ENHANCED ATTENTIONAL BIAS TO VISUAL MARIJUANA CUES IN SMOKERS INDICATED BY EVENT-RELATED POTENTIALS

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BACKGROUND AND SIGNIFICANCE
- Drug cues capture attention relative to other salient environmental stimuli among drug dependent individuals.
- An event-related potential (ERP), the late-positive potential (LPP), is sensitive to the attentional engagement and motivational salience of a stimulus.
- Attentional biases to visual drug cues have been indexed with LPPs among dependent users of numerous drugs.
- Electrophysiological evidence of an attentional bias towards visual drug cues has been observed among chronic marijuana users, but has not been investigated in infrequent social users.

AIMS AND HYPOTHESES
- To determine if marijuana use is associated with ERP indices (i.e., LPP) of attentional bias towards visual marijuana cues relative to comparably salient non-drug images.
- To investigate if perceptions of prototypes of peer smokers and social norms of marijuana use relate to this attentional bias.

METHOD
144 undergraduate students from the University of Colorado at Boulder participating in a longitudinal study investigating marijuana use. Participants met the inclusion criteria for one of the following marijuana smoking groups:
- Non-smoker: never smoked marijuana once in their lifetime
- Infrequent-smoker: smoked marijuana <4 times per month for <3 year
- Frequent-smoker: smoked marijuana ≥5 times per week for ≥1 year

Visual Oddball Task
- Participants viewed trials of 5 pictures consisting of 4 neutral context pictures and 1 target/oddball picture related to either marijuana, exercise, or neutral (equi-probable).
- Marijuana- and exercise-related pictures were found on the internet and neutral pictures were selected from the International Affective Picture System (Lang, Bradley, & Cuthbert, 1999). Target pictures were presented as the 3rd, 4th, or 5th picture in each trial. Pictures were presented for 1sec with a 1sec ISI, during which participants categorized the content of the picture as exercise/marijuana-related or other. Participants completed 108 trials.

GENERAL ODDBALL RESULTS
Late-Positive Potential Quantification
- Late Positive Potential (LPP) is sensitive to attentional capture and motivational salience of a stimulus. Measured as the mean amplitude in the positive-going component at Pz during 500-700ms post-picture onset. To control for presentation order and frequency ERPs were only analyzed for target pictures.

LPP is larger to infrequent marijuana and exercise pictures than frequent neutral pictures
- The LPP was analyzed in a General Linear Model with picture type (marijuana vs. exercise vs. neutral) as a within subjects factor and orthogonal contrast coded variables for non-smokers vs. smokers and infrequent-smokers vs. frequent-smokers.
- Demonstrating the classic oddball effect, the LPP was larger to infrequently presented marijuana- and exercise-related pictures than frequently presented neutral pictures (Marijuana = 11.2µV, Exercise 10.5µV, Neutral = .1µV; F(1, 141) = 723.8, η² = .84, p < .001).

MARIJUANA CUE RESULTS

<table>
<thead>
<tr>
<th>LPP Amplitude (µV)</th>
<th>Marijuana</th>
<th>Exercise</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Smoker</td>
<td>10.0</td>
<td>10.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Infrequent-Smoker</td>
<td>11.8</td>
<td>10.0</td>
<td>-.3</td>
</tr>
<tr>
<td>Frequent-Smoker</td>
<td>13.1</td>
<td>11.7</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Smokers display a larger LPP to marijuana pictures than non-smokers
- Marijuana-related pictures elicited a larger LPP on average in both smoking groups compared to non-smokers (Smokers = 12.4µV vs. Non-Smokers = 10.0µV, F(1, 141) = 6.2, η² = .04, p = .01).

MARIJUANA PICTURE RELATES TO SUBJECTIVE PROTOTYPES OF SMOKERS

- Larger LPPs to marijuana pictures relative to exercise and neutral pictures were apparent in individuals who held more positive views of peer marijuana users (F(1, 139) = 5.8, p = .02). However, the LPP was not related to perceptions of norm of peer drug use.

Conclusions
- Marijuana smokers displayed enhanced attentional bias in the LPP toward marijuana pictures relative to equally infrequently presented exercise pictures. However, no differences emerged between infrequent and frequent users.
- A more favorable view of marijuana users, but not simply perceptions of social norms related to peer drug use, was related to enhanced attention capture of marijuana cues.

References