

Figure S1. Study flow diagram.

Table S1. Demographic and smoking characteristics of randomized participants.

|  | Overall $(\mathrm{N}=245)$ | Usual Nicotine Content Group $(\mathrm{N}=123)$ | Reduced Nicotine Content Group $(\mathrm{N}=122)$ |
| :---: | :---: | :---: | :---: |
| Baseline 1 Phase (Usual Brand Cigarettes) |  |  |  |
| ${ }^{\text {a }}$ Age (years) | 44.9 (11.4) | 45.1 (10.8) | 44.7 (12.1) |
| ${ }^{\text {a }}$ Gender (male) | 117 (47.8) | 51 (41.5) | 66 (54.1) |
| ${ }^{\text {a Race ( }} \mathrm{n}=243$ ) |  |  |  |
| White | 153 (62.4) | 82 (67.2) | 71 (58.7) |
| Black | 78 (31.8) | 35 (28.7) | 43 (35.5) |
| Other | 12 (4.8) | 5 (4.1) | 7 (5.7) |
| ${ }^{\text {a Hispanic ethnicity }}$ | 6 (2.4) | 2 (1.6) | 4 (3.3) |
| $\mathrm{BMI}^{\text {b }}$ (kg/m²) | 30.3 (8.3) | 30.8 (8.1) | 29.9 (8.6) |
| ${ }^{\text {a }}$ Education |  |  |  |
| Less than a HS degree | 40 (16.3) | 25 (20.3) | 15 (12.3) |
| HS degree or GED equivalent | 112 (45.7) | 57 (46.3) | 55 (45.1) |
| More than a HS degree ${ }^{\text {c }}$ | 93 (38) | 41 (33.3) | 52 (42.6) |
| ${ }^{\text {a Household income }}$ ( $\mathrm{n}=184$ ) |  |  |  |
| \$0-19,999 | 68 (37) | 30 (31.2) | 38 (43.2) |
| \$20,000-59,999 | 72 (39.1) | 41 (42.7) | 31 (35.2) |
| \$60,000 + | 44 (23.9) | 25 (26) | 19 (21.6) |
| ${ }^{\text {a Employment statuse }}$ ( $\mathrm{n}=243$ ) |  |  |  |
| Currently working | 108 (44.1) | 54 (44.6) | 54 (44.3) |
| Not currently working | 135 (55.1) | 67 (55.4) | 68 (55.7) |
| Kessler Psychological Distress Scale score | 4.1 (4.5) | 4.2 (4.7) | 4 (4.3) |
| Center for Epidemiologic Studies Depression Scale score | 15.9 (7.1) | 15.8 (7.3) | 15.9 (6.9) |
| Monthly (or more) alcohol use in past year | 66 (26.9) | 31(25.2) | 35(28.7) |
| Monthly (or more) illegal drug use in the past year | 18 (7.3) | 6 (4.9) | 12 (9.8) |
| Cigarettes/day | 19.6 (9.3) | 19.8 (10.2) | 19.5 (8.4) |
| Age started smoking daily (years) | 17.1 (4.7) | 16.8 (4) | 17.4 (5.3) |
| Number of years smoking daily | 27.8 (11.8) | 28.3 (11.3) | 27.2 (12.3) |
| Number of lifetime quit attempts |  |  |  |
| 0 | 79 (32.2) | 45 (36.6) | 34 (28.6) |
| 1-3 | 116 (47.3) | 55 (44.7) | 61 (51.2) |
| 4 or more | 47 (19.2) | 23 (18.7) | 24 (20.2) |
| Menthol flavor preference | 170 (69.4) | 85 (69.1) | 85 (69.7) |


