The Relationship Between Secondhand Tobacco Smoke (SHS) Exposure and Smoking Behaviours: Designing a Program of Research

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Available at: https://works.bepress.com/chizimuzo_okoli/100/
The relationship between secondhand tobacco smoke (SHS) exposure and smoking behaviours: Designing a program of research

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Acknowledgements

Chang Gung Institute of Technology

Formosa Plastics Group
Purpose

To explore the effects of secondhand tobacco smoke (SHS) exposure on smoking behaviour by:

A. Assessing its impact on nicotine dependence among smokers
B. Examining its relationship to smoking initiation among nonsmokers
Overview

- Background and Significance
- Study 1: Literature Review Study
- Study 2: SHS Exposure, Nicotine Dependence, and Smoking Cessation
- Study 3: Hair Nicotine as a Measure of SHS Exposure
- Study 4: Effects of Nicotine Exposure from SHS Among Bar and Restaurant Workers
- Study 5: Nicotine Dependence Symptoms among Young Never-Smokers Exposed to SHS
- Study 6: An Examination of the Relationship between Adolescents’ Initial Smoking Experience and their Exposure to Peer and Family Member Smoking
- Conclusions and Future Directions
Background and Significance

He has his daddy's eyes and his momma's lungs.

Secondhand Smoke Kills.
Background

- Composed of both side-stream and mainstream smoke (NCI, 1999)
- Over 4000 chemicals in tobacco smoke (NCI, 1999)
Significance

- Widespread source of indoor air pollution
- Sensory irritation and respiratory discomfort
- Cardiovascular disease, lung and other cancers, and respiratory illness
- Passive nicotine exposure
Diseases Caused by Smoking and SHS exposure

Cancers
- Lung, Lip, Oral cavity/pharynx, Larynx, trachea
- Urinary bladder
- Colon
- Pancreas
- Liver
- Kidney, other urinary

Cardiovascular disease
- Ischemic heart disease
- Cerebrovascular disease
- Rheumatic heart disease
- Atherosclerosis
- Hypertension
- Aortic aneurysm
- Pulmonary heart disease
- Other arterial disease

Respiratory disease
- Chronic airways obstruction
- Asthma
- Bronchitis/emphysema
- Pneumonia/influenza
- Respiratory tuberculosis

Paediatric disease
- Low birth weight
- Respiratory conditions-newborn
- Respiratory distress syndrome
- Sudden Infant Death Syndrome

Reproductive Problems
- Reduced fertility
- Spontaneous Abortion
- Placental abruption

Physiologic effects of nicotine exposure

- Increased heart rate
- Constricts blood vessels
- Increased alertness
- Nausea
- Dizziness

Nicotine, \( \text{C}_{10}\text{H}_{14}\text{N}_2 \)
SHS Exposure and Behaviour

Smoking Behaviours

“nicotine is the drug in tobacco primarily responsible for addiction, and that the pharmacologic and behavioral processes underlying tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine” (US Surgeon General’s Report, 1988)

Mental Health

Long-term cognitive deficits related to learning, memory, and academic ability

## Animal studies

<table>
<thead>
<tr>
<th>Studies</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mousa, Aloyo, Van Loon. 1988</strong></td>
<td>Exposure to cigarette smoke (43 weeks) produces analgesia in rats</td>
</tr>
<tr>
<td><strong>Anderson, Pinkerton, Uyeminami, et al. 2004</strong></td>
<td>Chronic exposure (4 weeks) to cigarette smoke produces analgesia in rats</td>
</tr>
<tr>
<td><strong>Simons, Cuellar Moore, et al., 2005</strong></td>
<td>Analgesia produced by chronic exposure is mediated through nicotinic and opioid receptors in rats</td>
</tr>
</tbody>
</table>
Preadolescent tobacco smoke exposure leads to acute nicotine dependence but does not affect the rewarding effects of nicotine or nicotine withdrawal in adulthood in rats

Hidetaka Yamada a, Mahendra Bishnoi a, Kim F.M. Keijzers a, Irma A. van Tuijl a, Elysia Small a, Hina P. Shah a, Rayna M. Bauzo a, Firas H. Kobeissy b, Sreedharan N. Sabarinath b, Hartmut Derendorf b, Adrie W. Bruijnzeel a,∗

a Department of Psychiatry, College of Medicine, McKnight Brain Institute, University of Florida, 100 S. Newell Dr, PO Box 100256, Gainesville, FL 32610, USA
b Department of Pharmaceutics, College of Pharmacy, University of Florida, 1600 SW Archer Rd., Gainesville, FL 32610, USA
Epidemiological studies

