

Brief article

# Psychological, peer, and family influences on smoking among an adolescent psychiatric sample

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## Abstract

Although much is known about adolescent cigarette use and initiation in community samples, less is known about these factors among adolescents in clinic-referred populations or those with severe psychopathology. Data were collected from 106 adolescents aged 12 to 15 years ( $M = 13.6$ ,  $SD = 0.74$ ) recruited from a psychiatric inpatient facility. Hierarchical logistic regressions assessed the relationship among psychological, peer, and family environment factors and smoking at baseline and 18 months posthospitalization. Conduct problem symptoms, friends' cigarette use, and friends' marijuana use were associated with greater odds of lifetime and current smoking at baseline but not at follow-up. After accounting for the significant effect of baseline use, greater family conflict predicted decreased odds of having initiated smoking at the 18-month follow-up. The period following inpatient psychiatric hospitalization may represent an important window for smoking cessation and prevention efforts targeting peer and family factors, especially for youth with externalizing problems. © 2012 Elsevier Inc. All rights reserved.

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## 1. Introduction

Despite substantial declines in cigarette use over the last 15 years, smoking remains a prevalent health problem among teenagers. Evidence suggests that nearly 90% of smoking initiation occurs during adolescence (U.S. Department of Health and Human Services, 1994) and that the earlier one begins smoking, the less likely one is to successfully quit (Breslau & Peterson, 1996; Coombs, Li, & Kozlowski, 1992). Nationally, approximately 7% of eighth graders, 13% of tenth graders, and 20% of twelfth graders have smoked a cigarette in the past 30 days (Johnston, O'Malley, Bachman, & Schulenberg, 2010). Rates are even higher in adolescents

with emotional and/or behavioral disorders. In one study of 120 early adolescents admitted to a psychiatric inpatient unit ( $M = 13.7$  years,  $SD = 2.5$  years), 53% of adolescents reported lifetime smoking and 39% endorsed current smoking (Upadhyaya, Brady, Wharton, & Liao, 2003). Another study of older adolescent psychiatric inpatients ( $M = 15.3$  years,  $SD = 1.4$  years) found still higher rates, with nearly 60% of the sample endorsing current smoking (Ramsey, Brown, Strong, & Sales, 2002).

Parental and family factors have been identified as key proximal predictors of adolescent smoking (Avenevoli & Merikangas, 2003) and are particularly influential during early adolescence. Factors such as high parental monitoring, parental involvement, and disapproval of smoking have been found to lower the risk of tobacco use in teens (Darling & Cumsille, 2003; Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Simons-Morton, 2002, 2004). Parental involvement and expectations have also been found to decrease the

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likelihood of smoking among seventh graders, in spite of increasing peer pressure to smoke (Simons-Morton, 2002, 2004). Conversely, several characteristics of the family environment have been shown to increase the odds of smoking (Darling & Cumsille, 2003; Isohanni, Moilanen, & Rantakallio, 1991; Tilson, McBride, Lipkus, & Catalano, 2004). In a number of studies, family environments characterized by less cohesion, support, and expressiveness and greater levels of family conflict have been associated with higher levels of adolescent tobacco use (Biglan, Duncan, Ary, & Smolkowski, 1995; Brook, Zhang, Finch, & Brook, 2010; Duncan, Tildesley, Duncan, & Hops, 1995; Glendinning, Shucksmith, & Hendry, 1997; Kristjansson, Sigfusdottir, Allegrante, & Helgason, 2009).

Empirical data also identify peers as one of the most significant factors associated with adolescent smoking (Kobus, 2003). The influence of peer smoking is multifaceted. Both the number of peers who smoke and peer approval of smoking are positively related to smoking initiation in teens (Mayhew, Flay, & Mott, 2000). In a study of 4,263 eighth-grade students, teens with one tobacco-using friend were 2.73 times more likely to smoke, while teens with two or more tobacco-using friends were 9.46 times more likely to smoke than teens who were not friends with smokers (Simons-Morton & Farhat, 2010). Additionally, peer group socialization and selection of friends have both been related to smoking among teenagers (Ennett & Bauman, 1994; Go, Green, Kennedy, Pollard, & Tucker, 2010; Hoffman, Monge, Chou, & Valente, 2007). For example, teen smokers tend to associate with other smokers, while nonsmokers tend to affiliate with other nonsmokers (Kobus, 2003). Although the relationship between peer and family factors is complex, several studies have provided evidence suggesting that peer variables exert a greater influence on adolescent smoking outcomes than family characteristics (Flay et al., 1994; Hu, Flay, Hedeker, Siddiqui, & Day, 1995; Simons-Morton & Farhat, 2010; Tucker, Ellickson, & Klein, 2003; Wang, Fitzhugh, Westerfield, & Eddy, 1995).