| Environmental Tobacco Smoke |  |  |  |
| :---: | :---: | :---: | :---: |
| Exposure score |  |  |  |
| Little or no ETS | 52 (21.2) | 26 (21.1) | 26 (21.3) |
| Moderate ETS | 41 (16.7) | 20 (16.3) | 21 (17.2) |
| High ETS | 152 (62) | 77 (62.6) | 75 (61.5) |
| Fagerström Test for Cigarette Dependence score | 6.1 (2.1) | 6.2 (2.1) | 6.1 (2.1) |
| Hooked on Nicotine Checklist score | 7.4 (2.3) | 7.3 (2.3) | 7.5 (2.2) |
| Penn State Cigarette | 13.5 (3.2) | 13.6 (3.2) | 13.4 (3.3) |
| Dependence Index score |  |  |  |
| Exhaled carbon monoxide ${ }^{\text {f }}$ | 30 (15) | 30 (15) | 29 (15) |
| Plasma Cotinine ( $\mathrm{ng} / \mathrm{mL}$ ) ${ }^{\text {g }}$ | 274 (151) | 266 (157) | 282 (145) |
| Median (Range) | 253 (3-812) | 237 (3-812) | 261 (24-730) |
| Baseline 2 Phase (UNC Study Cigarettes) |  |  |  |
| Total cigarettes/day | 24.1 (12.5) | 24 (13.9) | 24.2 (11) |
| Study cigarettes/day | 24 (12.6) | 23.8 (14) | 24.1 (11) |
| Fagerström Test for Cigarette Dependence score | 6.3 (2.1) | 6.2 (2.2) | 6.3 (2) |
| Hooked on Nicotine Checklist score | 6.9 (2.4) | 6.9 (2.5) | 7 (2.3) |
| Penn State Cigarette | 13.4 (3.2) | 13.5 (3.3) | 13.3 (3.2) |
| Dependence Index score |  |  |  |
| Exhaled carbon monoxide ${ }^{\text {f }}$ | 31 (17) | 31 (16) | 32 (17) |
| Plasma Cotinine ( $\mathrm{ng} / \mathrm{ml})^{\text {s }}$ | 261 (148) | 260 (149) | 262 (149) |
| Median (Range) | 237 (11-797) | 238 (11-797) | 234 (26-779) |

Continuous measures reported as mean (standard deviation); Categorical measures reported as frequency (column percent)
BMI= body mass index; ETS= environmental tobacco smoke; HS= high school; GED= general education diploma; SD= standard deviation
${ }^{\text {a Measure incorporated from PhenX Toolkit }{ }^{37} \text { version October 5, } 2015 . . . . . ~}$
${ }^{\text {b }}$ Calculated as (V2 Weight (lbs.) x 703) / (V1 Height (in.)) ${ }^{2}$
cLess than a Bachelor's degree required for inclusion
${ }^{d}$ Total Family (Household) Income includes the participant's income + income of all family members living in the participant's household (before taxes for the last calendar year)
${ }^{e}$ Currently Working includes working full-time or part-time, military; Not Currently Working includes temporarily laid off, sick leave, maternity leave, looking for work, unemployed, retired, non-working disabled (permanently or temporarily), keeping house, non-working student
${ }^{f}$ Reflects the average of two CO measurements if $>1$ CO was collected at the visit for safety monitoring
gValues < Limit of Quantification ( $\mathrm{LOQ}=4.3$ ) were coded as $3(\mathrm{LOQ} / \mathrm{sqrt}(2)$ )

Table S2. Results of analyses comparing mCEQ subscales in RNC vs. UNC groups.

