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Structural and Functional Support in the Prediction of Smoking Cessation in Caregivers of Children with Asthma

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Abstract

Caregivers of children with asthma smoke at a rate similar to the general population. Research on the relative importance of structural or functional social support in smoking cessation has been mixed. Participants were smokers (N=154) who were caregivers of children with asthma. Both functional (perception of social support measured by the Interpersonal Support Evaluation List) and structural social support (living with another smoker, partner status, and the proportion of smoking friends) were measured at baseline. Participants received an asthma-education and smoking cessation intervention based on Motivational Interviewing. Biochemically-verified abstinence was assessed at 6-months post treatment. Hierarchical logistic regression analyses indicated that functional support predicted smoking abstinence even when controlling for relevant covariates and structural support (OR = .896, p=.025). Exploratory analyses revealed that this effect was driven primarily by the self-esteem ISEL subscale. Structural support (lower proportion of smoking friends), but not functional support, predicted making a 24-hour quit attempt (OR = 1.476, p=.031) but this effect became non-significant when the effect of functional support was accounted for. Smoking cessation that focuses on building general functional support, particularly self-esteem support, may be beneficial for smoking cessation in caregivers of children with asthma.

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Keywords

Asthma; cigarette smoking; social support

Introduction

Tobacco use is the leading preventable cause of death in the United States.[1] Tobacco smoke not only affects smokers, but also leads to health risks in non-smokers through exposure to second-hand smoke (SHS). Exposure to SHS is associated with negative health effects for all children, but children with asthma are at particular risk. SHS is a known trigger for asthma exacerbations; it increases respiratory symptoms[2] and is a detriment to recovery after hospitalization.[3] Despite knowledge that smoking is particularly harmful for children with asthma, parents of children with asthma continue to smoke at rates similar to that of the general population.[4]

Deficits in social support may be one reason for continued smoking in caregivers of children with asthma. There is evidence that parents of children with chronic illnesses experience a greater amount of parenting stress and poorer psychological adjustment than parents of healthy children.[5] Parents of children with asthma report greater parenting stress than parents of children with other medical conditions, such as cancer or cystic fibrosis.[6] Caregivers of children with asthma may need additional social support to quit smoking.[7] Higher stress and lower social support in mothers of children with asthma is related to higher symptoms of depression[8] and greater social support has been shown to predict smoking cessation in Latino caregivers of children with asthma.[9] Therefore, social support may be particularly important in caregivers of children with asthma who are attempting to quit smoking.

Social support has two components: structural support, or the availability of social network connections (i.e., the existence of social ties in one's social network and an individual's integration with this network; number of friends, married vs. single, etc.), and functional support (i.e., perception of emotional, instrumental and informational support by members of one's social network).[10] Studies have examined the effects of general social support (e.g., general social network characteristics and perceived support from the network) and support specifically related to smoking cessation (e.g., smoking-specific characteristics of the social network such as partner smoking status and proportion of smoking friends and perceived support related to quitting) on smoking outcomes.[11] In terms of general support, higher levels of functional social support predicts a lower likelihood of being a smoker,[12] a higher likelihood of quitting smoking,[13,14] and a lower likelihood of relapse.[15] Research on general structural support has found that those who are partnered (have a partner, as opposed to being single) or married are more likely to quit smoking after treatment[9,13,16] and remain quit up to a year following treatment.[16]

Both smoking-specific functional and structural support predicts smoking cessation outcomes. Smoking-specific functional support predicts smoking cessation after treatment[9,14] and reduced rates of relapse over time.[17] In terms of smoking-specific structural support, living with other smokers predicts both a lower likelihood of smoking

cessation[13,16] and a higher likelihood of relapse over time.[13,15] Also, having fewer smoking friends or co-workers, or a lower proportion of friends or co-workers who are smokers compared to non-smokers, predicts a lower likelihood of relapse over time.[14] A better understanding of the types of social support that impact smoking cessation would help to inform treatment development, particularly for high-risk groups that may need more support to successfully quit.

