Smoking Cessation in Adolescents

The Role of Nicotine Dependence, Stress, and Coping Methods

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Objectives: To compare perceived reasons for continued smoking and withdrawal symptoms between current smokers and quitters in an inner-city adolescent population. To examine the relationship of nicotine dependence, stress, and coping methods between smokers and quitters and, using the Transtheoretical Model of Change, among adjacent smoking cessation stages.

Design: A cross-sectional study using a self-administered questionnaire.

Participants: The study comprised 354 clinic patients between the ages of 12 and 21 years who reported past or present smoking.

Main Outcome Measures: Demographic characteristics, smoking status, perceived reasons for continued smoking, attempts to quit, and withdrawal symptoms, as well as standardized scales assessing nicotine dependence, stress, and coping methods.

Results: The overall prevalence of smoking in this population was 26%. Smokers were significantly more likely to report smoking more cigarettes per day as well as higher levels of physical addiction ($P<.01$), greater levels of perceived stress ($P<.02$), and less use of cognitive coping methods ($P<.02$) than quitters ($P<.005$). However, comparison of consecutive stages revealed a significant difference only between precontemplation and contemplation in cognitive coping methods ($P<.01$). Three of 20 withdrawal symptoms (cravings, difficulty dealing with stress, and anger) were reported more frequently among current smokers who had attempted to quit in the last 6 months than among former smokers ($P<.01$).

Conclusion: Interventions for inner-city adolescents who smoke should be designed to target those with the highest levels of nicotine dependence, stress, and decreased use of cognitive coping methods because they are the least likely to quit on their own, rather than developing stage-specific models.

Arch Pediatr Adolesc Med. 2001;155:489-495

In 1998, more than 4 million adolescents in the United States were current cigarette smokers. Although only 5% of daily smokers enrolled in high school think that they will be smoking in 5 years, 75% of these adolescents still smoke 5 to 7 years later. Most report that they would like to quit but are unable to do so. In fact, among high school students who had smoked daily at some point, 72.9% had tried to quit smoking, and 13.5% were former smokers. Most research on smoking and adolescents has concentrated on factors that lead to smoking, to develop more effective primary prevention programs. However, our understanding of why adolescents quit and how we can influence this behavior is limited.

Once smoking behavior becomes established, regular smokers are more likely than beginning smokers to report that they smoke because they are addicted. Among adolescents, nicotine dependence is related to both the intensity and duration of smoking. Studies among adults suggest that lighter smokers and those who have smoked for a shorter period of time are more likely to quit than heavier smokers and those who have smoked for a longer period of time. However, despite this relationship between continued smoking and nicotine dependence, cessation studies using medication for nicotine dependence have had limited success in adolescents. Therefore, it is important to address other factors that are responsible for continued smoking.

Stress is associated with continued use of cigarettes in both adults and adolescents. When adolescents are given 2 choices (“It relaxes or calms me” and “It’s really hard to quit”) and asked why they continue to smoke, they frequently report that they use smoking to relax. Among adults, stress levels are inversely related to the duration of smoking cessation, and those who continue to smoke report higher levels of stress. In another study, the degree of perceived stress was the only variable that prospectively predicted success with quitting, with lower levels associated with higher quit rates.

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Coping processes have been defined as ongoing cognitive and behavioral strategies to manage external and internal demands. Among adult quitters, studies have noted that any productive attempt to cope with relapse crises is better than no coping attempt. Others have indicated that all coping strategies are equally effective and that using multiple cognitive or multiple behavioral strategies is just as effective as using a combination of these methods.

In designing cessation studies, it has been suggested that rather than classifying smokers into groups (ie, smokers vs quitters), interventions should be tailored to match the individual smoking cessation stage of change using the Transtheoretical Model of Change (TMC). Unfortunately, only a limited number of studies have evaluated the adult data on smoking cessation stages in adolescent smokers and former smokers. To the best of our knowledge, differences in nicotine addiction and stress by individual stages of change have not been evaluated in adolescents.

