The influences of parent, sibling and friend behaviors on smoking initiation, regular smoking and nicotine dependence

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The Influences of Parent, Sibling and Friend Behaviors on Smoking Initiation, Regular Smoking and Nicotine Dependence

Hong Xian, Jeffrey F. Scherrer, Hui Pan, Theodore Jacob, Kathleen K. Bucholz
Cigarette smoking is the leading cause of cancer mortality in the United States
  - Accounts for 30% of all cancer deaths

Adolescents and young adults continue to start smoking and develop nicotine dependence (ND)
  - Daily 4,000 children between 12-17 try cigarettes
  - 22% of high school students are regular smokers and over half of smokers in their 20s are nicotine dependent in the United States
Genetic and environmental factors contribute to smoking initiation, regular smoking and ND

- Genetic factors account for 46-84% of risk for initiation, 58-74% of the risk for regular smoking and between 33-70% of the risk of ND
Parents, siblings and friends influence smoking in young adults

- Increased smoking shown to be associated with:
  - Greater parent-child conflict
  - Lower levels of attachment
  - Inconsistent parenting
  - Older sibling substance use
  - Friend and peer smoking
OBJECTIVE

- Examine associations between parent, sibling and peer level variables and offspring smoking initiation, regular smoking, and ND in an offspring-of-twins design that accounts for familial vulnerability
METHODS

Sample and Data Derived from Twins as Parents (TAP) and Children of Alcoholics (COA) studies (1999-present):

- **Fathers**
  - 1,107 twin fathers sampled from the Vietnam Era Twin Registry
  - Twin pairs either concordant or discordant for alcohol dependence (AD) (COA) or illicit drug dependence (DD) (TAP). Controls were non-AD or DD twin pairs

- **Mothers**
  - 1,023 biological and/or rearing mothers

- **Offspring**
  - 1,919 offspring between 12-32 years of age
Outcome Measures

- Smoking initiation: ever tried cigarettes
- Regular smoking: 21 cigarettes per day, smoking 3 or more times per week for a minimum of 3 weeks
- Fagerstrom Test for Nicotine Dependence (FTND)
Predictor Variables

- Parents Report:
  - Twin ND 4 group design variable
  - Twin DD-AD 7 group design variable
  - Maternal and paternal substance use history
Predictor Variables (cont.)

- Offspring report:
  - Mother-child / father-child closeness
  - Mother / father strictness
  - Mother / father consistency
  - Mother / father school pressure
  - Sibling alcohol and drug use
  - Friend smoking, alcohol and drug use
  - School smoking, alcohol and drug use
  - Sociodemographics
<table>
<thead>
<tr>
<th>Group 1: Monozygotic (MZ) and Dizygotic (DZ) twins with ND:</th>
<th>High genetic-high environmental risk (HG-HE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 2: Non-ND MZ twins with ND co-twins:</td>
<td>High genetic-low environmental risk (HG-LE)</td>
</tr>
<tr>
<td>Group 3: Non-ND DZ twins with ND co-twins:</td>
<td>Medium genetic-low environmental risk (MG-HE)</td>
</tr>
<tr>
<td>Group 1: non-ND MZ and DZ twins:</td>
<td>Low genetic-low environmental risk (LG-LE)</td>
</tr>
<tr>
<td>Group 1: MZ and DZ twins with DD and with / without AD</td>
<td>Group 2: Non-DD twins with a MZ DD co-twin with / without AD</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Group 3: Non-DD twins with a DZ DD co-twin with / without AD</td>
<td>Group 4: MZ and DZ twins with AD only</td>
</tr>
<tr>
<td>Group 5: Non-AD twins with a MZ AD co-twin</td>
<td>Group 6: Non-AD twins with a DZ AD co-twins</td>
</tr>
<tr>
<td>Group 7: non-DD and non-AD MZ and DZ twins</td>
<td></td>
</tr>
</tbody>
</table>
Analytic Approach

- Univariate multinomial logistic regression
- Multivariate multinomial logistic regression of significant univariate variables
- All analyses adjusted for sampling bias
- SAS surveylogistic used to account for clustered family data when computing 95% confidence intervals
### RESULTS

Table 1. Sociodemographics (n=1,919)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (range)</td>
<td>21.4 (12 – 32)</td>
</tr>
<tr>
<td>Gender: female</td>
<td>51%</td>
</tr>
<tr>
<td>Father’s race</td>
<td>93.5% White</td>
</tr>
<tr>
<td>Parents’ education:</td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>64% ≥ h.s.</td>
</tr>
<tr>
<td>Mother</td>
<td>63% ≥ h.s.</td>
</tr>
<tr>
<td>Smoking Variable</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Never tried cigarettes</td>
<td>32.7%</td>
</tr>
<tr>
<td>Ever tried cigarettes</td>
<td>34.8%</td>
</tr>
<tr>
<td>Regular smoker</td>
<td>16.2%</td>
</tr>
<tr>
<td>FTND</td>
<td>16.4%</td>
</tr>
</tbody>
</table>
Table 3. Multinomial logistic regression modeling results showing association [Odds Ratios] between parent, sibling and peer behaviors and offspring smoking outcomes.

