavior, which could then lead to reductions in illicit substance use such as smoking (Hodge et al., 2001). However, it is

unclear why religious involvement directly affected the smoking behavior of only boys. It is possible that religiously involved adolescent girls also have different sets of values and beliefs, but that lower levels of problem peer associations are the primary mechanism for reducing their smoking. Future research should further explore additional mechanisms to explain the differential benefits of religious involvement for adolescent boys and girls.

Boys', but not girls' team sports involvement at 15 months was also directly associated with lower levels of smoking, and boys' baseline sports involvement was indirectly related to smoking at 24 months via 15-month team sports involvement. Previous research on late adolescents has found that sports involvement differentially predicted problem behavior such as alcohol use for boys and girls (Eccles & Barber, 1999). It could be that a primary protective benefit that girls derive from organized activity involvement is the reduction in negative peer groups such involvement provides. Thus, team sports may not be protective against smoking for girls because sports were not associated with lower exposure to problem peers for boys or girls. In contrast, boys' sports involvement may protect against smoking for reasons other than peer associations. For young adolescent boys, sports involvement may be more essential to their identities or crowd membership (Barber et al., 2005; Brown et al., 1994) leading to reductions in behaviors, such as smoking, that might be viewed as detrimental to peak athletic performance or socially unacceptable for certain crowds. Alternatively, sports involvement may facilitate positive internal or psychological outcomes for involved boys, such as increased self-esteem or self-efficacy, which then could lead to reductions in smoking behavior. The fact that baseline sports involvement was associated with reduced smoking via 15-month involvement is consistent with previous research in which steady involvement in sports (involvement for multiple years in a row as

opposed to erratic participation) was associated with lower levels of smoking behavior (Rodriguez & Audrain-McGovern, 2004). Future research should continue to consider alternative mechanisms for explaining associations between youth involvement and reductions in problem behavior, especially for boys.

The current study utilized a number of robust statistical strategies. Most notably, the study utilizes longitudinal data from three measurement waves within 2 years. In addition, latent variables were used to measure exposure to problem peers. Given that the current study utilized exclusively self-report data, it was important to include measures of both the smoking behavior of adolescents' friends and more general aspects of their problem peer groups to mitigate potential connotations between adolescents' own smoking and that of their peers. In addition, the use of latent variable allowed for a more stringent measure of mediation and indirect effects, as statisticians have argued that single-variable mediators may overestimate mediation (Hoyle & Kenny, 1999). The structural models utilized a conservative statistical strategy that longitudinally controlled for adolescents' baseline smoking and baseline exposure to problem peers. This strategy controlled for continuity in adolescents' smoking behavior and problem peer associations across the length of the study. This also controlled for potential selection effects, as smoking teens may be more likely to seek out problem peer groups, and the present study controlled for the possibility that adolescents' problem peer associations at 15 months resulted from their own previous smoking. As previously noted, the current paper also controlled for selection effects by utilizing a sample of youth enriched for the dependent variable of interest, cigarette smoking.

The present study has a number of limitations including the use of self-report data for all measures. Even though the study did utilize longitudinal data and a latent problem peer variable, caution should be taken in interpreting the significant associations, which could have been inflated by shared method variance. In addition, while attrition across the waves of the study was low, non-participants did differ from participants on several variables and this bias in the sample could have affected the findings. The study utilized three categories of involvement that have been studied extensively in previous organized activity research and were empirically derived from a larger scale of adolescent social integration. However, the items were not consistent across the three categories. The religious involvement scale included an item assessing how important religion was to the adolescent, while the team sports and school clubs scales assessed only the number of activities and the frequency of involvement. In addition, the activity items ask adolescents to consider their involvement "on average" and did not include a consistent time frame for adolescents to consider when rating their involvement (e.g., past year and last 6 months). The sample for the current study was enriched for smoking experimentation, and this sampling strategy could have influenced the pattern of findings, as well as explained why several of the expected hypotheses were not confirmed. While this research strategy did help control for selection effects (and the sample was diverse in terms of ethnicity and socioeconomic status), it does potentially limit the generalizability of these findings to other populations where smoking behavior is more normally distributed. Finally, the effects in the present study, although statistically significant, were relatively modest. However, the study utilized longitudinal data that incorporated three collection points in a short period of time (2 years) and controlled for baseline smoking and problem peer associations. Thus, significant effects emerged despite the use of a conservative statistical strategy.

The current study has a number of policy implications and suggestions for future research. Cigarette smoking is an important behavioral outcome both because of the short-term consequences and because adolescents who smoke are more likely to become adult smokers. The present study indicates that organized activities may help to curb smoking escalation among adolescents who are experimenting with smoking or are vulnerable to increased smoking behaviors. These findings bolster the call for schools and communities

to provide ample participation opportunities to youth and encourage youth workers to support adolescents who are at-risk for smoking escalation to participate in organized activities. This study also demonstrates the importance of considering peer associations, especially for adolescent girls, when examining the protective effects of organized involvement in empirical research (Ennett et al., 2006). Additionally, youth workers may want to consider the importance of peer interactions when structuring school club or religious activities. If organized activity involvement can inhibit smoking escalation among at-risk youth, or even reduce the frequency of adolescents' smoking behavior, than involvement the potential to substantially diminish the link between adolescent and adult cigarette smoking.

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