While the above studies provide evidence that social support is associated with smoking behavior, cessation, and relapse, interventions that have attempted to augment social support to promote smoking cessation have had mixed results. Systematic reviews of randomized controlled trials have concluded that interventions that target social support for smoking cessation did not increase perceived social support and did not improve quit rates compared to control groups.[18,19] The lack of evidence for social support interventions for smoking cessation led to the removal of one of the clinical guidelines for smoking cessation that directed providers to help their patients increase their external social support.[20] However, the studies on which this recommendation is based have serious limitations. The measurement of smoking outcomes and social support has been inconsistent in terms of constructs measured and timing of assessments, smoking status has not been consistently bioverified, multifactorial designs have led to “ceiling effects” through the addition of social support components onto already efficacious smoking cessation interventions, and sample sizes have been small.[21] A further problem is the lack of a guiding theoretical framework regarding how social support exerts its effects on smoking cessation.[11]

In their integrative model of social support and smoking, Westmaas and colleagues emphasize the importance of both general and smoking-specific functional and structural support for smoking cessation.[11] They point to Cohen and colleagues’ stress buffering model which posits that higher levels of perceived general functional social support may reduce appraisals of stressors as threatening and therefore negative physiological responses to stress.[22] This allows for more effective coping with the stresses of quitting (e.g., withdrawal symptoms) and thus a higher likelihood of smoking cessation.[22] Westmaas and colleagues also include structural support as an important construct that may influence both the extent to which functional support is available (or perceived to be available), and social pressure to quit smoking.[11]

The aim of the current paper is to explore the relative importance of structural and functional support in a sample of caregivers of children with asthma. Examining this question among smokers with children with asthma is particularly important, given the risk of asthma exacerbations that arise from SHS exposure and the need for tailored interventions for this at-risk population. The fact that these smokers were not required to be motivated to quit smoking in order to be in the trial increases the generalizability of the results. Because both types of support have predicted smoking outcomes in previous research, we hypothesized that both functional and structural support will predict abstinence from smoking at a 6 month follow-up after smoking cessation treatment. We assess indices of both general and smoking-specific social support. Specifically, we hypothesize that higher general functional social support, not living with another smoker and lower proportion of smoking friends, and having a romantic partner will predict smoking abstinence at a 6 month follow-up after

smoking cessation treatment. We conduct exploratory analyses to determine which types of general functional support (i.e., appraisal, belonging, self-esteem, and tangible support) were the strongest predictors of outcomes. We also conduct exploratory analyses to examine whether structural and functional support predict 24-hour quit attempts.

Method

Sample

Participants were154current smokers who were caregivers of children with asthma and were part of a larger smoking cessation induction study (NHLBI R01 62165-05). Caregivers were eligible if their child experienced an asthma exacerbation requiring an emergency department or urgent care visit or hospitalization (within the last 3 months), and were recruited primarily from emergency departments and physician referrals. Participants were eligible if they were (a) a current smoker, smoked >= 100 cigarettes in their lifetime and >= 3 cigarettes per day, (b) a primary caregiver of a child with asthma, (c)>= 18 years of age, (d) not currently, or planning to become, pregnant, (e)fluent in English, (f) reachable by telephone, (g) not enrolled in a smoking cessation program or using nicotine replacement or medication to help them quit smoking. We excluded individuals who smoked fewer than 3 cigarettes per day to ensure that participants were regular smokers and not non daily smokers, or “chippers,” as they may represent a very different group in terms of smoking attitudes and cessation.[23] Participants whose children were diagnosed with other significant pulmonary disorders (e.g., cystic fibrosis) were excluded. Participants were told that to be a part of the study, they would need to consent to asthma education visits that would take place in their homes and be willing to discuss their smoking. Participants were told that they did not have to want to quit smoking to be in the program but that if they did decide to quit, they would receive 8 weeks of treatment with the Transdermal Nicotine Patch (TNP) at no cost.

