



# Disposition of Cannabinoids in Oral Fluid and Whole Blood after Vaporized and Smoked Cannabis

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# Outline

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- Background on “vaping”
- Study goals
- Pharmacokinetics (Ed Cone)
- Pharmacodynamics (Ryan Vandrey)

# Background:

## “Vaping” Cannabis is Gaining Momentum and Widely Used

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- Combustion of cannabis produces a similar profile of carcinogens as tobacco
- Vaporization eliminates these toxins and is perceived to be a “safe” alternative
- The technology of vaporization has led to sale of hundreds, if not thousands, of devices for vaping
- Devices can be portable or table-top
- Used with “raw” cannabis or extracts/oils
- Portable devices can be used to “conceal” cannabis use

# Examples of "Vaping" Devices



# Study Goals

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Much of the science of cannabis is based on studies of combusted cannabis

- Profile the distribution of cannabinoids after vaporization in comparison to smoked cannabis
- Infrequent user population (no use in past 30 days; mean time since last use >1 year)

# Participant Demographics

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- Healthy adults; drug-free non-smokers
- 8F/9M
- 11 Caucasian/3 AA/3 "Other" (hispanic)
- Mean Age: 27 (+/- 6; range 22-44)
- Mean BMI: 26 (+/- 3; range 21-34)

# Study Design

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- Six 8-hr sessions
  - Vaporize raw cannabis containing 0, 10, 25 mg THC
  - Smoke raw cannabis containing 0, 10, 25 mg THC
  - Route clustered in 3 consecutive sessions, not blinded, random dose order within each route
- Blood, oral fluid, urine, PD measures

# Cannabis Plant Material

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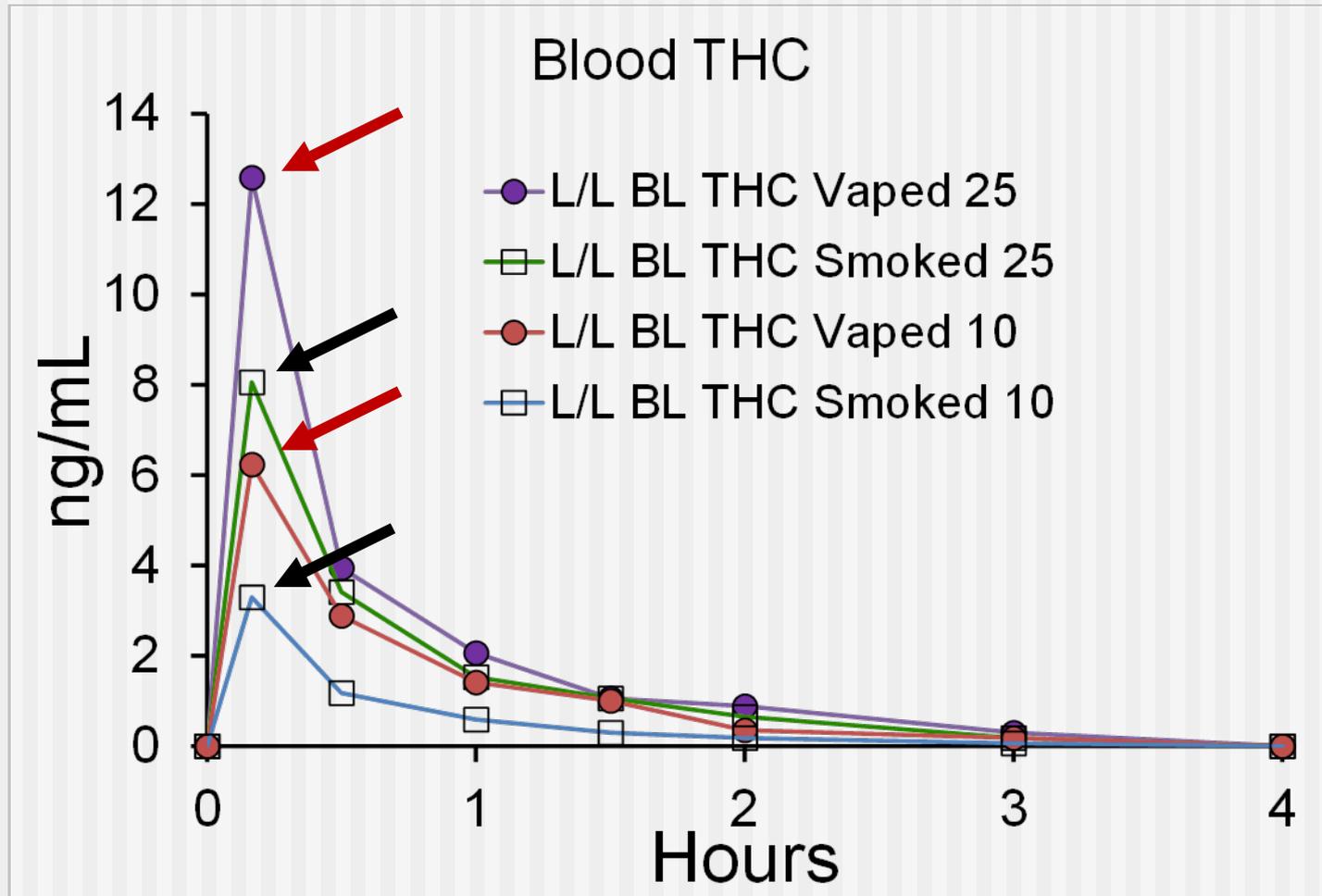
- NIDA supplied cannabis
- 13% total THC
- 0.1% Cannabidiol (CBD)
- 0.8% Cannabinol (CBN)