In addition to peer and family factors, individual psychological factors have also been linked to adolescents' smoking behaviors in both community and clinical samples (Covey, Glassman, & Stetner, 1998; Hawkins, Catalano, & Miller, 1992; Turner, Mermelstein, & Flay, 2004). Major depressive disorder (MDD) and conduct problem disorders (including oppositional defiant disorder and conduct disorder) represent two conditions that have demonstrated a significant relationship with smoking (Brown, Lewinsohn, Seeley, & Wagner, 1996; Duncan & Rees, 2005; Fergusson, Goodwin, & Horwood, 2003; Prinstein & La Greca, 2009; Turner et al., 2004). Both cross-sectional analyses and longitudinal studies have found depression to be a risk factor for as well as a result of smoking (Brown et al., 1996; Simons-Morton, 2002; Windle & Windle, 2001). Similarly, conduct problems have been found to increase an adolescent's risk of early smoking initiation, current smoking, and the development of nicotine dependence (Chilcoat &

Breslau, 1999; Lambert & Hartsough, 1998; Milberger, Biederman, Faraone, Chen, & Jones, 1997; Ramsey et al., 2003; Riggs, Mikulich, Whitmore, & Crowley, 1999; Upadhyaya et al., 2003).

Although a substantial body of knowledge exists on smoking in community samples of adolescents, considerably less is known regarding the role of peer influences, family factors, and psychopathology on smoking among adolescents being treated for psychiatric disorders (Avenevoli & Merikangas, 2003; Kobus, 2003; Mayhew et al., 2000). Several studies have examined rates of smoking among adolescent psychiatric inpatients, but have not examined the predictive effects of other salient factors (Ramsey et al., 2002, 2003; Upadhyaya et al., 2003). Thus, this article examines how psychological, peer, and family factors influence current cigarette use and initiation of use in adolescents upon psychiatric inpatient admission as well as at 18 months following hospitalization. This study was guided by three primary hypotheses. First, we expected that mental health problems (depression and conduct problems) at baseline would be positively associated with an increased likelihood of lifetime and current cigarette use at baseline and follow-up. Second, we expected peer substance use and family environment variables to predict increased likelihood of lifetime and current cigarette use at both time points, beyond the effects of the individual psychological variables. Finally, we expected that peer influences would have a greater effect on smoking outcomes than family environment variables.

## 2. Methods

The methods for this study have been described in a previous publication (Prinstein et al., 2008). Participants in the initial study included 146 psychiatrically hospitalized adolescents. The measure of cigarette use was not administered at the start of the study, and consequently, data on this measure are not available for the entire sample. The current sample therefore consisted of 106 adolescents (67% female) between the ages of 12 and 15 years ( $M = 13.6$ ,  $SD = 0.74$ ), with complete baseline data on cigarette use. The sample was 80% Caucasian, 4% Hispanic, 1% African American, 1% Asian American, and 14% other/more than one race.

Participants were recruited from a psychiatric inpatient facility in the northeastern United States. All adolescents admitted to the unit were eligible for study participation, provided that they had sufficient cognitive functioning to complete a structured interview (e.g., no active psychosis or developmental delay). Consistent with institutional review board-approved procedures, adolescents and their parents were invited to participate in this study shortly after admission to the unit. After providing written consent and assent, adolescents and their parents were separately administered a comprehensive assessment battery. All assessment measures were read aloud to adolescents during one-on-one interviews conducted by trained staff. Adolescents completed smoking questions again at 9 and 18 months postbaseline.

## 2.1. Measures

### 2.1.1. Child Depression Inventory

The Child Depression Inventory (CDI; Kovacs, 1992) is a 27-item paper-and-pencil questionnaire that served as the measure of depressive symptoms. For each item, the adolescent was presented with three statements representing varying levels of symptomatology. The adolescent was asked to choose the statement that best described him/her over the past 2 weeks. An overall CDI score was calculated as the sum of the individual items, with higher scores indicating higher levels of depressive symptoms. Adequate reliability for the CDI for both boys and girls across several age groups (coefficient alpha ranging from .83 to .89) has been established (Smucker, Craighead, Craighead, & Green, 1986). Internal consistency in the current sample was .87.