<table>
<thead>
<tr>
<th>Predictive Variable</th>
<th>Offspring smoking outcome variable</th>
<th>Ever Smoked</th>
<th>Regular smoker</th>
<th>FTND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MZ &amp; DZ twins w/ DD &amp; w/w.o AD</td>
<td></td>
<td>1.036</td>
<td>1.207</td>
<td>1.125</td>
</tr>
<tr>
<td>2. non-DD twins w/ MZ DD cotwin w/w.o AD</td>
<td></td>
<td>1.064</td>
<td>1.398</td>
<td>1.668</td>
</tr>
<tr>
<td>3. non-DD twins w/ DZ DD cotwin w/w.o AD</td>
<td></td>
<td>0.756</td>
<td>1.433</td>
<td>0.790</td>
</tr>
<tr>
<td>4. MZ &amp; DZ twins w/ AD only</td>
<td></td>
<td>1.366</td>
<td>1.041</td>
<td>1.477</td>
</tr>
<tr>
<td>5. non-AD twins w/ MZ AD cotwin</td>
<td></td>
<td>1.254</td>
<td>1.298</td>
<td>1.317</td>
</tr>
<tr>
<td>6. non-AD twins w/ DZ AD cotwin</td>
<td></td>
<td>1.645</td>
<td>1.262</td>
<td>1.560</td>
</tr>
<tr>
<td>7. non-DD &amp; AD twins w/ non-DD &amp; AD cotwins</td>
<td></td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Predictive Variable</td>
<td>Offspring smoking outcome variable</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
<td></td>
</tr>
<tr>
<td>Paternal ND 4-group:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ND Group1 (HG-HE)</td>
<td>0.810</td>
<td>1.077</td>
<td>2.095</td>
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<tr>
<td>ND Group2 (HG-LE)</td>
<td>0.629</td>
<td>1.073</td>
<td>1.449</td>
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<tr>
<td>ND Group3 (MG-LE)</td>
<td>0.667</td>
<td>0.879</td>
<td>1.037</td>
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<tr>
<td>ND Group4 (LG-LE)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Maternal heavy smoking index (HSI):</td>
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<td></td>
<td></td>
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<tr>
<td>Non-smoker</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Low HSI</td>
<td>1.198</td>
<td>1.696</td>
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<tr>
<td>High HIS</td>
<td>1.094</td>
<td>1.185</td>
<td>1.690</td>
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<td>Predictive Variable</td>
<td>Offspring smoking outcome variable</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
</tr>
<tr>
<td>Mom problem drinking</td>
<td></td>
<td>1.253</td>
<td>1.864</td>
<td>2.490</td>
</tr>
<tr>
<td>Dad problem drinking</td>
<td></td>
<td>1.194</td>
<td>1.152</td>
<td>1.235</td>
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<tr>
<td>Mom strictness: less strict</td>
<td></td>
<td>0.757</td>
<td>1.174</td>
<td>0.877</td>
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<tr>
<td></td>
<td>average</td>
<td>1.0</td>
<td>1.00</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>more strict</td>
<td>0.839</td>
<td>0.760</td>
<td>0.944</td>
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<tr>
<td>Dad strictness: less strict</td>
<td></td>
<td>1.050</td>
<td>0.834</td>
<td>0.913</td>
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<tr>
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<td>average</td>
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<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>more strict</td>
<td><strong>1.410</strong></td>
<td><strong>1.499</strong></td>
<td><strong>1.053</strong></td>
</tr>
<tr>
<td>Mom not consistent</td>
<td></td>
<td>1.108</td>
<td>1.395</td>
<td>1.648</td>
</tr>
<tr>
<td>Dad not consistent</td>
<td></td>
<td>1.533</td>
<td>1.166</td>
<td>1.368</td>
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<tr>
<td>Predictive Variable</td>
<td>Offspring smoking outcome variable</td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Mom closeness: very close</td>
<td>1.260</td>
<td>1.380</td>
<td>1.435</td>
</tr>
<tr>
<td></td>
<td>some what close</td>
<td>1.199</td>
<td>1.566</td>
<td>0.952</td>
</tr>
<tr>
<td></td>
<td>not close</td>
<td>1.0</td>
<td>1.380</td>
<td>1.566</td>
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<tr>
<td></td>
<td>DAD closeness: very close</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>some what close</td>
<td>1.075</td>
<td>1.112</td>
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</tr>
<tr>
<td></td>
<td>not close</td>
<td>0.953</td>
<td>1.718</td>
<td>1.586</td>
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<tr>
<td></td>
<td>Mom school pressure: a lot</td>
<td>1.295</td>
<td>0.946</td>
<td>0.967</td>
</tr>
<tr>
<td></td>
<td>some</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>a little</td>
<td>0.819</td>
<td>0.479</td>
<td>1.200</td>
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<tr>
<td></td>
<td>none</td>
<td>1.177</td>
<td>1.406</td>
<td>1.398</td>
</tr>
<tr>
<td></td>
<td>Dad school pressure: a lot</td>
<td>0.951</td>
<td>0.875</td>
<td>0.892</td>
</tr>
<tr>
<td></td>
<td>some</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>a little</td>
<td>1.113</td>
<td>0.818</td>
<td>0.567</td>
</tr>
<tr>
<td></td>
<td>none</td>
<td>0.357</td>
<td>0.146</td>
<td>0.187</td>
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</table>
## Table 3 Continued.

