RESEARCH REPORT

Ability of smokers to reduce their smoking and its association with future smoking cessation

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Abstract
Aims. We examined whether cigarette smokers in the United States can significantly reduce their smoking and maintain this reduction and, if so, whether this predicts an increase or decrease in the probability of smoking cessation in the future. Design. Longitudinal observation study. Setting. The 22 US cities of the Community Intervention Trial for smoking cessation (COMMIT). Participants. The 1410 subjects who smoked at both baseline and at 2-year follow-up. Intervention. Public health efforts to prompt cessation in half the communities. Measurements. Self-reported cigarettes/day and abstinence at baseline, 2-year and 4-year follow-ups. Findings. At 2-year follow-up. 60% of the subjects had either not changed or increased their smoking, 17% had decreased their smoking by 5–25%, 15% by 24–49% and 8% by ≥ 50%. Among the 40% who had reduced ≥ 5% at 2-year follow-up, 52% reported maintaining that reduction at 4-year follow-up. Reduction in smoking at year 2 did not prospectively predict an increase or decrease in the probability of making a quit attempt; nor did it predict eventually quitting by year 4. Conclusions. A substantial minority of US smokers are able to reduce their smoking and maintain this for long periods of time. Smoking reduction neither promotes nor undermines cessation.

Introduction
The decline in the prevalence of smoking in the United States has reversed in the last 4 years.¹ Although many attribute this to increased initiation, in fact, cessation activity has also decreased. For example, the quit ratio (the percentage of ever-smokers who have become ex-smokers) in the United States increased steadily from 1960 to 1990 but this increase has not continued from 1990 to 1995.² This discouraging trend is accompanied by the realization that, despite many new treatments for smoking cessation, the rate of success with treatment has not substantially increased over time and typically hovers around 30%.³,⁴

This plateauing of cessation activity and treatment success in the United States has prompted some scientists, clinicians and policy makers to consider smoking reduction as a legitimate alternative for smokers not able to, not ready to, or not willing to quit smoking.⁵ Whether reduction is an acceptable alternative to the standard of abstinence is debatable.⁵

One common argument is that smokers cannot reduce their smoking significantly and maintain this reduction over time. This belief is based on the belief that smokers cannot reduce their smoking significantly and maintain this reduction over time. This belief is based on the belief that...
on the observation that when smokers who are trying to stop smoking smoke a few cigarettes per day most go back to smoking the same number of cigarettes per day as prior to their quit attempt. Clinicians and others often fail to realize this observation is based on a selected subset of smokers: i.e. those who were so dependent that they failed despite treatment and who were usually told that reduced smoking is not possible.

There is empirical evidence that smokers can indeed initiate and maintain reductions. For example, in the large Lung Health Study, 60% of the sample reduced rather than stopped smoking. Of these, 39% had reduced by \( \geq 50\% \). In addition, five experimental trials have found that many smokers who are not interested in quitting can be induced to reduce their smoking as much as 50\%. In two of these studies, reductions were maintained through 6 months and in a third up to 2.5 years.

A second common argument is that encouraging smoking reduction will give smokers an easy way out and a false sense of dealing with their smoking and thereby undermine smoking cessation attempts. Interestingly, some have made the converse argument; i.e. reduction could increase self-efficacy about gaining control over one’s smoking and thus promote cessation attempts. One study reported that subjects who had cut down to 1–9 cigarettes per day at the end of a smoking cessation treatment were neither more or less likely to go on to quit smoking compared to those who smoked at their normal rate at the end of treatment. On the other hand, one of the five experimental reduction trials noted above reported that 92% of subjects reported they were more likely to try to stop smoking after having reduced their smoking in the trial.

In summary, whether smokers can significantly reduce their smoking and maintain any reduction and whether such reductions lead to increased or decreased cessation is unclear. The present article uses data from the recent Community Intervention Trial for smoking cessation (COMMIT) to test these possibilities.

Methods
COMMIT was a randomized, controlled trial conducted in 11 matched pairs of communities to test the effectiveness of a multifaceted intervention on smoking cessation. The intervention was designed (a) to encourage health care providers to promote smoking cessation counseling and office management systems, (b) to encourage institutional changes at work sites and other organizations to support non-smoking, (c) to promote participation in smoking cessation assistance in the community and (d) to increase awareness of smoking as a major public health problem. None of these activities promoted smoking reduction as a goal.