### 2.1.2. NIMH Diagnostic Interview Schedule for Children

The Diagnostic Interview Schedule for Children (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) was used to calculate adolescent- and parent-reported symptoms of conduct problems. The DISC-IV is a highly structured diagnostic interview that reliably assesses common mental health disorders using the *Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition* criteria in children and adolescents (Shaffer et al., 2000). Both the parent and youth versions were administered as part of this study. Composite symptom scores were calculated separately for the youth and parent versions by tallying the total number of symptoms endorsed on both the oppositional defiant disorder and conduct disorder sections of the DISC-IV. In previous psychometric testing, Shaffer et al. (2000) found that test–retest reliability was somewhat higher for the youth version than the parent version for MDD (adolescent version  $\kappa = .92$ , parent version  $\kappa = .66$ ) and conduct disorder ( $\kappa = .65$ , parent version  $\kappa = .43$ ), whereas reliability for the youth and parent versions was similar for oppositional defiant disorder (adolescent version  $\kappa = .51$ , parent version  $\kappa = .54$ ) (Shaffer et al., 2000).

### 2.1.3. Health Risk Behaviors questionnaire

The Health Risk Behaviors (HRB) is a self-report measure based on the Youth Risk Behavior Surveillance Survey (YRBS; Centers for Disease Control and Prevention, 1998) that assesses history of alcohol, cigarette, and marijuana use. For the current study, we examined two questions related to smoking. Participants were asked whether they had ever used cigarettes and how frequently they had smoked over the past 30 days. Adolescents who reported any previous use of cigarettes were defined as lifetime smokers, while adolescents who reported any previous use of cigarettes over the past 30 days were defined as current smokers. These items have previously demonstrated good test–retest reliability over a two week period among a national sample of

adolescents ( $\kappa$  values were .86 for lifetime cigarette use and .82 for current cigarette use) (Brener et al., 2002).

### 2.1.4. Deviant Peer Group Affiliation questionnaire

The Deviant Peer Group Affiliation (DPGA) is a self-report measure that was developed for a previous study (Prinstein, Boergers, & Spirito, 2001) as an extension of existing measures of peer affiliation. As in previous measures of deviant peer affiliation (e.g., Dishion, Patterson, Stoolmiller, & Skinner, 1991; Fergusson & Horwood, 1996), participants are first asked to identify the number of people they consider to be “very close friends.” Adolescents are then asked how many of these friends engaged in substance use and other risky behaviors. For each item, a ratio between 0 and 1.0 was calculated to reflect the proportion of identified close friends who engaged in the risky behavior. Each ratio was then centered and divided by the standard deviation of that item to create a standardized score. The current study examined only the four items that assessed substance use. Three of the items assessed peer use of cigarettes, alcohol, and marijuana, and a fourth item assessed peer disapproval of substance use. Prinstein et al. (2001) examined the factor structure of this questionnaire and determined that these four items loaded on a single factor.

### 2.1.5. Family Environment Scale

The FES is a 90-item, true/false, parent-report measure that assesses various characteristics of family relationships. The FES has been used previously in studies of adolescent substance initiation and use (Ary, Duncan, Duncan, & Hops, 1999; Duncan et al., 1995; Foxcroft & Lowe, 1995; Santisteban et al., 2003). The Relationship dimension of the FES consists of three subscales: Cohesion, Expressiveness, and Conflict (Moos & Moos, 1981). In previous studies, the reliability of the FES Relationship dimension has been shown to vary by subscale (Boyd, Gullone, Needleman, & Burt, 1997; Moos & Moos, 1981). The Cronbach alpha values for the current sample were Cohesion = .79, Expressiveness = .48, and Conflict = .79, which were consistent with the reliability estimates found by Boyd et al. (1997). Due to the low reliability of the Expressiveness scale, only the Cohesion and Conflict scales were used in the current analysis.

## 2.2. Missing data

Because the current analyses only contained two time intervals, imputation of missing 18-month data was not justified. Analyses were therefore conducted using only adolescents with complete data on the outcome variables. For the baseline regression analyses, the sample consisted of 106 adolescents with complete baseline cigarette use measures. Individuals with missing lifetime smoking data at 18 months who reported having initiated smoking at baseline were coded as lifetime smokers at follow-up. For the 18-month regression analyses, there were 81 adolescents with complete

data on the measure of past 30-day cigarette use and 93 adolescents with complete data on lifetime cigarette use. Those adolescents with missing data at the 18-month follow-up did not differ from the full baseline sample on any of the study variables, providing no evidence of attrition bias.