| No. of Visit | Visit 4 |  | Visit 5 |  | Visit 6 |  | Visit 7 |  | Visit 8 |  | Visit 9 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Nicotine Content | 7.4 mg |  | 3.3 mg |  | 1.4 mg |  | 0.7 mg |  | 0.2 mg |  | 0.2 mg |  |
|  | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ |
| Satisfaction ${ }^{1}$ | $\begin{gathered} 0.11 \\ (-0.23,0.46) \end{gathered}$ | 0.5214 | $\begin{gathered} 0.09 \\ (-0.7,0.44) \end{gathered}$ | 0.6304 | $\begin{gathered} -0.44 \\ (-0.8,-0.08) \end{gathered}$ | 0.0172 | $\begin{gathered} -0.4 \\ (-0.78,-0.03) \end{gathered}$ | 0.0356 | $\begin{gathered} -0.47 \\ (-0.86,-0.08) \end{gathered}$ | 0.0181 | $\begin{gathered} -0.62 \\ (-1.02,-0.22) \end{gathered}$ | 0.0026 |
| Psychological reward ${ }^{2}$ | $\begin{gathered} 0.07 \\ (-0.21,0.36) \end{gathered}$ | 0.6113 | $\begin{gathered} 0.06 \\ (-0.23,0.35) \end{gathered}$ | 0.6874 | $\begin{gathered} -0.26 \\ (-0.56,0.03) \end{gathered}$ | 0.0809 | $\begin{gathered} -0.02 \\ (-0.33,0.28) \end{gathered}$ | 0.8768 | $\begin{gathered} -0.24 \\ (-0.56,0.07) \end{gathered}$ | 0.1326 | $\begin{gathered} -0.39 \\ (-0.72,-0.06) \end{gathered}$ | 0.0192 |
| Aversion ${ }^{3}$ | $\begin{gathered} 0.03 \\ (-0.17,0.23) \end{gathered}$ | 0.7556 | $\begin{gathered} 0.03 \\ (-0.18,0.23) \end{gathered}$ | 0.7991 | $\begin{gathered} 0.02 \\ (-0.19,0.23) \end{gathered}$ | 0.8210 | $\begin{gathered} 0.1 \\ (-0.12,0.32) \end{gathered}$ | 0.3690 | $\begin{gathered} -0.05 \\ (-0.27,0.18) \end{gathered}$ | 0.6835 | $\begin{gathered} 0.01 \\ (-0.22,0.25) \end{gathered}$ | 0.9083 |
| Enjoyment of Respiratory Tract Sensations ${ }^{4}$ | $\begin{gathered} 0.07 \\ (-0.33,0.47) \end{gathered}$ | 0.7142 | $\begin{gathered} 0.14 \\ (-0.27,0.55) \end{gathered}$ | 0.4995 | $\begin{gathered} -0.21 \\ (-0.63,0.2) \end{gathered}$ | 0.3161 | $\begin{gathered} -0.44 \\ (-0.87,-0.003) \end{gathered}$ | 0.0486 | $\begin{gathered} 0.04 \\ (-0.41,0.49) \end{gathered}$ | 0.8528 | $\begin{gathered} -0.15 \\ (-0.61,0.31) \end{gathered}$ | 0.5261 |
| Craving reduction ${ }^{5}$ | $\begin{gathered} -0.2 \\ (-0.69,0.29) \end{gathered}$ | 0.4241 | $\begin{gathered} -0.16 \\ (-0.66,0.35) \end{gathered}$ | 0.5367 | $\begin{gathered} -0.71 \\ (-1.23,-0.19) \end{gathered}$ | 0.0072 | $\begin{gathered} -0.23 \\ (-0.77,0.31) \end{gathered}$ | 0.4021 | $\begin{gathered} -0.59 \\ (-1.14,-0.03) \end{gathered}$ | 0.0388 | $\begin{gathered} -0.19 \\ (-0.76,0.39) \end{gathered}$ | 0.5260 |

Note: Mean difference of RNC vs. UNC ( $95 \% \mathrm{CI}$ ). Bolded $p$ values indicate significance. Linear mixed-effect models adjusted for baseline (Visit 3) measure of the outcome, flavor, site, age group, education group, brand, gender, race, FTND score, cotinine, employment status. 1: mCEQ subscale 1; 2: mCEQ subscale $2 ; 3$ : mCEQ subscale $3 ; 4$ : mCEQ subscale 4;5: mCEQ subscale 5 . Unit for Nicotine Content: mg/cigarette.

Table S3. Results of analyses comparing CLS in RNC vs. UNC groups.