Ukraine (n= 609), age:15-29yrs
• Lower age of smoking initiation
• Earlier age of daily smoking

African-Americans (n= 388), adults
• Current Tobacco use

Australia (n= 3434), youth
• Dose response relationship with daily smoking
(Darling, et al, 2007. A&NZJPH, 27, 6, 655)

Mediterranean (n= 1059), adults
• Current smoking

Sweden (n= 496), adults
• Poor smoking cessation outcomes

Canada (n= 191), age 5-12 yrs
• Nicotine from SHS exposure related to smoking in adolescence
Pathways between SHS and Smoking Behaviour

Behavioural Modeling
- Exposure to environmental smoking from peers, family, e.t.c.

Smoking initiation/Maintenance

Environmental Smoking Cues
- Exposure to olfactory/visual cues

Nicotine Exposure
- Neural sensitization
Study 1: Secondhand Smoke and Nicotine Exposure: A brief review

Key Hypothesis

1) Can environments of SHS provide sufficient levels of exposure to nicotine as found in active smoking

2) Is nicotine from passive smoking among nonsmokers absorbed in sufficient quantities known to have euphorant effects among active smokers
Selection of Studies

Key words
• Secondhand smoke exposure
• Environmental tobacco smoke exposure

Databases

Inclusion Criteria
• From 1995-2004
• English Language
• Non-animal studies
• Includes a biomarker of exposure and/or air monitor and/or self-report

22 Studies retrieved

19 Self-report
13 Air monitors
18 Biomarkers
HYPOTHESIS 1:

## HYPOTHESIS 2:

**Associations** | **Mean serum nicotine**
--- | ---
Self reported SHS exposure in hours *(Pacifi el al, 1995)* | 5.9±5.6 ng/ml

**Nicotine discrimination** *(Perkins, et al., 2001)* | 2.6 ng/ml (for smokers)  
1.6 ng/ml (for nonsmokers)

**Reports of euphoria among deprived smokers** *(Pomerleau, C, & Pomerleau, O., 1992)*. | 4.5±1.0 ng/ml
Summary of Findings

- **Hypothesis 1 supported**: Nonsmoking bar and restaurant workers can absorb levels of nicotine from SHS exposure comparable to that of active smoking.

- **Hypothesis 2 supported**: Nonsmokers can absorb levels of nicotine from SHS exposure at levels known to have euphorant effects among smokers.

- **Implications**:
  - Nicotine exposure from SHS may increase risk for smoking behaviour among smokers and nonsmokers.
  - Nonsmokers exposed to SHS may have similar health risks as smokers.
Study 2:

Secondhand Tobacco Smoke Exposure, Nicotine Dependence, and Smoking Cessation

Specific Aims

a) Determine the association between self-reported SHS exposure, intentions and attempts to quit smoking, and nicotine dependence among smokers

b) Assess the extent to which SHS exposure predicts nicotine dependence, controlling for demographic variables, cigarettes smoked per day, and attempt to quit
Methods

- **Design:**
  - Cross-sectional analysis

- **Sample Selection**
  - Baseline data from the 2001 Quit and Win Tobacco Free Contest (Kentucky, USA)
  - Current smoker who had smoked *cigarettes* within the past 30 days
  - $N = 822$ adults
Measures

Independent Variable

- SHS exposure
  - None, Either home or car, Both home and car (Range: 0-2)

Dependent Variable

- Readiness to Quit
  - Attempt to quit, Intention to quit (Yes/No)

- Nicotine Dependence
  - Fagerstrom Tolerance Questionnaire (FTQ, Range: 0-8)
Sample Description

- Mean FTQ score = 5.01 (SD = 1.92)

- Female: 66%
- Caucasian/White: 89%
- High school diploma: 83%
- Earn below $25,000 (U.S.): 59%
Intentions and attempts to quit by SHS exposure sources (N = 822)

Note. All differences between groups are significant at p < .05
## Results of regression analysis of variables* associated with FTQ scores (n = 712, Adjusted $R^2=0.45$)