### 2.3. Analysis plan

Two sets of analyses were designed to test the study hypotheses. The first set of analyses examined predictors of smoking at baseline, while the second set examined predictors of smoking over the 18-month study follow-up. For each set of analyses, two dependent variables from the HRB Questionnaire were examined: current cigarette use (any cigarette use over the past 30 days) and lifetime cigarette use (any history of use). Hierarchical logistic regressions with sequential testing of blocks of predictor variables were used to test the study hypotheses. All analyses were conducted using SPSS 17.0 (SPSS Inc., 2009). In the analysis design, the demographic variables of age and gender were entered in Block 1 and psychological variables (baseline depression score and conduct problem symptom scores) were entered into Block 2. The effects of close peers' use of cigarettes, alcohol, and marijuana as well as peer disapproval of use were entered in Block 3. To enable a direct comparison of the importance of family environment versus peer factors, scores of family cohesion and conflict were also entered in Block 3 of the regression equation. For the 18-month analyses, baseline current cigarette use was included in Block 1 of the first logistic regression model and baseline lifetime cigarette use was included in Block 1 of the second logistic regression. By including baseline smoking status in the first block to account for individuals who had already initiated use at the start of the study, the logistic regression examining lifetime smoking at 18 months essentially allowed us to examine whether any other of the baseline factors predicted smoking initiation over the 18 months following hospitalization.

## 3. Results

Thirty-six percent of the sample reported current smoking (defined as having at least one cigarette in the past 30 days) and half endorsed a lifetime history of smoking (defined as having smoked at least one whole cigarette) at baseline (see Table 1).

At the 18-month follow-up, 51% of the sample reported current smoking and 77% of the sample reported a lifetime history of use, indicating that 28% of teens had initiated use over the 18 months following hospitalization. Table 2 summarizes the predictor variables at baseline. Thirty-two percent of the sample met criteria for a diagnosis of MDD at baseline, and 32% of the sample met criteria for a diagnosis of a conduct problem disorder (oppositional defiant disorder and/or conduct disorder). Adolescents reported significantly fewer mean number of overall conduct problem symptoms

Table 1  
Cigarette use in a sample of psychiatrically hospitalized adolescents

	Baseline, n (%)	18-month follow-up, n (%)
Lifetime cigarette use		
No use	54 (51)	21 (23)
Smoked at least 1 cigarette	52 (49)	72 (77)
Past 30-day use		
No use	68 (64)	40 (49)
Smoked at least 1 day	38 (36)	41 (51)

( $M = 3.34$ ,  $SD = 3.47$ ) compared with parent reported symptoms ( $M = 6.20$ ,  $SD = 3.65$ ,  $t = 8.17$ ,  $df = 105$ ,  $p < .001$ ); the correlation between these measures was moderate ( $r = .49$ ,  $p < .05$ ), suggesting that they are related, yet independent, measures of adolescent conduct problems. Mean FES scores were not in the clinical range for either of the subscales. No significant differences were found between girls and boys on the study variables.

### 3.1. Predictors of baseline smoking

#### 3.1.1. Current use

The first cross-sectional hierarchical logistic regression analysis examined demographic, psychological, peer, and family-level predictors of current cigarette use (Table 3). Age and gender were not significantly associated with current smoking. Of the psychological predictors, only adolescent reported conduct problem symptoms demonstrated a trend towards significance with current smoking ( $p = .05$ , odds ratio [OR] = 1.19). In addition, having close friends who smoke cigarettes and marijuana (but not alcohol) significantly increased adolescents' odds of current smoking (ORs of 2.02 and 1.98, respectively). None of the family environment scales were significantly associated with current use.

#### 3.1.2. Lifetime use

The second cross-sectional hierarchical logistic regression analysis examined the influence of the same set of predictor variables on lifetime smoking. Adolescent-reported conduct problem symptoms was the only psychological predictor associated with greater odds of lifetime smoking at baseline (OR = 1.22). Similar to the analysis of current use, close friends' use of cigarettes and marijuana (but not alcohol) also significantly increased adolescents' odds of lifetime cigarette use (ORs of 2.81 and 2.29, respectively). Again, none of the demographic or family environment scales were associated with lifetime use.