In 1988, a random-digit dial telephone survey was conducted in approximately 5400 households in each COMMIT community. From these households, cohorts of approximately 110 heavy smokers (>25 cigarette per day) and 110 light-to-moderate smokers ( \( \leq 25 \) cigarette per day) were selected randomly from each site and re-interviewed in 1989 about tobacco use (total targeted = 220 subjects \( 11 \) sites = approximately 2420). The mean response rate for the initial contact was 84% and for the second interview was 89%. The cohort was re-interviewed 2 and 4 years later. Across the 4 years of the study, 34% of the smokers were lost to follow-up, 29% due to inability to locate, 2% due to death and 3% due to other reasons. The sample for the present analysis was restricted to the 1410 subjects who smoked 10 or more cigarettes/day at baseline, continued to smoke at 2-year follow-up and reported smoking status at 4-year follow-up.

Number of cigarettes per day was defined at each follow-up as the weighted average of number of cigarettes subjects reported smoking on weekdays and on weekend days. A cessation attempt was defined as a self-reported “serious” attempt to quit in the 12 months prior to the interview. A quit was defined as a report of not having smoked any cigarettes in the past 6 months. Biochemical verification was not obtained.

Results
Compared to population estimates of US smokers, the 1410 smokers in the present sample were of similar age (42 years) but were more likely to be female (53% vs. 47%), non-white (20% vs. 15%) and better educated (58% with college vs. 28%). Because of the sampling strategy, the study sample contained heavier smokers (\( x = 25 \) vs. 21 cigarettes/day).
### Table 1. Logistic regression results modeling successful cessation and attempts to quit smoking with an increase in smoking as the reference group

<table>
<thead>
<tr>
<th>Reduction level, 1989 to 1991</th>
<th>Odds ratio*</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attempt to quit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; + 5.0%</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>+ 4.9 to − 4.9%</td>
<td>0.78</td>
<td>0.57–1.06</td>
</tr>
<tr>
<td>− 5.0 to − 24.9%</td>
<td>0.79</td>
<td>0.55–1.12</td>
</tr>
<tr>
<td>− 25.0 to − 49.9%</td>
<td>1.26</td>
<td>0.87–1.83</td>
</tr>
<tr>
<td>≥ − 50.0%</td>
<td>1.28</td>
<td>0.79–2.07</td>
</tr>
<tr>
<td><strong>Successful cessation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; + 5.0%</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>+ 4.9 to − 4.9%</td>
<td>1.06</td>
<td>0.65–1.74</td>
</tr>
<tr>
<td>− 5.0 to − 24.9%</td>
<td>0.86</td>
<td>0.47–1.59</td>
</tr>
<tr>
<td>− 25.0 to − 49.9%</td>
<td>1.14</td>
<td>0.62–2.12</td>
</tr>
<tr>
<td>≥ + 50.0%</td>
<td>1.72</td>
<td>0.85–3.46</td>
</tr>
</tbody>
</table>

*Controlled for gender, amount smoked at baseline, age, race/ethnicity, education, and income.

In exploratory analyses, both percentage reduction and number of cigarettes/day reduced were highly correlated ($r = 0.89$). The following analyses describe only the results for percentage reduction; analyses using absolute cigarettes/day produced similar results.

In the whole sample of 1410, the mean number of cigarettes/day did not change from baseline to year 2 ($x = 24.7$ at baseline and 23.3 at year 2, $p < 0.10$). Overall, 30% increased their smoking by $> 5\%$, 30% did not change their smoking by $\pm 5\%$, 17% decreased their smoking by $5\%-24\%$, 15% by $25\%-49\%$ and 8% by $50\%-99\%$.

### Maintenance of reduction

Among the 40% of smokers who had reduced by $> 5\%$ at year 2, 52% reported the same or greater reduction (including cessation) at year 4. Among those who had reduced by $5\%-24\%$, 62% maintained their reduction; among those who reduced $25\%-49\%$, 48% maintained their reduction. Among those who had reduced by $\geq 50\%$, 36% maintained their reduction. Thus, when calculated among the entire sample (1410 subjects), the incidence of reducing by $> 5\%$ at year 2 and then maintaining this reduction at year 4 was 21%. This 21% was composed of 11% who reduced and maintained a $5\%-24\%$ reduction, 7% who maintained a $25\%-49\%$ reduction and 3% who maintained a $\geq 50\%$ reduction.