<table>
<thead>
<tr>
<th></th>
<th>B (Unstandardized Coefficient)</th>
<th>Beta (Standardized Coefficient)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cigarettes smoked per day</td>
<td>.55</td>
<td>.59</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Age of initial cigarette use</td>
<td>-.36</td>
<td>-.10</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Length of abstinence (On last quit attempt)</td>
<td>-.14</td>
<td>-.10</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Number of sources of exposure (none, one, or both)</td>
<td>.28</td>
<td>.11</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

*Only significant associations are shown. Demographic (Age, education, gender) and control variables (treatment vs control group, successful quit for 24 hrs in past year) were non-significant variables in the final model.
Discussion

- Positive association between self-reported SHS exposure, attempts and intentions to quit, and nicotine dependence

- **SHS is an independent predictor of nicotine dependence**

- **Limitations:**
  - Cross-sectional study (no causality can be inferred)
  - No objective marker of SHS (i.e. air nicotine monitor)
  - SHS assessed only in home and car environments
  - Could not account for SHS from oneself
  - FTQ as a measure of dependence
SHS at home only, and in both current home environment and other settings was associated* with clinically-defined nicotine dependence ** (OR = 2.25; 95% CI 1.05, 4.86 vs. OR = 2.31; 95% CI 1.03, 5.18), respectively

*after adjustment for age, gender, education, income, employment status, current alcohol consumption, history of marijuana use, and number of cigarettes smoked per day

** based on the DSM-IV criteria for nicotine dependence
Study 3:

Measuring tobacco smoke exposure among smoking and nonsmoking bar and restaurant workers.

To evaluate the concurrent (predictive) validity of hair nicotine as a biomarker for SHS exposure among a sample of bar and restaurant workers

- Hypothesis: The greater the number of sources of secondhand smoke exposure, the higher the hair nicotine level will be among nonsmokers.
Biomarker of SHS Exposure

A good marker for SHS should:

- be unique to tobacco smoke
- be present in sufficient quantities to permit its detection at low smoking rates
- be emitted at similar rates from all cigarette brands
- should maintain a constant SHS ratio for a wide range of cigarette brands and environmental conditions
# Ways to Measure Exposure to Tobacco Smoke

<table>
<thead>
<tr>
<th>Measures</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Report</td>
<td>- non-invasive</td>
<td>- subjective measure</td>
<td>- multiple time periods (acute and chronic)</td>
</tr>
<tr>
<td></td>
<td>- inexpensive</td>
<td>- recall-bias</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- history of exposure for any time period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expired CO</td>
<td>- objective measure</td>
<td>- Risks for false positive results</td>
<td>~8hrs</td>
</tr>
<tr>
<td></td>
<td>- non-invasive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- inexpensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- quick results</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Ways to Measure Exposure to Tobacco Smoke

<table>
<thead>
<tr>
<th>Measures</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Half-life</th>
</tr>
</thead>
</table>
| Cotinine | -objective measure  
- relatively inexpensive  
- chronic & low level exposure  
- high specificity/sensitivity  
- multiple sources | - inter individual variability for cotinine excretion for similar exposure | 19-40hrs (urine)  
8hrs (Saliva) |
| Nicotine | -objective measure  
- relatively inexpensive  
- chronic & low level exposure  
- high specificity/sensitivity  
- multiple sources | - inter individual variability for nicotine excretion for similar exposure | 1 month (hair)  
4 hrs (blood) |
Nicotine in the Hair

- Reaches the hair through the lungs (not from the outside of the hair)
- Binds to melanocytes in the hair follicle
- Gets trapped in the medulla of the hair shaft
Underlying Assumptions

- Hair grows about 1 cm. per month
- Scalp hair grows more quickly than hair in other locations
- Back of scalp has most uniform growth patterns
- Rate of hair growth may be affected by race, sex, and age
Effect of Cosmetic Treatments on the Hair Nicotine Analysis

- Peroxide or strong hair dyes can cause leakage of nicotine
- Permanents and straighteners may cause even more leakage than dyes
Challenges to Using Hair as a Biomarker

- Irregular hair growth, individual differences
- Cultural views toward hair
- Worry about other drug detection
- Short hair or baldness
- May not get enough hair (need 50-100 mg)
- Can not distinguish between active and passive smoking in the same individual
Analysis Issues

- Adjust for number of cigarettes smoked/day (smoking patterns of both parents and others in the home)
- Adjust for number and types of exposure sources (smoking from home, car, school, work)
- Log-transformation of the nicotine values to adjust for low values and skewed distributions
Getting Started

• Assure the participant that you will be careful not to disfigure their hair

• Ask them to hold up their hair in the back of the scalp.
Don’t Let Go of the Hair Sample!