# Biospecimens

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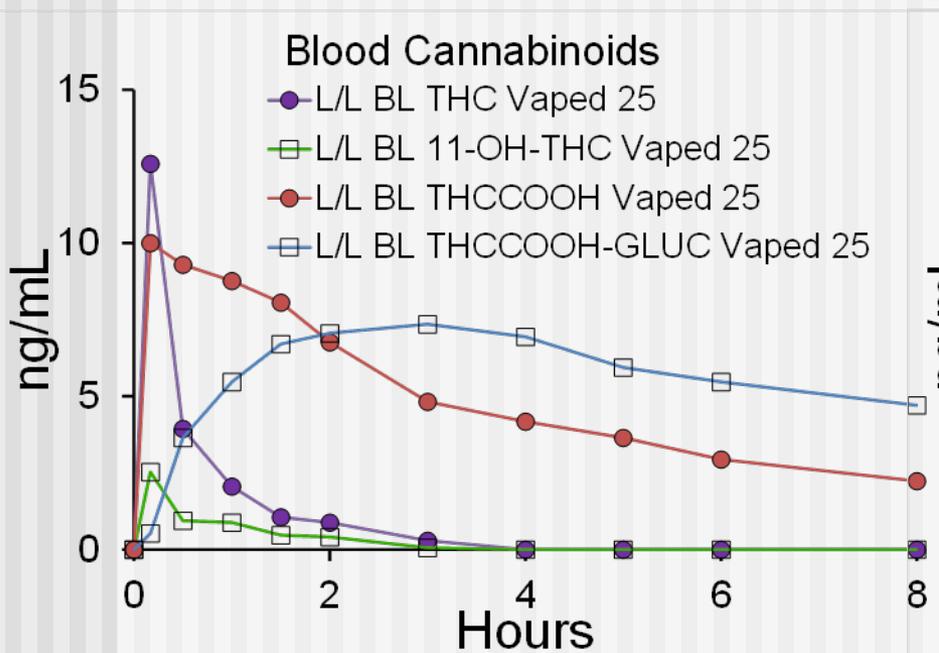
- Whole blood, oral fluid, and urine obtained post-dosing
- Blood and oral fluid analyzed by LC/MS/MS
- LOQ concentrations (ng/mL)
  - Blood: THC, 11-OH-THC, THCCOOH = 0.5
  - Oral fluid: THC = 1; THCCOOH = 0.02