Implications of the TMC model are that smokers use different coping mechanisms to move along the continuum toward smoking cessation. Studies report that adolescents use cognitive and behavioral processes similar to those used by adults. However, in the early stages of cessation, adolescents tend to use behavioral processes more often. Examples include self-liberation (choosing and committing to change) and counter-conditioning (substituting alternatives for behavioral problems, such as relaxation or positive self-statements). Other types of coping (eg, anger or avoidance coping) have not been evaluated.

Our interest was to study these concepts in a primarily inner-city minority adolescent population, as opposed to the white adolescent majority, to develop effective intervention programs that target both contributing psychosocial factors and nicotine dependence. Smoking rates in youths from minority backgrounds (22.7% among African American youths and 34% among Hispanic youths), although lower than in white adolescents (39.7%), have increased steadily during the last decade. Because little research exists on the development of culturally appropriate cessation programs, those directed at minority groups have used either a self-help approach or materials developed for the white population.

We first examined the perceived reasons for continued smoking, attempts to quit, and withdrawal symptoms among current smokers and compared these attitudes and behaviors with those of subjects who reported...
considering quitting in the next 6 months, or contemplation \((C; n=83)\); (3) able to quit for 24 hours or more in the last 6 months and planning on quitting in the next 30 days, or preparation \((P; n=73)\); (4) completely stopped smoking within the last 6 months, or action \((A; n=33)\); (5) completely stopped smoking more than 6 months ago, or maintenance \((M; n=46)\).

**MEASURES**

The Perceived Stress Scale is a 10-item measure of perceived stressful life situations assessed on a 5-point Likert scale and is a commonly used research instrument.\(^{26,27}\) As an example, one item asked subjects how often in the last 30 days they had been upset by an unexpected event. Scoring was from 0 to 4 on a 5-point scale, and the scores ranged from 0 to 40.\(^{30}\) This scale has been shown to have reliability and validity in previous studies with adolescents.\(^{18}\)

The Negative Life Events Scale is a 20-item checklist of which 11 events involve family members (eg, “Somebody in my family had a serious illness”) and 9 involve the adolescent (eg, “I had a serious accident”); the scale concerns events that took place during the last year. This scale has been shown to have reliability and validity in previous research studies with adolescents. Based on a total set of 20 items, the score ranges from 20 to 40.\(^{30}\)

We used a 47-item scale to assess 8 coping measures developed by Wills et al,\(^{32}\) which uses a 5-point Likert scale and has also served as a research instrument to measure coping strategies. These strategies have been divided into positive and negative methods by the developers of the measure, who have used these scales in school-based studies of adolescents. Positive coping methods include parental support, behavioral coping, and cognitive coping. Higher scores on these subscales suggest that the probability of substance use or abuse is reduced (protective). The negative or ineffective methods of coping are avoidance, anger, helplessness, substance use, and peer support coping. Higher scores reflect increased risk of substance use. We excluded substance use coping from further analysis because it includes the use of cigarettes, which was related to the outcome variables.

The Fagerstrom Test for Nicotine Dependence (FTND) is a 6-item self-report measure of nicotine dependence.\(^{12}\) It is a revision of the Fagerstrom Tolerance Questionnaire, which was developed to assess self-reported nicotine dependence and has demonstrated strong correlations with cotinine levels.\(^{10}\) This questionnaire and a modified version of it have been used to assess nicotine dependence among adolescents.\(^{8,33}\) A score of 7 to 10 on the FTND scale is considered to represent a high degree of nicotine dependence; a score of 4 to 6, moderate dependence; and below 4, light dependence. We added the past tense to each of the questions posed to former smokers to obtain a retrospective report of their nicotine dependence.