- Locate 1-2 centimeters of hair (about 10 strands)
- Twist the hair
- Cut as close as possible to the scalp!
- Place hair sample (cut end first) in small brown envelope
- Seal with TAPE
What if the Hair is Short?

- Take two small samples, one from each side of the back of the scalp.
- If the hair is very long, hold end and curl long hair around your finger.
How Much is Enough?

- The amount depends in part on the thickness of the hair, but be sure to get enough hair (about 10 strands).
Validation Study

- **Design:**
  - Cross-sectional analysis

- **Sample:**
  - 207 adult bar and restaurant workers from Lexington (KY), Owensboro (KY), and Morgantown (WV)

- **Main Measures:**
  - Hair Nicotine (ng/mg)
  - SHS exposure (self-reported number of sources of exposure, Range: 0-5)
Sample Description

- Mean age: 26.2 (SD = 8.9) yrs
- Work tenure: 28.5 (SD = 38.5) months

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>62%</td>
</tr>
<tr>
<td>Caucasian/White</td>
<td>90%</td>
</tr>
<tr>
<td>Some college</td>
<td>84%</td>
</tr>
<tr>
<td>Restaurant workers</td>
<td>86%</td>
</tr>
<tr>
<td>Never married</td>
<td>66%</td>
</tr>
<tr>
<td>Nonsmokers</td>
<td>38%</td>
</tr>
</tbody>
</table>
Differences in hair nicotine levels between nonsmokers and smokers (N = 205)

Note. 1. Hair nicotine levels are the geometric means (antilogarithm) of log-transformed hair nicotine values
2. Independent sample t-test: (p < .0001)
Figure 2. Hair Nicotine Levels of Nonsmokers by Number of Sources of Exposure (n = 125)

- None (n = 4): 0.63 ng/mg
- One (n = 47): 1.18 ng/mg
- Two (n = 52): 1.32 ng/mg
- Three or more (n = 22): 1.96 ng/mg

$r = .21, p = .018$
Discussion

- **Predictive Validity:**
  - Positive association between hair nicotine and increasing number of SHS exposure sources among nonsmokers

- **Limitations**
  - Homogenous Sample
  - No secondary objective marker (i.e., passive nicotine monitor, urine cotinine)
Hair analysis of nicotine and cotinine for evaluating tobacco smoke exposure by liquid chromatography–mass spectrometry

Thaneeya Chetiyasukornkul, Akira Toriba*, Ryoichi Kizu, Kazuko Kimura and Kazuichi Hayakawa

Graduate School of Natural Science and Technology, Kanazawa University, Kakuma-machi, Kanazawa, Ishikawa 920-1192, Japan
Study 4:

Behavioral effects of nicotine exposure from secondhand tobacco smoke among bar and restaurant workers.

Specific Aim

Assess the relationship between nicotine exposure from SHS and behavioral outcomes among nonsmokers.
Methods

- **Design:**
  - Cross-sectional analysis

- **Sample Selection**
  - Inclusion criteria
    - a) 18 years of age or older, b) worked in current establishment for at least 30 days, c) and worked at least 10 hrs per week.
  - Recruitment
    - Convenience sample from randomly selected establishments in Lexington, KY

- \( N = 105 \)
Measures

Independent Variable

- Hair Nicotine (ng/ml)
- SHS exposure (number of sources of exposure)

Dependent Variable

- Adapted items from the DSM-IV criteria for nicotine withdrawal
Sample Description

- Mean age: 26.0 (SD = 7.9) yrs
- Work tenure: 27.0 (SD = 30.1) months
Differences in hair nicotine by DSM-IV nicotine withdrawal symptoms among nonsmokers ($n = 62$)

Note. 1. Hair nicotine levels are the geometric means (antilogarithms) of log-transformed hair nicotine values.
2. Independent sample t-tests used.
Predictors of four or more DSM-IV nicotine withdrawal symptoms among nonsmokers (n = 62)

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Std err</th>
<th>Wald $\chi^2$</th>
<th>Odds Ratio</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.27</td>
<td>.77</td>
<td>0.12</td>
<td>0.76</td>
<td>.725</td>
</tr>
<tr>
<td>Hair Nicotine</td>
<td>.80</td>
<td>.34</td>
<td>5.52</td>
<td>2.22</td>
<td>.019</td>
</tr>
<tr>
<td>Number of SHS Exposure Sources</td>
<td>-0.10</td>
<td>.43</td>
<td>2.65</td>
<td>0.50</td>
<td>.103</td>
</tr>
</tbody>
</table>
Discussion