# Deposition of THC in Blood After Vaporization and Smoked Cannabis

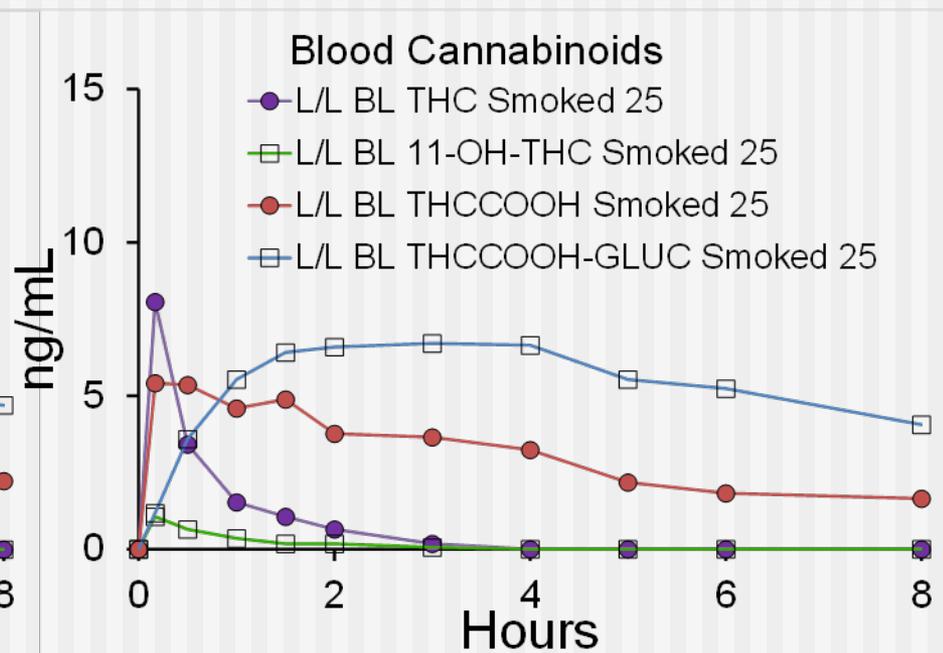


# Deposition of THC and Metabolites