**ANALYSIS**

\(\chi^2\) Analysis was used to examine the associations between categorical demographic variables and both smoking status (smokers and quitters) and smoking cessation stages (PC, C, P, A, and M). The Mann-Whitney rank sum test was used to compare age and the scores on the standardized scales between the 2 smoking groups. The Kruskal-Wallis nonparametric analysis of variance with contrasts was used to compare scale values between smokers and quitters and then to compare age and scale values among contiguous stages. A significance level of \(P<.05\) was employed for decision making in our statistical analyses using 2-tailed tests, and the Bonferroni adjustment was made for multiple comparisons. Data were analyzed on a personal computer using BMDP statistical software (Los Angeles, Calif).\(^{41}\)

**RESULTS**

Although adolescent smokers and quitters did not differ significantly by sex, race, educational level, employment status, or subjective assessment of religiosity (Table 1), smokers as a group were slightly younger than quitters (mean±SD, 17.6±2.1 years vs 18.2±1.7 years; \(P<.05\)). The demographics of the study sample did not differ significantly from that of the clinic population.

**SMOKING ATTITUDES AND BEHAVIORS AMONG SMOKERS AND QUITTERS**

The major reasons smokers acknowledged for continuing to smoke were as follows: “relaxes me,” 73%; “have a habit,” 56%; “I am addicted,” 29%; “I’m bored,” 22%; and “everyone around me smokes,” 17%. Fifteen percent or less said that it was to help them concentrate, was for the pleasure of smoking, or was due to peer pressure. Quitters asked to recall the reasons they smoked were significantly less likely (\(P<.01\)) to say that they had a habit (31%) or were addicted (11%).

Sixty-nine percent of the current smokers had attempted to quit for 24 hours or more in the last 6 months, and more than half (58%) of these smokers felt that they were unlikely to succeed if they tried to quit in the following month. Of those who had attempted to quit but were still smoking, a larger percentage than that of former smokers reported experiencing 3 of the 20 withdrawal symptoms (Table 2). These included cigarette cravings (47% vs 18%; \(P<.001\)), difficulty dealing with stress-
ful situations (33% vs 11%; P<.001), and feelings of anger (19% vs 6%; P<.01).

When subjects were asked why they started smoking again after attempting to quit, significant differences between smokers and quitters were obtained for 2 responses: 83% of smokers vs 17% of quitters chose “because of stress” (P<.001), and 25% vs 9% chose “after a fight” (P<.005). No significant differences were obtained for “because my friends smoke” or “I was bored.”

Among the reasons for quitting or wanting to quit, quitters more frequently acknowledged that others wanted them to quit than did current smokers (P<.01). There were no differences in concerns regarding current or future health or cost.

When asked who or what would help them if they chose to quit smoking or who had helped them quit, “doing it on my own” was the most common choice by both groups (82% of quitters vs 72% of current smokers). Only 10% of current smokers said that they would use a program, and 8% chose “with the help of medication.” Only 33% of current smokers and 28% of quitters acknowledged being advised to quit by a health professional.

STRESS, COPING, AND NICOTINE DEPENDENCE AMONG SMOKERS AND QUITTERS

In comparing all scale values between smokers and quitters, we found a significant difference in each of the measures used. Although most of these adolescents had mild nicotine dependence on the FTND scale, there was a significant difference between groups (mean±SD, 2.9±2.4 vs 1.7±2.3; P<.001). Measures of stress included the Perceived Stress Scale (mean±SD, 21.6±6.6 vs 19.1±6.7; P<.01) and the Negative Life Events Scale (mean±SD, 25.8±3.4 vs 24.6±3.0; P<.01). Among the coping subscales, only cognitive coping (positive method) was significantly different between these groups (mean±SD, 18.5±5 vs 20±5.5; P<.05).

STRESS, COPING, AND NICOTINE DEPENDENCE AMONG STAGES OF SMOKING CESSATION

We then compared demographics and median scores on the standardized scales between each pair of adjacent smoking cessation stages. Those in the various stages did not differ significantly by age, sex, race, educational level, employment status, or subjective assessment of religiosity.