### 3.2. Predictors of smoking at 18 months

#### 3.2.1. Current use

Hierarchical logistic regression examined whether the same set of demographic, psychological, peer, and family-level variables predicted current cigarette use (past 30-day

Table 2  
Summary of study variables for adolescent psychiatric patients at baseline (n = 106)

Variable	Mean (SD)
Psychological symptoms	
Depressive symptoms (CDI)	19.81 (9.43)
Conduct problem symptoms	
Adolescent report	3.34 (3.47)
Parent report	6.20 (3.65)
Close friend use/attitudes	
% Friends who smoke cigarettes	0.43 (0.34)
% Friends who got drunk	0.41 (0.35)
% Friends who smoke marijuana	0.39 (0.38)
% Friends who disapprove of use	0.48 (0.39)
Family environment	
Cohesion	39.24 (18.69)
Conflict	58.34 (13.72)

use) at the 18-month follow-up (Table 4). Current cigarette use at baseline significantly accounted for current smoking at 18 months. Adolescents who reported current use at baseline experienced a nearly ninefold increase in the odds of current smoking at 18 months relative to adolescents who did not report current smoking at baseline (OR = 8.97). Contrary to our hypotheses, none of the demographic, psychological, peer use, or family environment variables were significantly associated with current smoking at 18 months when accounting for baseline status.

3.2.2. Lifetime use

Another hierarchical logistic regression analysis examined lifetime history of cigarette use at the 18-month follow-up. This analysis enabled us to identify predictors of smoking initiation over the year and a half following inpatient hospitalization. None of the demographic, psycho-

logical, or peer influence variables significantly predicted lifetime cigarette use, after accounting for baseline status. Family conflict emerged as a significant, but modest predictor of lifetime cigarette use; however, the relationship was in the opposite direction than was predicted. Higher levels of family conflict were associated with a decrease in the odds of having initiated smoking over the 18-month follow-up period (OR = 0.92).

4. Discussion

The current article examined the effects of psychological, peer, and family environment factors on adolescent smoking in a severe psychiatric population. Rates of lifetime and current cigarette use in this sample of psychiatrically hospitalized adolescents were significantly higher than those reported in national community samples of youth. For example, the 2009 National Survey of Drug Use & Health found that 9% of 12- to 17-year-olds were identified as current smokers (Substance Abuse and Mental Health Services Administration, 2010), whereas the 2010 Monitoring the Future Study found that only 7% of eighth graders reported current smoking (Johnston et al., 2010). The high rates of current and lifetime smoking in the current sample are consistent with the high rates of smoking reported in other psychiatric samples of adolescents (Ramsey et al., 2002; Upadhyaya et al., 2003; Upadhyaya, Deas, Brady, & Kruesi, 2002).

Results of this study provided partial support for our three hypotheses. Consistent with our first hypothesis, we found that youth with a greater number of self-reported conduct problems were 22% more likely to report lifetime smoking at baseline. Additionally, there was a trend (p = .05) between

Table 3  
Hierarchical logistic regression analyses for baseline smoking outcomes in a sample of psychiatrically hospitalized adolescents

Variables	Past 30-day cigarette use			Lifetime cigarette use		
	OR	95% CI	p	OR	95% CI	p
Intercept	9.60		.64	1.70		.91
Block 1						
Age	0.75	0.38–1.49	.41	0.91	0.47–1.77	.79
Gender	0.69	0.24–2.03	.50	0.73	0.25–2.09	.55
Block 2						
Depression (CDI)	1.00	0.95–1.07	.85	1.01	0.95–1.07	.73
Conduct Problems—adolescent	1.19	1.00–1.42	.05	1.22*	1.02–1.47	.03
Conduct Problems—parent	1.06	0.89–1.26	.51	0.99	0.84–1.16	.89
Block 3						
Peer use						
% Friends who smoke cigarettes	2.02*	1.03–3.93	.04	2.81**	1.38–5.71	<.001
% Friends who got drunk	0.78	0.36–1.69	.53	0.53	0.22–1.28	.19
% Friends who smoke marijuana	1.98*	1.00–3.90	.04	2.29*	1.14–4.69	.02
% Friends who disapprove of use	0.98	0.54–1.80	.95	1.15	0.63–2.13	.65
Family environment						
Cohesion	0.99	0.95–1.03	.59	1.01	0.98–1.06	.44
Conflict	0.98	0.94–1.04	.57	1.00	0.95–1.05	.92

\* Indicates odds ratios significant at p < .05.