|  | Visit 4 |  | Visit 5 |  | Visit 6 |  | Visit 7 |  | Visit 8 |  | Visit 9 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean difference (95\% CI) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference ( $95 \% \mathrm{CI}$ ) | $p$ | Mean difference (95\% CI) | $p$ | Mean difference ( $95 \% \mathrm{CI}$ ) | $p$ | Mean difference ( $95 \% \mathrm{CI}$ ) | $p$ |
| CLS 1 | $\begin{gathered} \hline-0.61 \\ (-1.18,-0.03) \end{gathered}$ | 0.0386 | $\begin{gathered} \hline-0.76 \\ (-1.35,-0.17) \end{gathered}$ | 0.0114 | $\begin{gathered} \hline-1.35 \\ (-1.95,-0.75) \end{gathered}$ | <0.0001 | $\begin{gathered} \hline-0.88 \\ (-1.51,-0.26) \end{gathered}$ | 0.0055 | $\begin{gathered} \hline-1.19 \\ (-1.84,-0.55) \end{gathered}$ | 0.0003 | $\begin{gathered} \hline-1.29 \\ (-1.95,-0.62) \end{gathered}$ | 0.0002 |
| CLS 2 | $\begin{gathered} -0.21 \\ (-0.79,0.36) \end{gathered}$ | 0.4658 | $\begin{gathered} -0.68 \\ (-1.26,-0.09) \end{gathered}$ | 0.0235 | $\begin{gathered} -0.51 \\ (-1.11,0.09) \end{gathered}$ | 0.0935 | $\begin{gathered} -0.26 \\ (-0.88,0.36) \end{gathered}$ | 0.4080 | $\begin{gathered} -0.56 \\ (-1.2,0.08) \end{gathered}$ | 0.0863 | $\begin{gathered} -0.66 \\ (-1.32,0.004) \end{gathered}$ | 0.0516 |
| CLS 3 | $\begin{gathered} -0.03 \\ (-0.52,0.45) \end{gathered}$ | 0.9012 | $\begin{gathered} -0.34 \\ (-0.83,0.16) \end{gathered}$ | 0.1868 | $\begin{gathered} -0.16 \\ (-0.67,0.35) \end{gathered}$ | 0.5481 | $\begin{gathered} -0.17 \\ (-0.7,0.36) \end{gathered}$ | 0.5340 | $\begin{gathered} -0.27 \\ (-0.82,0.28) \end{gathered}$ | 0.3355 | $\begin{gathered} -0.35 \\ (-0.92,0.22) \end{gathered}$ | 0.2267 |
| CLS 4 | $\begin{gathered} -0.2 \\ (-0.82,0.41) \end{gathered}$ | 0.5187 | $\begin{gathered} -0.68 \\ (-1.31,-0.05) \end{gathered}$ | 0.0343 | $\begin{gathered} -0.58 \\ (-1.23,0.06) \end{gathered}$ | 0.0777 | $\begin{gathered} 0.14 \\ (-0.53,0.81) \end{gathered}$ | 0.6848 | $\begin{gathered} -0.74 \\ (-1.43,-0.04) \end{gathered}$ | 0.0371 | $\begin{gathered} -0.92 \\ (-1.63,-0.2) \end{gathered}$ | 0.0119 |
| CLS 5 | $\begin{gathered} -0.53 \\ (-1.09,0.02) \end{gathered}$ | 0.0593 | $\begin{gathered} -0.72 \\ (-1.29,-0.16) \end{gathered}$ | 0.0125 | $\begin{gathered} -1.39 \\ (-1.97,-0.81) \end{gathered}$ | <0.0001 | $\begin{gathered} -1.07 \\ (-1.67,-0.47) \end{gathered}$ | 0.0005 | $\begin{gathered} -0.99 \\ (-1.62,-0.37) \end{gathered}$ | 0.0018 | $\begin{gathered} -1.66 \\ (-2.3,-1.01) \end{gathered}$ | <0.0001 |
| CLS 6 | $\begin{gathered} -0.24 \\ (-0.82,0.35) \end{gathered}$ | 0.4326 | $\begin{gathered} -0.67 \\ (-1.27,-0.07) \end{gathered}$ | 0.0290 | $\begin{gathered} -1.3 \\ (-1.92,-0.68) \end{gathered}$ | <0.0001 | $\begin{gathered} -0.42 \\ (-1.06,0.22) \end{gathered}$ | 0.1938 | $\begin{gathered} -0.84 \\ (-1.5,-0.17) \end{gathered}$ | 0.0135 | $\begin{gathered} -1.42 \\ (-2.11,-0.74) \end{gathered}$ | <0.0001 |
| CLS 7 | $\begin{gathered} -0.13 \\ (-0.64,0.38) \end{gathered}$ | 0.6193 | $\begin{gathered} -0.19 \\ (-0.71,0.33) \end{gathered}$ | 0.4824 | $\begin{gathered} -0.78 \\ (-1.31,-0.25) \end{gathered}$ | 0.0042 | $\begin{gathered} -0.38 \\ (-0.93,0.17) \end{gathered}$ | 0.1763 | $\begin{gathered} -0.96 \\ (-1.54,-0.39) \end{gathered}$ | 0.0010 | $\begin{gathered} -0.81 \\ (-1.4,-0.22) \end{gathered}$ | 0.0069 |
| CLS 8 | $\begin{gathered} -0.23 \\ (-0.9,0.45) \end{gathered}$ | 0.5096 | $\begin{gathered} -0.45 \\ (-1.14,0.23) \end{gathered}$ | 0.1962 | $\begin{gathered} -0.95 \\ (-1.65,-0.25) \end{gathered}$ | 0.0082 | $\begin{gathered} -1.03 \\ (-1.76,-0.31) \end{gathered}$ | 0.0054 | $\begin{gathered} -1.21 \\ (-1.97,-0.46) \end{gathered}$ | 0.0016 | $\begin{gathered} -1.48 \\ (-2.25,-0.7) \end{gathered}$ | 0.0002 |
| CLS 9 | $\begin{gathered} -0.19 \\ (-0.44,0.06) \end{gathered}$ | 0.1305 | $\begin{gathered} -0.25 \\ (-0.51,0.005) \end{gathered}$ | 0.0545 | $\begin{gathered} -0.55 \\ (-0.81,-0.28) \end{gathered}$ | <0.0001 | $\begin{gathered} -0.37 \\ (-0.64,-0.1) \end{gathered}$ | 0.0080 | $\begin{gathered} -0.7 \\ (-0.98,-0.42) \end{gathered}$ | <0.0001 | $\begin{gathered} -0.71 \\ (-1,-0.42) \end{gathered}$ | <0.0001 |
| CLS 10 | $\begin{gathered} -0.03 \\ (-0.28,0.22) \\ \hline \end{gathered}$ | 0.8300 | $\begin{gathered} -0.12 \\ (-0.38,0.14) \\ \hline \end{gathered}$ | 0.3574 | $\begin{gathered} -0.33 \\ (-0.6,-0.07) \\ \hline \end{gathered}$ | 0.0130 | $\begin{gathered} -0.26 \\ (-0.53,0.01) \\ \hline \end{gathered}$ | 0.0621 | $\begin{gathered} -0.42 \\ (-0.71,-0.14) \\ \hline \end{gathered}$ | 0.0033 | $\begin{gathered} -0.42 \\ (-0.71,-0.12) \\ \hline \end{gathered}$ | 0.0054 |