Sixty-two percent of those in the PC and 74% in the C stage had attempted to quit for 24 hours or more in the last 6 months. A significantly larger percentage of those in the PC than the C stage recalled having had intense cravings (P<.001), difficulty dealing with stress, subjective depression, irritability, and feelings of sadness and anxiety (P<.05).

There was no significant difference in the FTND scores between adjacent stages (Figure 1) despite the visual difference between stages C and P. Those in the PC stage reported smoking an average of 10 cigarettes a day in the last month (range, 0-30). Those in the C
The adolescents in this study most often attributed the use of medication. A study of adolescents’ attitudes toward methods of quitting showed that teens rated the likelihood of success as the most important criteria for choosing a particular method. However, although most of the adolescents we studied acknowledged that they would be unlikely to succeed if they attempted to quit in the near future, they indicated that they would choose to quit without assistance.

It is disturbing that only a third of the subjects who smoked reported being asked by a physician to quit. Studies in adults have shown that 10% to 25% of smokers who are advised to quit by their physicians may quit or reduce the amount they smoke, stressing the need for pediatricians and other health professionals to address the issue. Several national medical organizations have guidelines to help provide anticipatory guidance, screening, and referrals. Given that most adolescents want to quit on their own, developing skills in motivational interviewing and brief office interventions may be the most effective means to enhance quit rates.

The adolescents in this study most often attributed the role of cigarettes in helping them to relax as the reason to continue smoking (73%). Stress was also acknowledged as a common cause for relapse after previous quit attempts (49%). The perceived stress score was significant.

### Table 2. Withdrawal Symptoms Stratified by Smoking Status*

<table>
<thead>
<tr>
<th>Withdrawal Symptom</th>
<th>Quitters (n = 79)</th>
<th>Smokers With Past Quit Attempts (n = 190)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frustration</td>
<td>15 (21)</td>
<td>33 (28)</td>
<td>.24</td>
</tr>
<tr>
<td>Weight gain</td>
<td>14 (19)</td>
<td>16 (14)</td>
<td>.30</td>
</tr>
<tr>
<td>Cravings</td>
<td>13 (18)</td>
<td>55 (47)</td>
<td>.001</td>
</tr>
<tr>
<td>Increased appetite</td>
<td>13 (18)</td>
<td>34 (29)</td>
<td>.08</td>
</tr>
<tr>
<td>Anxiety</td>
<td>10 (14)</td>
<td>24 (21)</td>
<td>.24</td>
</tr>
<tr>
<td>Irritability</td>
<td>10 (14)</td>
<td>29 (25)</td>
<td>.07</td>
</tr>
<tr>
<td>Restlessness</td>
<td>9 (13)</td>
<td>15 (13)</td>
<td>.93</td>
</tr>
<tr>
<td>Difficulty with stress</td>
<td>8 (11)</td>
<td>38 (33)</td>
<td>.001</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>7 (10)</td>
<td>7 (6)</td>
<td>.35</td>
</tr>
<tr>
<td>Nervousness</td>
<td>6 (8)</td>
<td>13 (11)</td>
<td>.52</td>
</tr>
<tr>
<td>No energy</td>
<td>6 (8)</td>
<td>12 (10)</td>
<td>.65</td>
</tr>
<tr>
<td>Depression</td>
<td>5 (7)</td>
<td>20 (17)</td>
<td>.04</td>
</tr>
<tr>
<td>Anger</td>
<td>4 (6)</td>
<td>22 (19)</td>
<td>.01</td>
</tr>
<tr>
<td>Trouble sleeping</td>
<td>4 (6)</td>
<td>15 (13)</td>
<td>.10</td>
</tr>
<tr>
<td>Trouble concentrating</td>
<td>4 (6)</td>
<td>9 (8)</td>
<td>.56</td>
</tr>
<tr>
<td>Crying easily</td>
<td>3 (4)</td>
<td>10 (9)</td>
<td>.24</td>
</tr>
<tr>
<td>Sweating</td>
<td>3 (4)</td>
<td>2 (2)</td>
<td>.31</td>
</tr>
<tr>
<td>Sadness</td>
<td>2 (3)</td>
<td>14 (12)</td>
<td>.03</td>
</tr>
<tr>
<td>Constipation</td>
<td>2 (3)</td>
<td>5 (4)</td>
<td>.59</td>
</tr>
<tr>
<td>Muscle cramps</td>
<td>2 (3)</td>
<td>3 (3)</td>
<td>.94</td>
</tr>
<tr>
<td>None reported</td>
<td>36 (50)</td>
<td>32 (28)</td>
<td>.002</td>
</tr>
</tbody>
</table>