\*\* Indicates odds ratios significant at p < .01.

Table 4  
Hierarchical logistic regression analyses for 18-month smoking outcomes in adolescent psychiatric patients

Baseline variables	Past 30-day cigarette use (n = 81)			Lifetime cigarette use (n = 93)		
	OR	95% CI	P	OR	95% CI	p
Intercept	0.14		.74	0.00		.30
Block 1						
Age	1.06	0.44–2.54	.89	1.73	0.61–4.96	.30
Gender	1.15	0.32–4.11	.83	0.46	0.11–1.94	.29
Baseline cigarette use	8.97**	2.24–35.92	<.001	11.76**	2.00–69.25	<.001
Block 2						
Depression Score	1.03	0.96–1.11	.37	1.02	0.93–1.11	.64
Conduct Problems—adolescent	0.97	0.78–1.21	.81	0.96	0.73–1.27	.79
Conduct Problems—parent	0.96	0.80–1.15	.63	1.20	0.94–1.54	.15
Block 3						
Peer use						
% Friends who smoke cigarettes	0.75	0.31–1.78	.51	1.63	0.49–5.49	.43
% Friends who got drunk	2.72	0.91–8.16	.07	1.10	0.27–4.40	.90
% Friends who smoke marijuana	0.67	0.28–1.68	.39	1.19	0.38–3.75	.76
% Friends who disapprove of use	0.50	0.22–1.12	.09	0.50	0.20–1.24	.13
Family environment						
Cohesion	1.03	0.98–1.08	.19	0.97	0.92–1.03	.39
Conflict	1.02	0.96–1.08	.57	0.92*	0.84–0.99	.04

\* Indicates odds ratios significant at  $p < .05$ .

\*\* Indicates odds ratios significant at  $p < .01$ .

conduct problem symptoms and an increase in the odds of current smoking at baseline. Of note, these findings were not replicated when using the measure of parent-reported conduct problems, and were not replicated at the 18-month follow-up point. Parents reported significantly greater rates of conduct problem behavior than youth reported (approximately double the rates of oppositional defiant disorder and/or conduct disorder), which may have resulted in reduced variability in the predictor and limited our ability to detect significant findings.

Contrary to our expectations, depressive symptoms were not significantly associated with adolescent smoking at baseline or at 18 months for this psychiatric inpatient sample. Although this finding was inconsistent with longitudinal studies documenting a positive association between depression and adolescent smoking, several studies have found that the size of the relationship is diminished when accounting for common confounding factors (Duncan & Rees, 2005; Fergusson et al., 2003; Prinstein & La Greca, 2009). Additionally, one of the few studies examining smoking outcomes in a sample of psychiatrically hospitalized adolescents similarly failed to find a significant association between depression and smoking (Ramsey et al., 2003). Current study findings suggest that severity of conduct problems, but not depression, was a significant risk factor for smoking among adolescents presenting for inpatient hospitalization.

In support of our second hypothesis, we found that close friends' use of certain substances substantially increased adolescents' odds of being a lifetime or current smoker at baseline. Specifically, close friends cigarette and marijuana use were significantly associated with current smoking as well as a lifetime history of smoking. Consistent with

findings from community samples (Alexander, Piazza, Mekos, & Valente, 2001; Holliday, Rothwell, & Moore, 2010; Kobus, 2003; Simons-Morton & Farhat, 2010), these findings support the critical role of peer substance use in influencing adolescent smoking. Relative to other predictors, cigarette smoking by close friends resulted in the largest increase in the odds for lifetime and current use at baseline. Notably, friends' drinking was not a significant risk factor for adolescent smoking at baseline, suggesting it is not peer substance use in general that increases adolescents' odds of smoking, but that there may be specificity regarding the means of consumption (e.g., smoking vs. drinking). Results of our baseline analyses further indicated that peer engagement in current substance use was a more important predictor than peer disapproval of substance use. Contrary to our hypotheses, none of the peer variables was associated with smoking at 18 months when accounting for baseline status.

Finally, we had hypothesized that peer variables would have a greater effect than family variables on smoking outcomes within this high-risk sample of adolescents. Results of our baseline analysis provided support for this hypothesis, and were consistent with existing literature documenting the consistent and potent effect of close peers' use on teen smoking (Conrad, Flay, & Hill, 1992; Kobus, 2003; Tyas & Pederson, 1998). At baseline, close friends' use was significantly associated with smoking outcomes, while family environment variables (e.g., cohesion and conflict) did not have a significant effect.