in Blood After Vaporization and Smoked Cannabis (25 mg)

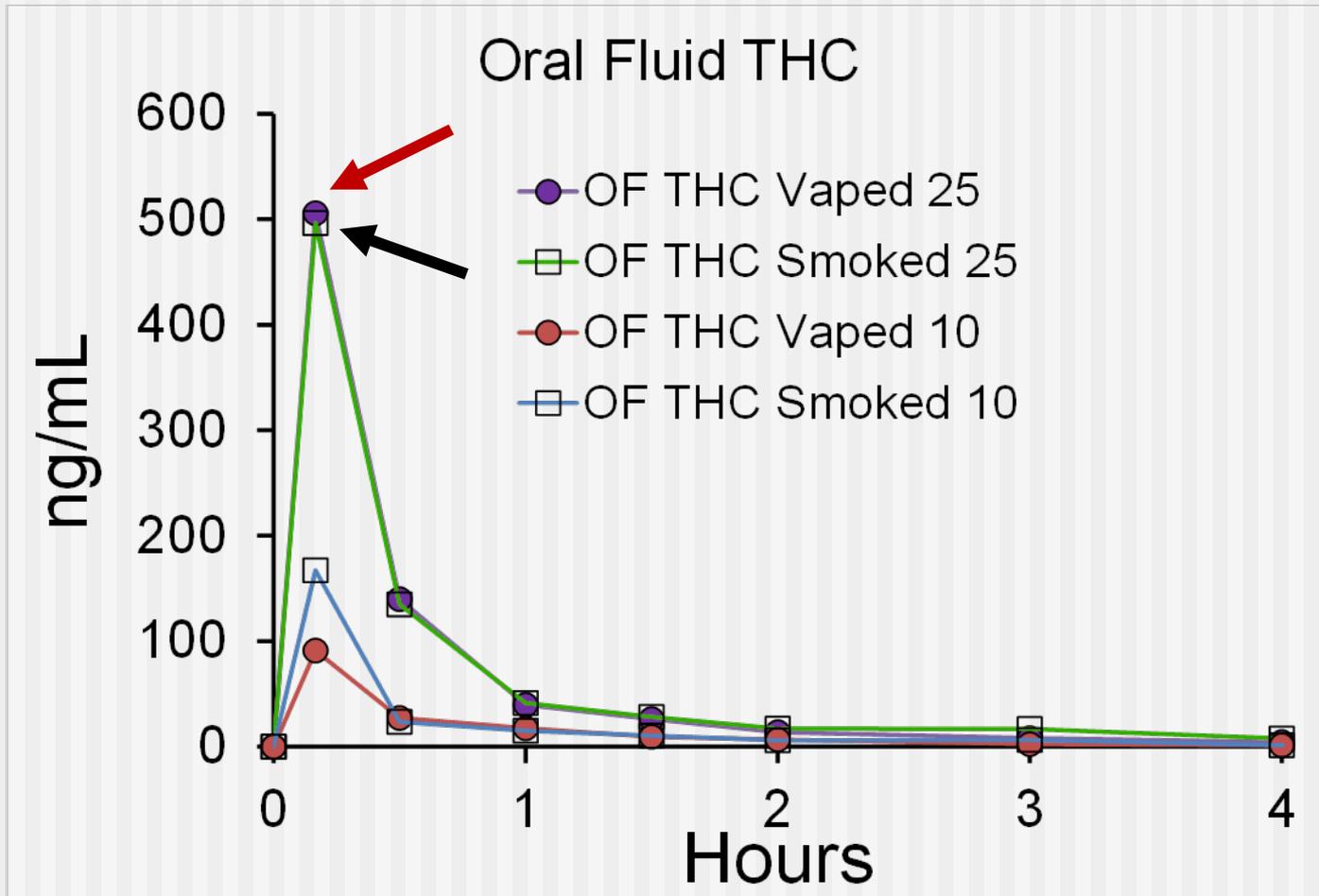
## Vaped



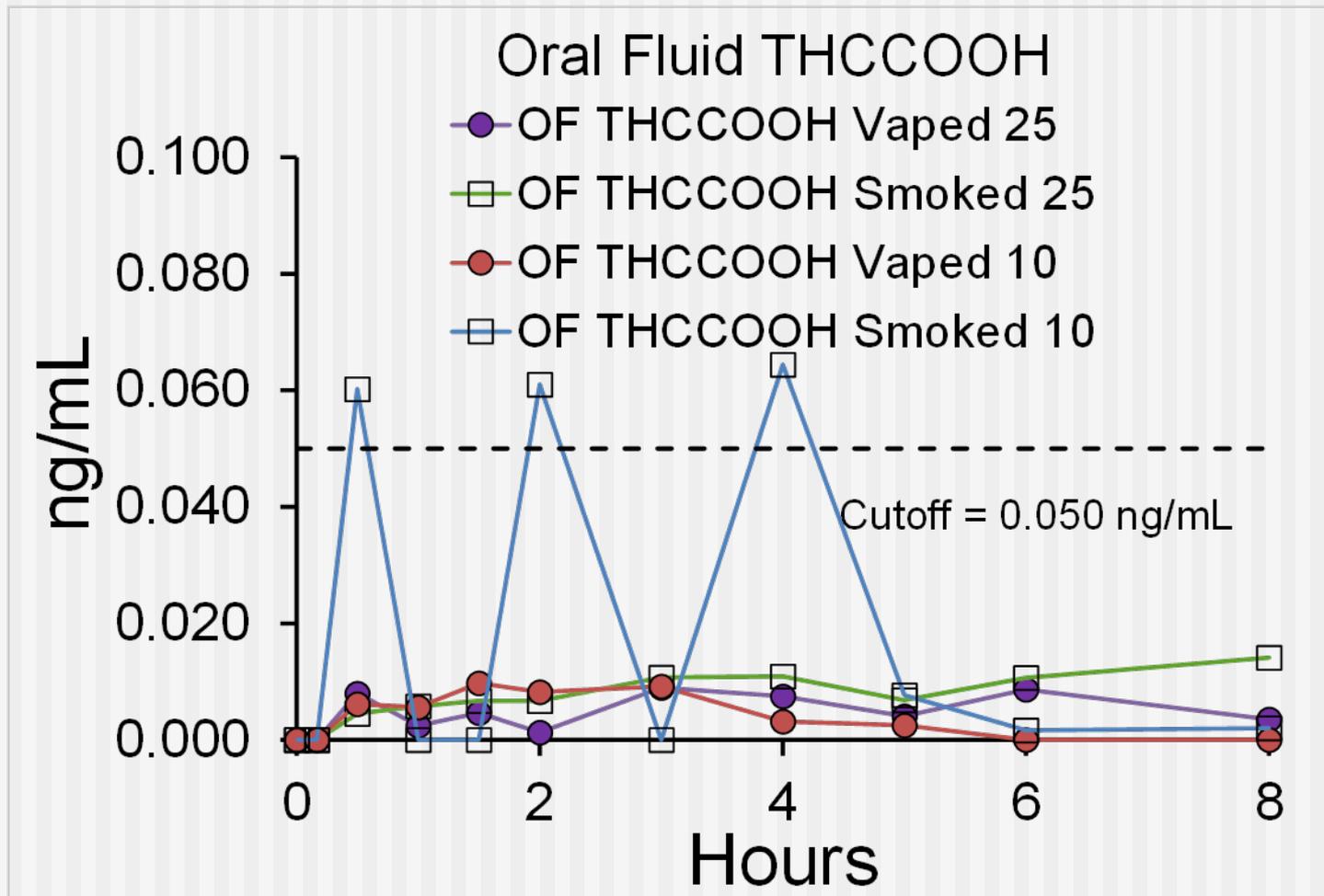