Study Design

Participants were screened for eligibility by phone. Participants who were eligible and interested in participating received an in-home visit by a research assistant during which they were consented and completed a baseline questionnaire. Participants received two home visits from a counselor to discuss asthma education and smoking. Counselors used Motivational Interviewing[24] focused on smoking cessation if participants were ready to quit and attempted to enhance motivation in those not ready to quit. All participants also received objective feedback about SHS exposure to their child, and the American Lung Association’s self-help smoking cessation manual. Participants received six check-in phone calls (5–10 minutes) from their counselor over the next four months to assess asthma and provide child wellness information (not related to smoking cessation). Six months after completion of the home visits (four months after baseline), research assistants administered the 6-month follow-up questionnaire by phone. If participants reported no smoking in the past 7 days (no cigarettes at all, even a puff), they were asked to complete a carbon monoxide breath test to verify self-reported abstinence either at the participant’s home or at our offices. All study procedures were approved by the institutional review board of the hospital where the study was based.

Measures

Demographics and Smoking History—Caregiver and child age and race/ethnicity, as well as caregiver partner status (whether or not the participant has a partner, as opposed to being single), education level, employment status, income, and number of cigarettes smoked per day were assessed. Baseline motivation to quit smoking was assessed with one item asking how much the participant wants to quit smoking on a 10-point scale ranging from 1 (do not want to quit) to 10 (very much want to quit). Nicotine dependence was assessed by the total score of the 6-itemFagerstrom Test for Nicotine Dependence (FTND).[25] Child functional morbidity due to asthma was measured with the Asthma Assessment Form, adapted from the Functional Severity scale.[26] Internal consistency of this measure has been found to be moderate to high (Cronbach's alpha = .72–.86).[27]

Social Support Measures—Structural support was measured by the assessment of two smoking-specific social characteristics, proportion of friends who are smokers (none, few, several, most, or all), and whether or not the participant lived with another smoker (yes/no), and one general social characteristic, caregiver partner status. Functional social support (perceived general support) was assessed with the 16-item Interpersonal Support Evaluation List (ISEL), which has demonstrated good full scale and test-retest reliability (α=.90).[28] The ISEL includes four subscales: appraisal (having someone to talk to about problems), belonging (having people to do things with), tangible (availability of material aid), and self-esteem support (availability of positive social comparisons). We also assessed social support using the ISEL after the intervention was completed to control for the potential effects of the intervention on social support and to isolate the impact of baseline social support on outcomes. We did not include a measure of smoking-specific functional support because of measurement problems associated with the Partner Interaction Questionnaire, a commonly used scale in the literature, in previous reviews.[11,21]

Smoking status—Seven-day point prevalence abstinence (7-day PPA) was defined as no smoking in the past seven days prior to the 6-month assessment. Carbon monoxide testing verified self-reported abstinence (≤10 ppm = abstinence).[29] We did not use salivary cotinine to verify abstinence because participants were provided with the Transdermal Nicotine Patch, which may affect cotinine levels.[30] Participants with ppm greater than 10 and those with missing data at follow-up were considered smokers (intent-to-treat analysis). We also examined 24-hour quit attempts as an exploratory outcome (whether or not the participant reported that they stopped smoking for at least 24 hours in an effort to quit smoking, not due to illness or hospitalization, since beginning the program).

Analytic Plan

Hierarchical logistic regression was used to determine whether structural and functional support variables measured at baseline predicted smoking cessation at the 6-month follow-up, controlling for nicotine dependence and relevant demographic variables. Baseline FTND, motivation to quit smoking, and child age were included as covariates because of their relationship to smoking cessation outcomes in previous studies.[31,32,33] Also, child functional morbidity due to asthma was used as an additional covariate, as child symptom level may impact parental smoking behavior. We also controlled for total social support