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[^0]:    Note: Mean difference of RNC vs. UNC ( $95 \% \mathrm{CI}$ ). Bolded $p$ values indicate significance. Linear mixed-effects models adjusted for baseline (visit 3 ) measure of the outcome, flavor, site, age group, education group, brand, sex, race, FTCD score, cotinine, and employment status. CLS items: CLS item 1 : How strong was the cigarette? ( $1=$ not at all, $10=$ extremely $)$; CLS item 2: How hot was the cigarette? $(1=$ not at all, $10=$ extremely $)$; CLS item 3 : How hard was it to draw? $(1=$ not at all, $10=$ extremely); CLS item 4: How harsh was the cigarette? $(1=$ not at all, $10=$ extremely $)$; CLS item 5 : How much taste did you get from the cigarette? $(1=$ not at all, $10=$ extremely); CLS item 6 : How satisfying was the cigarette? $(1=$ not at all, $10=$ extremely $)$; CLS item 7 : How much tobacco vs. 'just air' did you get from the cigarette? $(1=$ just air, $10=$ just tobacco $)$; CLS item 8: What is the likelihood that you would buy cigarettes like these? $(1=$ not at all, $10=$ extremely $)$; CLS item 9 : How much nicotine do you think these cigarettes gave you compared to your usual cigarettes? $(1=$ much less, $5=$ much more $)$; CLS item 10 : How satisfying was the hit these cigarettes gave you compared to your usual cigarettes? ( $1=$ much less, $5=$ much more) .