- Hair nicotine
- DSM-IV nicotine withdrawal symptoms among nonsmokers

Limitations

- Homogenous sample
- Cross-sectional study (no causality can be inferred)
- Lack of measures of standardized measures of behavioural symptoms among nonsmokers
Study 5

Nicotine dependence symptoms among young never-smokers exposed to secondhand tobacco smoke

Specific Aims

To examine the relationship between SHS exposure and nicotine dependence symptoms among young never smokers
Methods

- **Design:**
  - Cross-sectional analysis

- **Sample description**
  - a) 10-12 years of age
  - Stratified random sample of 40 schools in Quebec, Canada

- \( N = 1488 \) children
Measures

Independent Variable

- SHS exposure
  - In the home (number of persons who smoke in the home, Range: 1-5)
  - In the car (number of days in past 7 days in exposed to smoking in the car, Range: 1-7)

Dependent Variable

- 7 symptoms derived from standardized nicotine dependence scales:
  1. craving
  2. Physical addiction
  3. Mental addiction
  4. feel like you really need a cigarette
  5. Difficult to not smoke in places it is not allowed
  6. Ease of not smoking when observing other kids smoking
  7. loss of control over smoking

- Dichotomized (0 symptoms vs. 1+ symptoms)
Sample Description

- Female (56.0%)
- Mean age: 10.7 (SD = 0.5) yrs
- 4.6% reported one or more nicotine dependence symptoms
Differences in SHS exposure between youth with and without nicotine dependence symptoms (n = 1488)
Differences in SHS exposure between youth with and without nicotine dependence symptoms (n = 1488)

- Days exposed in the car
  - 0 days: 77.5%
  - 1-4 days: 68.1%
  - 5-7 days: 13.1%
  - 0-4 days: 18.9%

Legend:
- Yellow: None
- Green: >1
Multivariate Association between nicotine dependence symptoms (0 vs. >1) and SHS exposure in the home and car (N = 1488)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Crude OR (95% CI)</th>
<th>Adjusteda OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of persons who smoke in home</td>
<td>1.3 (1.0-1.6)*</td>
<td>1.1 (0.9-1.4)</td>
</tr>
<tr>
<td>No. of days exposed in the car</td>
<td>1.3 (1.1-1.6)*</td>
<td>1.2 (1.0-1.4)*</td>
</tr>
</tbody>
</table>

*aAdjusted for age, sex, parents, siblings, and friends who smoke, susceptibility to initiating smoking, and school socioeconomic status

* = p<.05
Discussion

- Greater exposure in the home and car associated with greater reports of nicotine dependence symptoms

- Limitations
  - Cross-sectional study (no causality can be inferred)
  - Low response to nicotine dependence symptoms ($n = 69/1488$)
  - No standard measure of nicotine dependence in children
  - No biological marker of exposure used (i.e., hair nicotine)
Study 6

An examination of the relationship between adolescents’ initial smoking experience and their exposure to peer and family member smoking.

Hypotheses

a) Adolescents with greater exposure to smoking are more likely to experience **positive symptoms** of initial smoking experience (e.g., relaxed, good, and high) and less likely to report negative symptoms (e.g., cough, sick, and dizzy).

b) Adolescents with greater exposure to smoking will have **increased sensitivity** to initial smoking experience (i.e., a greater total number of negative and positive reported symptoms).
Methods

- **Design:**
  - Cross-sectional analysis

- **Sample Selection**
  - Survey data from the 2002 British Columbia Youth Survey on Smoking and Health
  - Students who had ever ‘puffed’ on a cigarette
  - $N = 1187$ students (grades 10 to 11)
Measures

Independent Variable

- Exposure to smoking from peers and family
  - Friends, Parents (mother and father), and siblings. “Yes” = 2, “no they quit” = 1, and “no they never smoked,” “I don’t know” and “does not apply” = 0.
  - A total score representing exposure to smoking from peers and family members was calculated with a range from 0 (no exposure) to 16 (high exposure).