A different pattern of results emerged at the 18-month follow-up. After accounting for baseline smoking status, family conflict was the only variable that significantly predicted lifetime smoking at 18 months. Of note, the

relationship was in the opposite direction than was predicted. Reporting greater amounts of family conflict at baseline predicted a modest decrease in odds of initiating smoking at the 18-month follow-up. This finding is inconsistent with other naturalistic longitudinal research demonstrating that greater family cohesion and lower amounts of family conflict are associated with lower rates of tobacco and other substance use during adolescence (Bray, Adams, Getz, & Baer, 2001; Gutman, Eccles, Peck, & Malanchuk, 2011; Latendresse et al., 2008; Lloyd-Richardson, Papandonatos, Kazura, Stanton, & Niaura, 2002). However, the degree of family conflict reported in the current sample ( $M = 58.34$ ,  $SD = 13.72$ ) was below the empirically derived clinical threshold (Moos & Moos, 1981). Therefore, it is possible that the amount of conflict reported in this sample is not indicative of clinically elevated family problems that would be expected to require intervention or predict negative outcomes. Instead, the greater conflict reported in this sample may reflect appropriate family disagreements or expressions of frustration. An alternate consideration is that parents who more openly express disagreements or conflict with their child may be more likely to provide strong discipline, which has also been associated with decreased substance use among adolescents (Fletcher & Jefferies, 1999; Latendresse et al., 2008). Future research should explore whether the same relationship is evident among families with clinically elevated levels of family conflict.

#### 4.1. Limitations

Findings of the current study must be interpreted within the context of potential limitations. First, the small sample size may have limited the ability to detect significant findings. Second, while several of the psychological and peer factors demonstrated significant associations with lifetime and current smoking at baseline, these analyses were cross-sectional and therefore preclude interpretations of causality. Third, the high rates of cigarette use in the sample at baseline may have inhibited our ability to find significant differences in the sample at the 18-month follow-up. Fourth, the dichotomous nature of the dependent variables enabled us to examine predictors of smoking initiation and any amount of current smoking, which has been relatively understudied in this population. However, future research should explore whether the same prediction pattern is found when examining other measures of smoking and smoking dependency, such as frequency of days smoked or quantity of cigarettes smoked per day. Finally, the sample was predominantly female (72%), and therefore potential gender differences could not be examined. Some research suggests differential predictors by gender (Gutman et al., 2011; Mercken, Snijders, Steglich, Vertiainen, & de Vries, 2010) and future research should examine whether gender moderates the effect of psychological, peer, and family factors on smoking outcomes among adolescents with severe psychopathology.

#### 4.2. Clinical implications

Adolescents with co-occurring psychiatric disorders have high smoking rates (Brown, Madden, Palenchar, & Cooper-Patrick, 2000; Upadhyaya et al., 2002) and may represent a subpopulation with particularly high-risk of continued smoking as adults (Myers & Brown, 1997; Rohde, Kahler, Lewinsohn, & Brown, 2004). Psychiatric hospitalization represents a window of opportunity to implement cessation and prevention efforts among this high-risk population. In one of the only studies to examine the process of quitting among adolescents following psychiatric hospitalization, MacPherson et al. (2007) found that adolescents who attempted to quit in the first week following hospitalization demonstrated less average smoking over a 12-month follow-up period compared with adolescent smokers who did not make an attempt during this period. However, adolescents who attempted to quit immediately following hospitalization demonstrated a marked increase in smoking within the first few months following treatment (MacPherson et al., 2007). This finding suggests that the period during and immediately following hospitalization represents an important window for cessation efforts and that a greater intensity or duration of treatment may be necessary for this high-risk group (Brown et al., 2003). Additionally, the period following an acute hospitalization may represent an opportunity for targeted prevention efforts for adolescents who have not initiated smoking. Family or parent education and intervention programs may be especially important for adolescents with mental health disorders (Hall & Prochaska, 2009). Taken together, results of our baseline and 18-month analyses indicate that smoking cessation and selected prevention efforts should address both peer and family factors to reduce the high rates of smoking in early adolescents with significant psychiatric problems, particularly those that endorse externalizing disorders. Parents in particular need to be aware of the high rates of cigarette smoking in this population and the potential role that family environment may play in initiation of smoking.

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