post-intervention to attempt to control for the potential impact of the smoking cessation intervention on perceived social support. These variables were entered into the first step of the regression equation and the independent variables of interest (indices of structural and functional social support) were entered at the second step. We conducted post-hoc analyses to determine which subscales of the ISEL (measured at baseline) predicted smoking cessation (at 6month follow-up). In these analyses, regressions were structured as in the main analyses; however, separate models were conducted for each subscale due to multi-collinearity. Also, post-intervention subscale social support was added as an additional covariate to attempt to control for the potential impact of the smoking cessation intervention on perceived social support. Exploratory analyses regressed 24-hour quit attempts on structural and functional support, controlling for child age, FTND, motivation to quit, post-intervention total social support, and child functional morbidity due to asthma, as described above.

Results

Thirteen participants (7.7%) were missing baseline data and were excluded from analyses for a final sample of 154 participants. The sample was primarily female (81.8%), 34 years of age (*M*=33.7, *SD*=8.9), single (64.3%), and racially diverse (47.4% Caucasian, 28.6% African American, 9.7% Indian, 1.3% Asian, 13% other; 15.8% identified as Hispanic). Participants reported smoking an average of 13.5 (*SD*=7.9) cigarettes per day at baseline and reported a moderate dependence on nicotine (M_{FTND} = 3.85, *SD* = 2.33). The majority of the sample did not live with another smoker (61.7%). Participants expressed a moderate level of motivation to quit smoking (*M* = 6.5 out of 10, *SD* = 1.2). The children of participants were on average, 6 years old (M=5.5, SD = 4.6), and had asthma with a moderate level of ongoing symptoms (M_{AFS}=1.56, *SD*=.99). Approximately 10.4% of the sample achieved 7-day PPA (biochemically verified, intent-to-treat sample) at the 6-month follow-up point. By the 6-month follow-up, 63.6% of the sample had made at least one 24-hour quit attempt.

Main Analyses

After controlling for covariates, baseline functional support as measured by the ISEL significantly predicted abstinence at 6 month follow-up. For every one point increase in ISEL total scale score, caregivers were 10.7% less likely to report smoking in the past 7 days (Model 1, Table 1). Structural support alone, controlling for covariates, did not predict abstinence (Model 2, Table 1). When structural and functional measures of support were entered together in step 2, after controlling for covariates, baseline functional support was the only variable to significantly predict abstinence at the six month follow-up (Model 3, Table 1).

A median split for the total functional social support scale was used to further interpret the data (Figure 1). At the 6 month follow-up point, a greater percentage of smokers with high levels of functional social support achieved 7-day PPA (16.9%, n=14 out of 83) than those with low levels of functional social support (2.8%, n=2 out of 71).

Sensitivity analyses were conducted by repeating these analyses with only those who made at least one quit attempt between baseline and the 6 month follow-up. Results were similar

to those conducted with the full sample. None of the three structural social support variables alone predicted 7 day PPA (all p's>.1). However, functional support alone significantly predicted 7-day PPA at the 6 month follow-up point (OR = .883, 95% CI = .793–.982, p = .022). When structural and functional variables were entered together, only functional support remained a significant predictor of 6 month 7-day PPA (OR = .881, 95% CI = .790–.982, p = .022).

Exploratory analyses were used to examine which subscales of the ISEL explained the results. Only the self-esteem support subscale (*OR* = .624, 95% CI = .445–.874, p = .006) at baseline was a significant predictor of 6 month 7-day PPA after controlling for baseline covariates.

24-Hour Quit Attempts

Exploratory analyses were conducted to examine whether baseline structural and functional support predicted attempts to quit smoking. After controlling for covariates, the proportion of friends who smoked (structural support) significantly predicted the occurrence of at least one 24-hour quit attempt by 6-month follow-up (*OR* = 1.476, 95% CI = 1.036–2.104, p = .031), such that those who had a greater proportion of friends who smoked were less likely to have made a quit attempt. The other structural support variables (living with another smoker and partner status) and functional support did not predict making an attempt to quit smoking (all p>.1). After entering both the structural and functional social support variables into the equation, however, proportion of friends who smoked was no longer a significant predictor of making at least one 24-hour quit attempt by 6 month follow-up (*OR* = 1.450, 95% CI = .957–2.198, p = .080).