Dependent Variable

- Initial symptoms of smoking experience:
  - feeling dizzy, cough, feel sick, feel high, feel relaxed, feel nervous, and feel good (Yes/No)

- Initial sensitivity to smoking
  - summary score of symptoms (range 0-7).
Sample Description

- Female (50.5%)
- Mean Age: 15.9 (SD = 0.94)
- Mean exposure to smoking from friends and family score: 4.04 (SD = 3.03)
- Initial smoking sensitivity score: 2.34 (SD = 1.53)
Initial symptoms of smoking experience (n = 1187)

- Cough: 62.2%
- Sick: 24.2%
- Nervous: 24.4%
- Dizzy: 36.6%
- Relaxed: 38.4%
- Good: 30.0%
- High: 18.7%
Association between exposure to smoking by peer and family members and initial symptoms of smoking experience (n = 1187)

<table>
<thead>
<tr>
<th></th>
<th>Crude OR (95% CI)</th>
<th>Adjusted(^a) OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>0.96* (0.92-1.00)</td>
<td>0.96 (0.92-1.01)</td>
</tr>
<tr>
<td>Sick</td>
<td>1.07** (1.02-1.11)</td>
<td>1.04 (0.99-1.09)</td>
</tr>
<tr>
<td>Nervous</td>
<td>0.99 (0.95-1.04)</td>
<td>0.96 (0.92-1.01)</td>
</tr>
<tr>
<td>Dizzy</td>
<td>1.20** (1.15-1.26)</td>
<td>1.12** (1.07-1.17)</td>
</tr>
<tr>
<td>Relaxed</td>
<td>1.13** (1.08-1.17)</td>
<td>1.08** (1.03-1.13)</td>
</tr>
<tr>
<td>Good</td>
<td>1.15** (1.11-1.20)</td>
<td>1.09** (1.04-1.14)</td>
</tr>
<tr>
<td>High</td>
<td>1.20** (1.14-1.26)</td>
<td>1.13** (1.07-1.19)</td>
</tr>
<tr>
<td>Total score(^b)</td>
<td>Beta = 0.26** (B = 0.13)</td>
<td>Beta = 0.13** (B = 0.07)</td>
</tr>
</tbody>
</table>

\(^a\)Adjusted for age, sex, age of smoking initiation, depression score (CESD) and addiction to tobacco.

B Associations between exposure to smoking by peer and family members and total score was calculated using linear and multiple linear regression models (Adjusted R\(^2\) = 0.15, p<.05).

* = \(p \leq .05\), **\(p \leq .007\) (A cut-off for statistical significance of .007 (i.e., \(a = .05/7\)) was derived using a Bonferroni correction to adjust for multiple comparisons in each set of regression models.)
Discussion

- **Hypothesis 1 supported**: Adolescents with greater exposure to smoking by peer and family members are more likely to endorse positive symptoms of initial smoking experience.

- **Hypothesis 2 supported**: Adolescents with greater exposure to smoking by peer and family members are more likely to experience a greater number of symptoms.

- **Limitations:**
  - Cross-sectional study (no causality can be inferred)
  - Potential recall bias because of self-reported symptoms
  - No biomarker of exposure was obtained
  - Validity of initial symptoms of smoking?
How a person experiences their initial few cigarettes is due to both heritable contributions and environmental experiences unique to the person. The covariation of diverse subjective experiences appears to be due to a heritable latent sensitivity to the chemicals contained in an average cigarette and is best indexed by dizziness.
Conclusions and Future Directions
Summary of Findings

- **Study 1**: In nonsmokers, nicotine exposure from SHS can be absorbed at levels similar to active smoking which are known to have psychological effects.

- **Study 2**: In smokers, SHS exposure is an independent factor associated with increased nicotine dependence and decreased intentions and attempts to quit smoking.

- **Study 3**: Hair nicotine levels are objective, valid measures of SHS exposure.
Summary of Findings contd...

- **Study 4**: Among nonsmoking bar and restaurant workers, SHS exposure is associated with increased reports of nicotine-withdrawal symptoms.

- **Study 5**: Among never smoking adolescents, exposure to smoking in the car and the home is associated with reports on nicotine dependence symptoms.

- **Study 6**: Among youth smokers, exposure to smoking by peers and family members is associated with sensitivity to and increased reports of positive symptoms of initial smoking experience.
Current Studies

McGrath, J (PI); O’Loughlin, J (Co-PI); Hammond, K (Co-I); Okoli, C (Co-I); Racicot, S. Pharmacological and Social Smoke Exposure as Differential Predictors of Smoking Initiation in Adolescents: The AdoQuest Cohort. CIHR Operating Grant (Oct, 2009- Sep, 2014)
Thank you for your time and attention!