

# 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 the LPP 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

### Participants

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:* smoke marijuana <4 times per month for <3 year  
*Frequent-smoker:* smoke 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 3<sup>rd</sup>, 4<sup>th</sup>, or 5<sup>th</sup> 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.

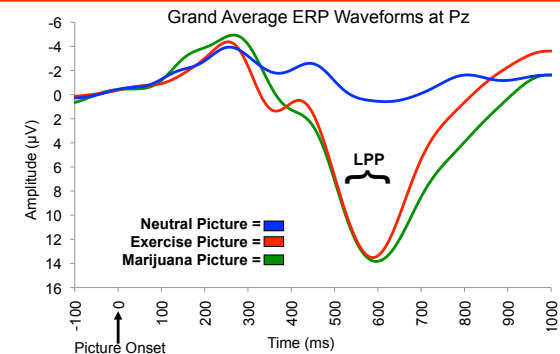
## GENERAL ODDBALL RESULTS

### 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;  $F(1, 141) = 723.8$ ,  $\eta_p^2 = .84$ ,  $p < .001$ ).



## MARIJUANA CUE RESULTS

	Marijuana	Exercise	Neutral
Non-Smoker	10.0	10.2	0.1
Infrequent Smoker	11.8	10.0	-0.3
Frequent Smoker	13.1	11.7	0.4

### Smokers display a larger LPP to marijuana pictures than non-smokers

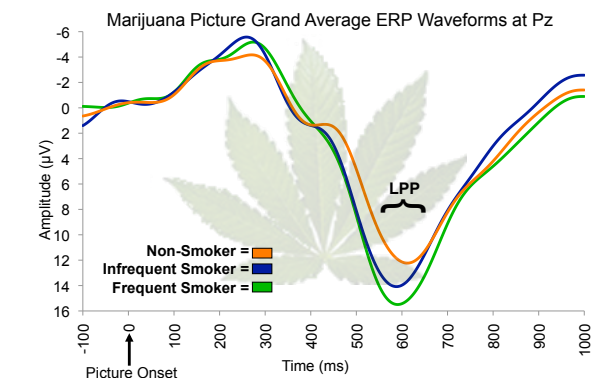
- Marijuana-related pictures elicited a larger LPP on average in both smoking groups compared to non-smokers (Smokers = 12.4µV vs. Non-Smokers = 10.0µV;  $F(1, 141) = 6.2$ ,  $\eta_p^2 = .04$ ,  $p = .01$ ).

### Marijuana pictures elicit larger LPP than exercise pictures among smokers, but not non-smokers

- A significant picture type (marijuana vs. exercise) X smoking group (non-smokers vs. smokers) interaction revealed that marijuana-related pictures elicited a larger LPP than exercise pictures among smokers only (Non-Smokers: Marijuana = 10.0µV, Exercise = 10.2µV vs. Smokers: Marijuana = 12.4µV, Exercise = 10.8µV;  $F(1, 141) = 6.5$ ,  $\eta_p^2 = .04$ ,  $p = .01$ ).
- Follow up analyses revealed that the LPP to marijuana pictures remains significantly larger for smokers than non-smokers after controlling for general attention processes (neutral LPP) and attention to infrequent salient stimuli (exercise LPP;  $F(1, 139) = 9.3$ ,  $p = .003$ ).

### LPP to marijuana pictures related 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 ( $F(1, 139) = 5.6$ ,  $p = .02$ ). However, the LPP was not related to perceptions of norms 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

Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (1999). *International Affective Picture System: Instruction manual and affective ratings*. University of Florida: The Center for Research in Psychophysiology.