Discussion

The current study was the first to examine the importance of both structural and functional support in predicting biochemically-verified smoking abstinence in caregivers of children with asthma. Also, because this was a cessation induction trial, participants were not necessarily motivated to quit upon entering the study. While we hypothesized that both types of support would predict abstinence, our results indicated that only higher baseline functional support significantly predicted abstinence at six months, even when controlling for smoking-specific structural support characteristics, and that this effect was driven by the self-esteem support subscale. Structural support was not a significant predictor of 6-month 7-day PPA. In addition, in post-hoc analyses, we found that one aspect of structural support (smaller proportion of friends who smoke) was a significant predictor of making at least one 24-hour quit attempt while functional social support was not. This effect became non-significant (p = .08) when functional and structural support were entered together in the regression equation.

Previous research regarding which types of social support predict smoking cessation has been mixed. Our results suggest that when considered individually (Models 1 and 2 in Table 1), both structural and functional support may be important predictors of smoking outcomes because each type of support predicted a different type of outcome (making a 24-hour quit attempt versus bioverified 7-day PPA). These results are in-line with several studies that

have found that different psychosocial factors predict quit attempts versus abstinence after a smoking cessation intervention.[34]

When both structural support and functional support were entered together into the regression equation (Model 3 in Table 1), functional support continued to predicted 7-day abstinence while structural support no longer predicted making a quit attempt. In Westmaas and colleagues' integrative social support model,[11] functional support (both general and smoking-specific) is hypothesized to affect smoking cessation through its impact on stress processes and adaptive coping responses. This fits with the stress-buffering model of social support which theorizes that social support may buffer the effect of stress and lead to more successful smoking cessation.[22] This may be particularly important in high-stress groups such as parents of children with chronic illnesses, who may benefit more from a supportive social network. Future research should examine the relationship between perceived stress, general and smoking-specific functional and structural support, and smoking outcomes in caregivers of children with asthma.

Exploratory analyses revealed that the self-esteem subscale was a predictor of abstinence 6 months after the intervention. A previous study found that appraisal support was the most consistent predictor of abstinence.[14] It may be that for caregivers of children with asthma who have more burden related to disease management, having someone to talk to about problems (appraisal support) is less important than feeling that they compare favorably to others in their social network (self-esteem support). Individuals that feel that they compare less favorably to others in general may also be less confident in their ability to quit smoking. This higher self- confidence may translate to a higher perceived ability to cope with stressors related to quitting smoking.[11,22] Higher self-efficacy to quit smoking has predicted smoking cessation,[35] so this may be an important construct to examine in future studies in parents of children with asthma. However, these analyses were exploratory and future research should attempt to replicate these findings.

Our findings suggest that clinically, focusing on enhancing general functional support, particularly self-esteem support, may lead to a higher likelihood of successful quitting in smoking caregivers of children with asthma. Cognitive-behavioral treatment for smoking cessation could include challenging cognitions around lower perception of self compared to peers. Helping smokers make more realistic comparisons of themselves to their peers may allow them to feel more comfortable in reaching out for support from others. This increase in general functional support may in turn impact their ability to cope with the challenges of quitting smoking, as theorized in the stress-buffering model.[22] This may impact smokers' self-efficacy specifically related to quitting smoking.

Our results also suggest that while having fewer smoking friends may lead to a higher likelihood of making a 24-hour quit attempt, this effect is made non-significant when taken in context with the perception of functional support. While many cessation interventions focus on the importance of continuing to make quit attempts after a failed attempt, some research has found that while a higher number of quit attempts predicts making a future attempt, it also predicts a higher likelihood of relapsing than in those with fewer attempts.[34] Therefore, it may be most important to focus on increasing general functional social support

which predicts a more sustained, biochemically verified period of 7-day abstinence rather than focusing on changing structural aspects of the social network (e.g., making more non-smoking friends).

