Title: Trial on the Effect of E-cigarette Advertising on Cigarette Perceptions in Adolescents

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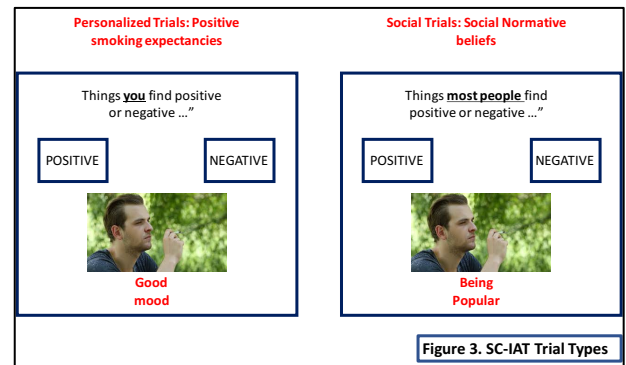**Document date: Thursday December 12, 2024**

Research Approach

We will achieve our aims by having 200 non-smoking adolescents (aged 15-16) complete a laboratory study (Figure 2). During their visit, Adolescents will then be randomly assigned to watch a smoking movie that manipulates exposure to ENDS Advertisements. Attention to movie smoking will be measured using validated eye movement measures of attention.[16] Adolescents will then complete SC-IAT task to measure how exposure to ENDS ads affected their implicit smoking expectancies and implicit normative beliefs.

Priamry Measures

Implicit measurement of positive smoking expectancies and social normative beliefs about smoking using the SC-IAT. A modified version of the SC-IAT[15] will be administered before and after exposure to ENDS ads. The SC-IAT is a validated implicit association computer task that can be used to measure the associations between a visual cue (e.g., a smoking-related image) and a) personal implicit attitudes (e.g., implicit positive smoking expectancies)

Figure 3. SC-IAT Trial Types

and b) implicit normative evaluations (e., social normative beliefs about smoking). The rationale for using the implicit association tests to assess implicit attitudes[15] and implicit normative evaluations[44] have been described elsewhere. Adolescents will complete two phases, a personalized phase to measure their implicit positive smoking expectancies and a social phase to measure their implicit normative beliefs about smoking (Figure 3). Each trial in the personalized phase begins with the words "Things **you** find positive or negative …" presented in the upper middle of the screen that stays visible for the duration of the trial. After 500 msec, adolescents are presented with a visual smoking cue and associated word or short phrase presented in the middle of the screen. The word either conveys a positive smoking expectancy (e.g., relaxation) or a negative smoking expectancy (e.g., bad mood). The labels "Positive" and 'Negative' are presented on opposite sides at the top right-hand and left-hand side of the screen. The task of the participant is to categorize the cue word as "positive" or "negative" by pressing the spatially-mapped keyboard key as quickly and accurately as possible. The theory is that participants will categorize the word faster if the visual cue word pairing is congruent with their smoking expectancies. For example, an individual with high positive smoking expectancies would react faster if a visual smoking cue was paired with a positive word, such as "relaxation" than a negative word, such as "bad mood." In a control condition, neutral non-smoking images are presented instead of smoking images. Trials in the social phase are like the personalized phase with the following expectations. Trials begin with the wording "Things **most people** find positive or negative …" followed by the presentation of the trial screen. The cue word will convey a positive (cool) or negative (uncool) social belief about smoking. Like above, the theory is that participants will categorize the word faster if the visual cue word pairing is congruent with their social normative beliefs about smoking. The order in which phases are completed will be counterbalanced, and experimental procedures will follow established methods.[15] Visual smoking images and control images will be taken from the International Smoking Image database.[49] Smoking-related images include photos of people smoking in a variety of environmental situations. Neutral images are identical but have the smoking cues removed. Positive and negative cue words will be sampled from previous research that have used similar tasks.[50] and derived from scales that measure smoking expectancies[51] and normative smoking beliefs[17] designed for adolescents.

ENDS ad and control exposure. Immediately following the first SC-IAT,

adolescents will view a 15-minute movie clip that manipulates exposure to ENDS ads. ENDS ad exposure will be manipulated by embedding naturally occurring commercial breaks at 5 and 10 minutes. During each break, adolescents in the ENDS ad exposure condition will view ENDS ads for 30 seconds each. The commercial break will also include 3 30-sec control ads (e.g., food, clothes, and cars) to disguise the purpose of the experiment. Adolescents in the control ad condition will view 4 minutes of control commercials at each break. Ends and control ads will be randomly sampled from the 8 most popular brands in the United States in 2016.

Attention to dynamic smoking cues. Dynamic smoking cues are any action that promotes or represents a smoking behavior.[53] Selective attention is an implicit measure of cue saliency that is defined as an automatic response to attend to an environmental stimulus.[54] Measuring eye movements to dynamic cues has been shown to be a validated measure of selective attention to smoking cues in movies.[42] Eye tracking will be recorded using the Gazepoint GP3 eye-tracker (Vancouver, British Columbia). The GP3 device has a sample rate of 60 Hz and an accuracy of 0.5 to 1 degree of visual angle.

Covariate Assessment. We will measure the following covariates because they have been associated them with tobacco advertising exposure and adolescent smoking, but are not thought to part of the causal pathway.[18] We will collect sociodemographic factors including age, gender, and socioeconomic status. Socioeconomic status will be measured using the validated three item index of the Programme for International Student Assessment.[18] We will also measure social influences on smoking using validated questions, including the smoking status of parents and the smoking status of peers.[18] Rebelliousness and sensation seeking will be assessed using a validated 4-item index because it has been strongly associated with adolescent smoking intuition. Following our laboratory's previous work, we will also measure long-term exposure to on screen movie smoking using a validated method.

Primary analysis plan

Our outcomes of interest are as follows: 1) Implicit positive vaping expectancy scores measured post-intervention, and 2) selective attention to dynamic smoking cues. To assess the effect of ENDS advertising on implicit attitudes, we will use linear regression to predict Implicit positive vaping expectancy scores from advertising condition. We also use linear regression to assess the association between the amount of attention given to dynamic smoking cues and Implicit positive vaping expectancy scores. Specially, Implicit positive vaping expectancy scores will be predicted from dynamic attention scores in the onscreen smoking experimental arm. For all analyses, we will first calculate appropriate summary statistics, assess normality, and transform the data if necessary. We will include potential covariates in all analyses when they are significantly associated with the outcome ($P < 0.05$). We will conduct all analyses in the full sample stratified by sex, and conduct formal tests for interactions using a Wald Test on sex by exposure multiplicative interaction terms in full models.