## Smoked



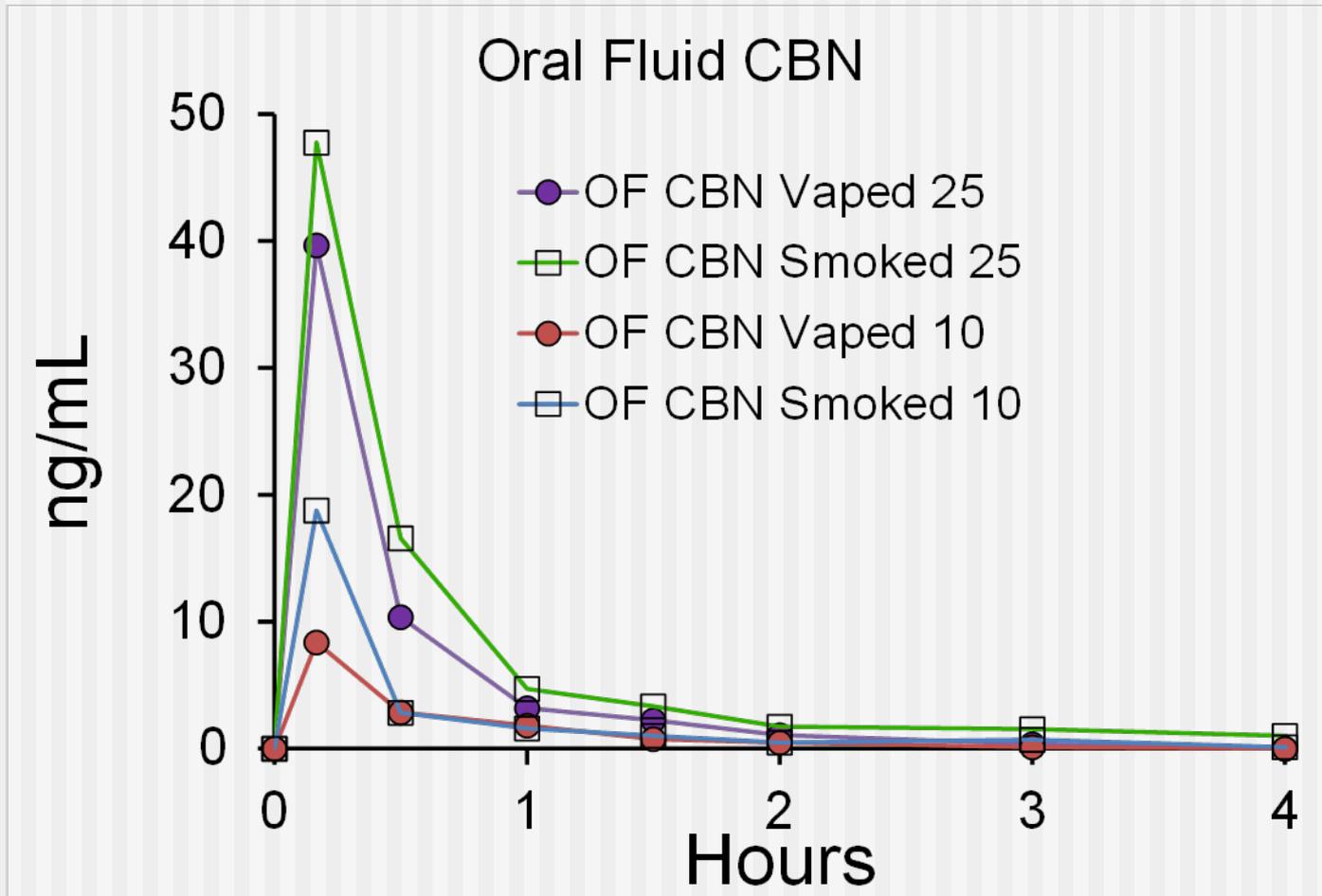
# Deposition of THC in Oral Fluid After Vaporization and Smoked Cannabis