Our findings may not generalize to a population of individuals without children with chronic health conditions such as asthma. However, this population represents a high-risk segment of smokers who may have high levels of parenting stress[5] and whose children are at higher risk of asthma complications due to caregiver continued smoking.[2,3] For these reasons, they may be even more difficult to treat due to disease management burden and dependence on others for support. Future studies should attempt to replicate these findings in a sample of smokers with healthy children, or without children, which would substantiate the importance of functional support in predicting successful quitting across a broader population. Also, because our participants were mostly female, the results may not generalize to male caregivers of children with asthma. However, mothers of children with asthma tend to report higher caregiving demands when compared with fathers.[36] The literature on gender differences in functional social support predicting smoking cessation is mixed,[37] but there is evidence that spousal smoking status (structural support) is a more important predictor of both smoking initiation and relapse for women than it is for men.[38,39] Future research should examine gender as a moderator on the impact of both functional and structural support on smoking cessation.

There are several limitations of our study. We included only three aspects of structural support and did not include a measure of social integration, or the degree of involvement with the social network.[40] We also did not include a measure of smoking-specific functional support. Smoking-specific functional support has typically been assessed using the Partner Interaction Questionnaire (PIQ) which assesses the perception of 20 abstinence-specific support behaviors that may have been provided by a spouse or other close individual.[41] Measurement problems with the Partner Interaction Questionnaire have been identified such that negative support behaviors may be more applicable to individuals still smoking while positive support behaviors may apply only to those who have quit.[21] The development and validation of an unbiased measure of smoking-specific functional support would benefit future research in social support and smoking. Another limitation of this study has to do with the measurement of the structural support characteristics. Differences in the predictive utility between the aspects of structural and functional support could be due to scale characteristics, as we compared three individual items measuring structural support to a full scale measuring functional support. However, the fact that the aspects of structural support used in this study have been related to cessation in previous studies lends confidence to our findings. Also, although our main outcome was biochemically verified (7-day PPA), our exploratory analyses that examined 24-hour quit attempts were not. Lastly, while exhaled carbon monoxide levels of less than or equal to 10 has been determined an appropriate cutoff to differentiate smokers from nonsmokers,[29] recent research has suggested that cutoffs for both CO and plasma cotinine may not be as strongly correlated with self-reported smoking status in light and minority smokers.[42] However, there are currently no accepted cutoffs for smoking biomarkers for these subgroups of smokers.

Future studies should include a wider variety of social network characteristics and a measure of social integration to determine the importance of theses constructs in predicting smoking cessation and quit attempts. Examining pathways between these social support constructs as well as the roles of stress and coping, would provide a more thorough examination of Westmaas and colleagues' integrative model of social support and smoking in caregivers of children with asthma.[11]

Conclusion

In conclusion, general functional support was a significant predictor of smoking cessation in this sample of caregivers of children with asthma who vary in their motivation to quit smoking. Smoking-specific structural support, (i.e., proportion of smoking friends and living with another smoker) and general structural support (i.e., partner status) did not predict abstinence but having fewer friends who smoke predicted making a 24-hour quit attempt. However, when considered in context with functional support, this effect became non-significant. Smoking cessation that focuses on building perceived general support, particularly support around self-esteem, may be beneficial for smoking cessation outcomes in this group of caregivers of children with asthma.