<table>
<thead>
<tr>
<th>Predictive Variable</th>
<th>Offspring smoking outcome variable</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
</tr>
<tr>
<td>Sib drug use: no any drug</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>mj only</td>
<td></td>
<td>2.106</td>
<td>2.866</td>
<td>1.807</td>
</tr>
<tr>
<td>mj + other drg / other drg</td>
<td></td>
<td>1.576</td>
<td>2.869</td>
<td>2.087</td>
</tr>
<tr>
<td># Friends smoked: none</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>a few</td>
<td></td>
<td>1.589</td>
<td>2.485</td>
<td>4.516</td>
</tr>
<tr>
<td>a quarter or more</td>
<td></td>
<td>2.178</td>
<td>7.730</td>
<td>22.397</td>
</tr>
<tr>
<td># Friends drank alc: none</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<tr>
<td>a few</td>
<td></td>
<td>1.780</td>
<td>1.687</td>
<td>0.738</td>
</tr>
<tr>
<td>a quarter or more</td>
<td></td>
<td>2.075</td>
<td>1.199</td>
<td>0.855</td>
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<tr>
<td>Predictive Variable</td>
<td>Offspring smoking outcome variable</td>
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<tr>
<td>----------------------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td></td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td># Friends used drug: none</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>a few</td>
<td>1.818</td>
<td>3.008</td>
<td>2.308</td>
<td></td>
</tr>
<tr>
<td>a quarter or more</td>
<td>1.774</td>
<td>3.872</td>
<td>2.795</td>
<td></td>
</tr>
<tr>
<td># Students smoked: none or few</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>a quarter to half</td>
<td>1.078</td>
<td>1.179</td>
<td>1.203</td>
<td></td>
</tr>
<tr>
<td>a half or more</td>
<td>1.322</td>
<td>1.179</td>
<td>1.654</td>
<td></td>
</tr>
<tr>
<td># Students drank alc: none or few</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>a quarter to half</td>
<td>1.096</td>
<td>1.465</td>
<td>0.950</td>
<td></td>
</tr>
<tr>
<td>a half or more</td>
<td>1.121</td>
<td>1.920</td>
<td>1.250</td>
<td></td>
</tr>
<tr>
<td># Students used drug: none or few</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>a quarter to half</td>
<td>1.17</td>
<td>0.766</td>
<td>0.986</td>
<td></td>
</tr>
<tr>
<td>a half or more</td>
<td>1.261</td>
<td>1.261</td>
<td>1.503</td>
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</tr>
</tbody>
</table>
### Table 3 Continued.

<table>
<thead>
<tr>
<th>Predictive Variable</th>
<th>Offspring smoking outcome variable</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ever Smoked</td>
<td>Regular Smoker</td>
<td>FTND</td>
</tr>
<tr>
<td>Kid age</td>
<td></td>
<td>1.112</td>
<td>1.173</td>
<td>1.224</td>
</tr>
<tr>
<td>Dad’s race: non-white</td>
<td></td>
<td>1.923</td>
<td>3.343</td>
<td>1.987</td>
</tr>
<tr>
<td>Mom edu: &lt; high sch</td>
<td></td>
<td>1.128</td>
<td>0.732</td>
<td>1.151</td>
</tr>
<tr>
<td>Dad not married</td>
<td></td>
<td>1.354</td>
<td>1.127</td>
<td>2.091</td>
</tr>
</tbody>
</table>
CONCLUSIONS

- Genetic vulnerability and exposure to a family smoking environment contributes to FTND:
  - Paternal ND is significantly associated with offspring being FTND.
  - Maternal heaviness of smoking associated with offspring FTND.

- Family environmental factors contribute to offspring smoking:
  - Parental divorce associated with offspring FTND
  - Sibling and friends’ substance use have robust impacts on smoking behaviors.
CONCLUSIONS (Cont.)

- Parenting and parent-offspring relationship is a weak predictor of smoking after accounting for genetic risk, sibling and peer influences.

- Public health efforts to prevent initiation and progression of smoking should target peer smoking.
STRENGTHS and LIMITATIONS

● Strengths:
  - Offspring-of-twins design
  - Non-clinical sample and structured method of data collection
  - Offspring age range

● Limitations:
  - Retrospective self-report
  - Limited variation in race
  - Sample size
ACKNOWLEDGMENTS

- Funding provided by:
  - NIDA: DA020810, DA18660, DA14363, DA18267 and DA019951
  - NIAAA: AA11667, AA11822, AA007580, and AA11998
- Special thanks to the members of the VET Registry and their families