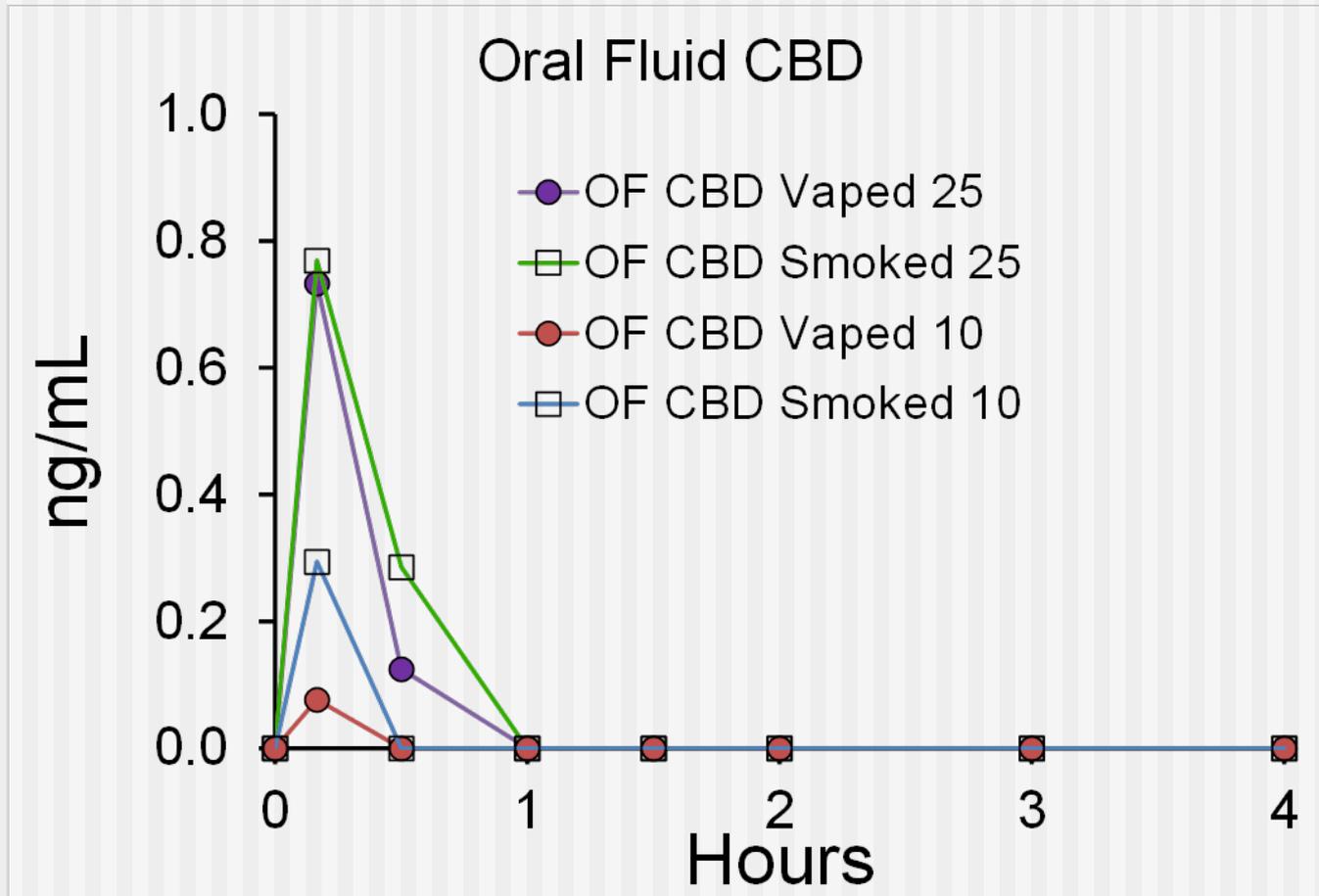
# Deposition of THCCOOH in Oral Fluid After Vaporization and Smoked Cannabis