*Denominator term varies across variables because of missing data. Percentages may not total 100% because of rounding. Data are presented as number (percentage).
significantly higher in smokers than in quitters but not significantly different between consecutive stages. Unfortunately, the measures employed in our study to evaluate stress do not provide numeric cutoffs to guide the health care provider about when counseling may be required, especially for the adolescent smoker. Therefore, it is difficult to determine the clinical significance of our findings. However, our data are consistent with reports suggesting that individuals with higher perceived stress scores and more negative life events are less likely to quit smoking.\textsuperscript{14,20,23} Reports justifying why people continue to smoke may be subject to strong rationalization bias.\textsuperscript{44} Although smokers may state that they smoke to relieve stress, a study by Cohen and Lichtenstein\textsuperscript{45} suggests that quitting smoking results in decreased stress, at least in those who want to quit. Whether the higher level of perceived stress among current smokers is related to withdrawal symptoms (when not smoking) followed by a subjective sense of relaxation (when smoking) remains to be determined. Prospective studies should be conducted to determine the direction of the relationship between stress and continued smoking.

Cognitive coping was the only coping method that showed a significant difference between smokers and quitters. The measure used, which is consistent with other research in this area, does not guide the health care provider to select this coping strategy as opposed to another. We believe that using this coping method possibly aids adolescents attempting to quit smoking to reframe stressful events or tempting situations; the method reduces their need to reach for a cigarette to cope with stressors. The scope of strategies in this method include thinking about the health benefits of not smoking, evaluating the social benefits of quitting (eg, pleasing a parent or loved one), using distraction strategies such as thinking about alternative pleasant activities, or a simple delay in smoking cigarettes. Increased use of cognitive coping may effect a move from precontemplation to contemplation among these minority adolescents and may keep those in maintenance from relapsing.

Using the TMC model, we noted that a smaller percentage of inner-city adolescents were in the earliest stage of change (PC) than that reported in studies with the white population, but that the percentages were similar for the C and P stages and higher for the A and M stages.\textsuperscript{26} These data are consistent with results of surveys demonstrating that white youths have lower quit rates than youths from minority backgrounds.\textsuperscript{45,46} This relationship may, however, be related to the younger age of initiation among whites.\textsuperscript{47} Among our minority adolescents, even those who reported that they were not seriously considering quitting in the next 6 months (PC) had made spontaneous attempts to quit in the recent past. This “desire not to quit” may therefore be related more to feelings of lower self-efficacy in quitting than a desire to continue smoking.

Because scores on the standardized scales for nicotine dependence and stress were higher among all sub-stages of smokers (PC, P, and C) than quitters (A and M) and were not significantly different between adjacent stages, interventions for these factors could possibly be designed for smokers as a group. A recent study noted that interventions mismatched to stages were as likely to be successful as matched interventions, and questioned the validity of this model in designing interventions.\textsuperscript{48} We therefore suggest that for those smokers least likely to quit on their own (ie, those with higher levels of addiction and stress), improving motivation and feelings of self-efficacy while teaching stress reduction techniques and improved use of cognitive coping skills may improve quit rates. This should include a discussion of the possible role of cigarettes in inducing stress symptoms and the reduction of these symptoms after quitting smoking.