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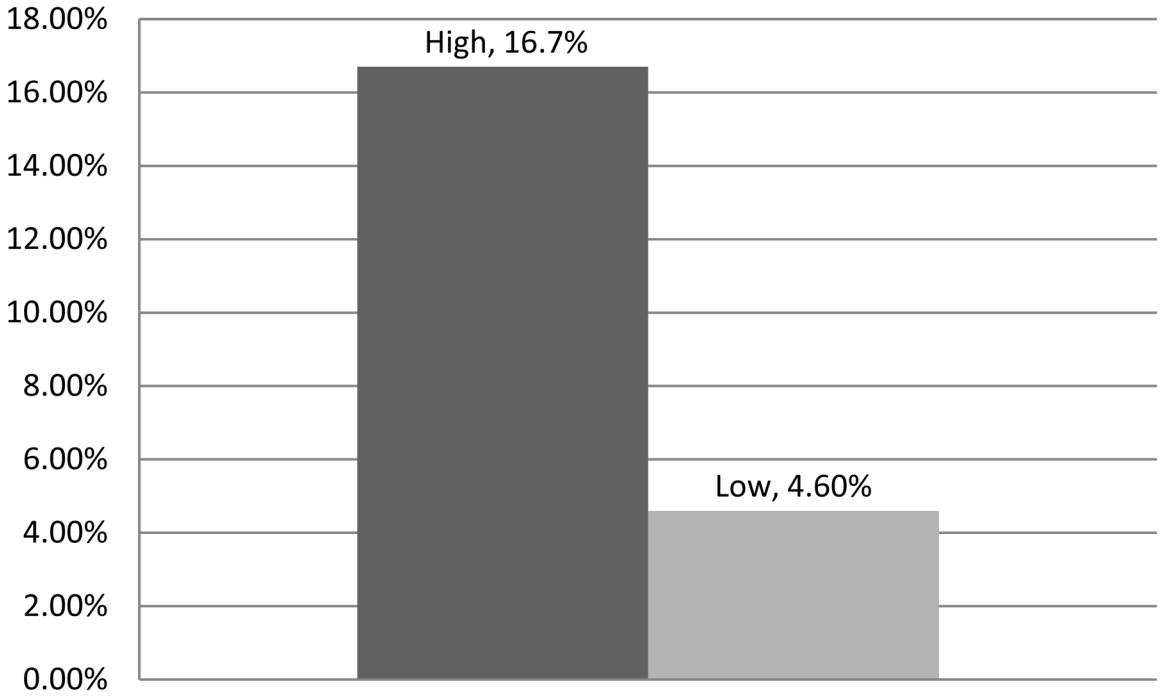

Figure 1.
High versus Low Levels of Social Support (as measured by the ISEL Total Scores) by percent abstinent at 6 months post-intervention

Table 1

Results of Logistic Regression Analyses of Main Hypotheses.

	Statistics			95% CI	
Step and Predictor	**R^2**	**Δ R^2**	**OR**	**Lower**	**Upper**
Model 1: ITT analyses with functional support characteristics					
Step 1: FTND	.03		1.03	.79	1.34
Child age			1.06	.93	1.22
Motivation to quit			.79	.46	1.37
AFSS			.99	.98	1.01
ISEL total post-intervention			1.03	.94	1.12
Step 2: ISEL total baseline	.07	.04	.89*	.81	.99
Model 2: ITT analyses with structural support characteristics					
Step 1: FTND	.02		1.14	.89	1.46
Child age			1.05	.92	1.19
Motivation to quit			.76	.46	1.25
AFSS			.99	.99	1.01
Step 2: Other smokers in the home	.03	.01	.59	.19	1.84
Proportion smoking friends			.85	.50	1.45
Partner Status			.67	.23	1.99
Model 3: ITT analyses with structural and functional support					
Step 1: FTND	.03		1.05	.79	1.37
Child age			1.06	.93	1.22
Motivation to quit			.79	.45	1.39
AFSS			.99	.98	1.01
ISEL total post-intervention			1.03	.95	1.12
Step 2: ISEL total baseline	.08	.05	.89*	.81	.99
Other smokers in the home			.62	.19	1.94
Proportion smoking friends			1.01	.57	1.82
Partner status			.65	.21	2.02

[a]The table provides final estimates that were generated once all variables were entered in the model. Step 1 includes covariates and Step 2 includes predictor variables. ITT refers to intent-to-treat. The outcome is biochemically-verified abstinence at 6 months post-intervention.

$b_{*}\ p<.05$