# Deposition of CBN in Oral Fluid After Vaporization and Smoked Cannabis



# Deposition of CBD in Oral Fluid After Vaporization and Smoked Cannabis



# Pharmacokinetic Conclusions

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- Vaporization of cannabis plant provides higher blood levels of THC than by the smoked route
- Oral fluid concentrations after vaporization appeared to be equivalent to smoking
- THCCOOH in oral fluid was erratic and often negative

# Pharmacodynamic Measures

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# Pharmacodynamic Measures

Do you feel a drug effect?

not at all

Extremely



1 2 3 4 5 6 7 8 9

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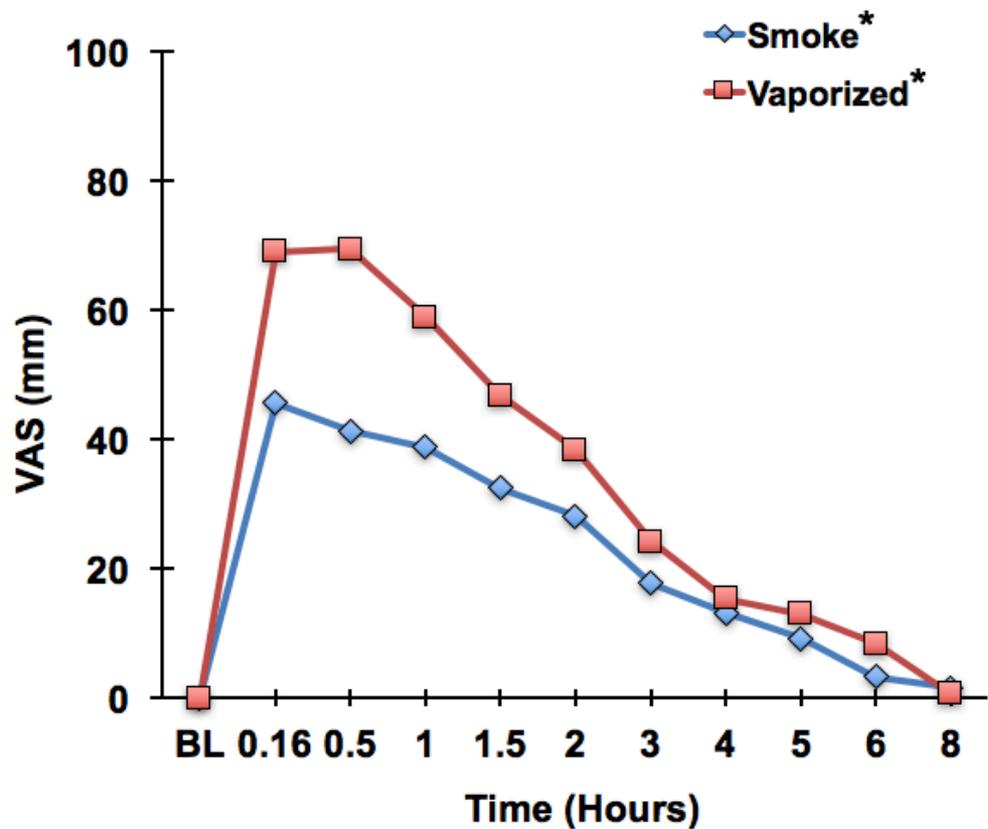
2