Certain limitations in this study require comment. Because the sample is composed mainly of inner-city adolescents from minority backgrounds, these results cannot necessarily be generalized to adolescents residing in other geographic areas. However, no other study has looked at stages of smoking cessation in minority adolescents, nor at the role of nicotine dependence, stress, and coping in the ability to quit in this population. Because this was a cross-sectional study, the number of cigarettes used and the level of nicotine dependence among former smokers were elicited by recall. Although we did not use any biochemical assessments of smoking status, studies have shown little discrepancy between self-reports and biochemical assessments of adolescent cigarette smoking.\textsuperscript{49-51} However, recall bias by former smokers is possible, so the number of cigarettes smoked and number of withdrawal symptoms may have been underreported. Therefore, the results of former smokers should be cautiously interpreted. In addition, our sample was composed mainly of women, and

Table 3. Coping Methods and Stages of Smoking Cessation\textsuperscript{*}

<table>
<thead>
<tr>
<th></th>
<th>PC (n = 119)</th>
<th>C (n = 83)</th>
<th>P (n = 73)</th>
<th>A (n = 33)</th>
<th>M (n = 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive coping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive†</td>
<td>18.0 (6-30)</td>
<td>20.0 (6-30)</td>
<td>19.0 (6-30)</td>
<td>20.0 (12-28)</td>
<td>19.5 (7-30)</td>
</tr>
<tr>
<td>Behavioral</td>
<td>24.0 (6-30)</td>
<td>24.0 (6-30)</td>
<td>23.0 (11-30)</td>
<td>22.0 (12-30)</td>
<td>24.0 (9-30)</td>
</tr>
<tr>
<td>Parental</td>
<td>8.0 (4-20)</td>
<td>10.0 (4-20)</td>
<td>10.5 (4-20)</td>
<td>10.0 (4-20)</td>
<td>9.0 (4-20)</td>
</tr>
<tr>
<td>Negative coping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>13.0 (7-35)</td>
<td>11.0 (7-35)</td>
<td>13.0 (7-35)</td>
<td>10.0 (7-35)</td>
<td>13.0 (7-29)</td>
</tr>
<tr>
<td>Helplessness</td>
<td>8.0 (4-20)</td>
<td>8.0 (4-20)</td>
<td>7.0 (4-20)</td>
<td>7.0 (4-15)</td>
<td>7.0 (4-14)</td>
</tr>
<tr>
<td>Peer support</td>
<td>16.0 (4-20)</td>
<td>15.0 (4-20)</td>
<td>15.0 (4-20)</td>
<td>16.0 (4-20)</td>
<td>16.0 (4-20)</td>
</tr>
<tr>
<td>Avoidance</td>
<td>40.0 (12-58)</td>
<td>39.0 (21-60)</td>
<td>39.5 (25-60)</td>
<td>39.5 (12-57)</td>
<td>39.0 (20-58)</td>
</tr>
</tbody>
</table>

\textsuperscript{*} Data are presented as median (range). PC indicates precontemplation; C, contemplation; P, preparation; A, action; and M, maintenance. \textsuperscript{†} Significant difference noted only between C & P at P < .05.
future studies will need to evaluate differences between the sexes in stress, coping, and nicotine addiction as they relate to smoking cessation in minority youths. Finally, because our study was cross-sectional, it is limited in its ability to predict progression.

CONCLUSIONS

These inner-city adolescent smokers did have nicotine dependence as evidenced by their reports of withdrawal symptoms and scores on the FTND scale. Smokers less likely to quit on their own were those who reported more withdrawal symptoms during their attempts to quit, higher levels of perceived stress, and less use of cognitive coping. Our results suggest that interventions for these factors should be designed for smokers as a group, rather than by stages of change on the TMC model.

Accepted for publication December 12, 2000.


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REFERENCES