The mean number of cigarettes per day decreased among those who reduced $\geq 5\%$ was 7.5 cigarettes per day. Specifically, 13% had decreased by 5–9 cigarettes per day, 11% by 10–19 and 4% by $\geq 20$ cigarettes per day.

### Reduction and cessation

In linear regression analyses, using percentage quitting as a continuous measure, subjects with a greater amount of reduction between baseline and year 2 did not have a greater or smaller incidence of reporting at least one quit attempt in the last year or of stopping smoking between years 2 and 4. However, bivariate analyses using the five groups described above suggested large reductions ($\geq 50\%$) might be associated with increased quit attempts (Table 1 and Fig. 1). Thus, we also conducted logistic regressions using these five groups with the group who increased their smoking by $\geq + 5\%$ as the reference group. In this analysis, greater reduction was again not significantly related to either quit attempts or success in quitting. When all of the regression analyses were redone accounting for differences in subject characteristics across reducers vs non-reducers (see next section), the results were nearly identical.

### Characteristics of reducers

Prior analyses of the entire COMMIT dataset reported that male gender, older age and fewer cigarettes per day (among other variables) predicted cessation, but race and education did not. To examine whether the characteristics of
reducers were similar to or different than continuing smokers, we conducted a multiple linear regression on percentage reduction in smoking across the 1410 subjects in this study using these same variables. The predictors of a greater reduction in smoking among non-abstinent smokers were: age (each 10-year increase in age increased the amount of reduction by 2%), being female (women had 7% more reduction than men) or black (blacks had 13% more reduction than whites) and smoking more cigarettes per day (each increase in smoking by 10 cigarettes per day increased the amount of reduction by 11%). Education was not a predictor.

Discussion
Inducing and maintaining a reduction in smoking
Can smokers reduce their smoking and maintain this reduction? Our data provide a mixed answer to this question. On the positive side, a substantial number of subjects (21%) were able to reduce their number of cigarettes per day and maintained this for at least 2 years. The mean number of cigarettes per day reduced by these smokers was not trivial ($x = 7.5$). Since the risks of smoking are dose-related, our observed reduction might be expected to incur a health benefit. However, there are two important assumptions with this expectation. The first is that the dose–response function for risk from smoking is based on between-subject differences at one point in time. Whether this same dose–response relationship applies to within-subject changes has never been tested in a prospective trial. The second assumption is that smokers will maintain any reductions for their lifetime. We know of no long-term data verifying this.

Finally, smoking patterns vary greatly across countries, cultures and subcultures; thus, our results may not generalize to other settings, especially less-developed countries where cost and other factors have already kept the number of daily cigarettes to less than that in the United States. In these countries, smokers may already be consuming the smallest number of cigarettes they can tolerate.

Reduced smoking and smoking cessation
If smokers were reducing as a step toward cessation one would expect to see reduction predict an increase in future smoking cessation activity. Also, one would expect to see that those who reduced smoking would have similar characteristics to those who go on to stop smoking. On the other hand, if smokers were reducing as an alternative to cessation one would expect to see

Figure 1. Prevalence of reported quit attempts and actual quitting 4 years after increasing, not changing or decreasing smoking over a 1-year period.
reduction predict a decrease in cessation activity and reducers to differ from quitters. In this dataset reduction did not predict either an increase or a decrease in cessation and reducers had some similar and some dissimilar characteristics compared to quitters. Thus, we conclude that reduction neither promotes nor undermines cessation.

At present, among smokers who are not actively trying to quit, the large majority of public health and clinical interventions for smoking cessation do not encourage smoking reduction as a preparatory stage. Although our results appear to support this view, readers should remember that our study was based on naturalistic observation; i.e. subjects self-selected into reduced smoking categories. It is possible that those who chose reduction were those who could not quit and this negative effect offset any positive causal effect of reduced smoking to prompt cessation.

Our study thus has both assets and liabilities. Its major asset is that it is the largest and most generalizable naturalistic test of whether under current conditions smoking reduction is feasible, and whether it is harmful or beneficial to cessation efforts. The study's major liability is the lack of biochemical validation of cessation. Biochemical validation of quit attempts would be difficult, as most quit attempts do not last even 48 hours. Biochemical validation of cessation is feasible; however, several lines of evidence suggest that, in minimal contact, population-based studies (such as the present one), biochemical verification is not always necessary.

Acknowledgements

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