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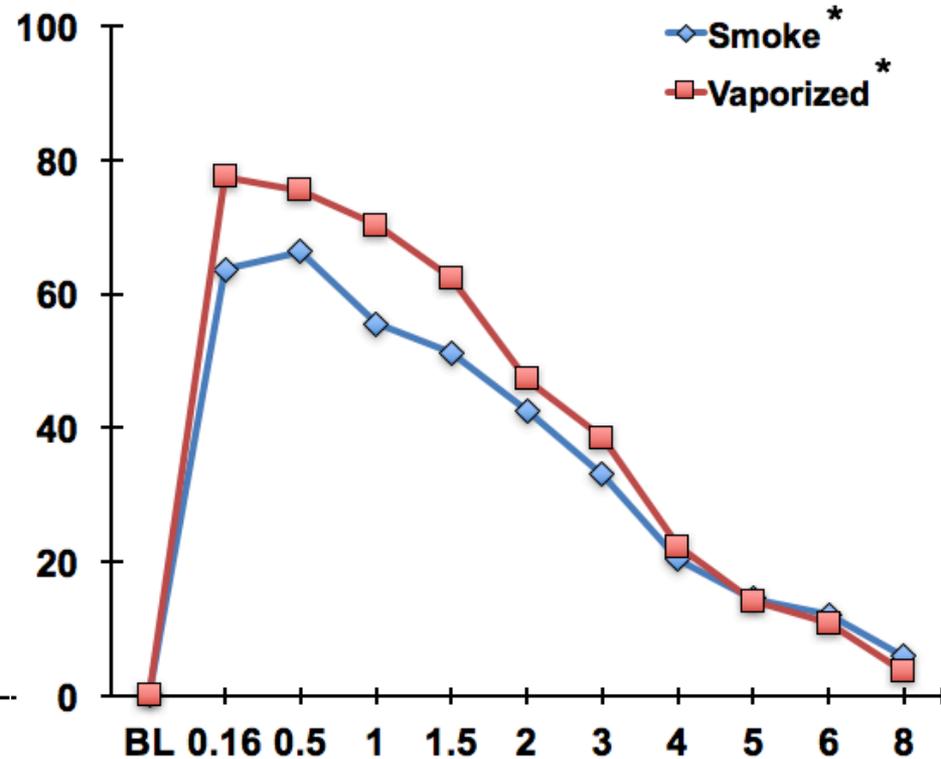
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# VAS: "Drug Effect"

## 10 mg THC

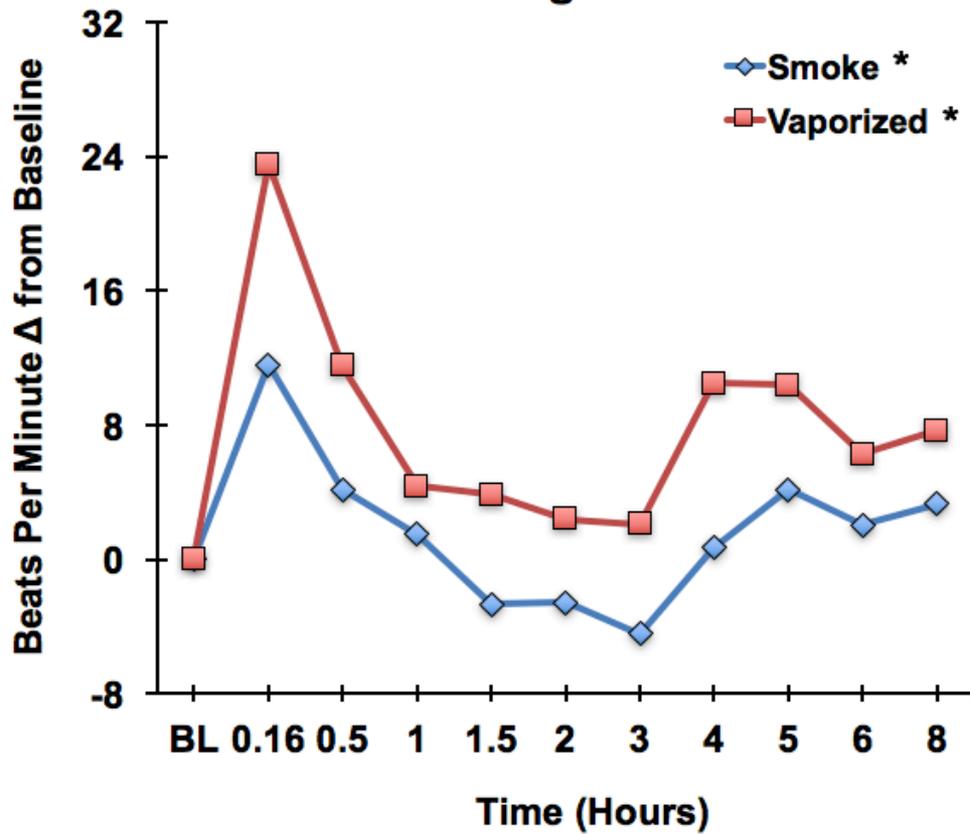


## 25 mg THC

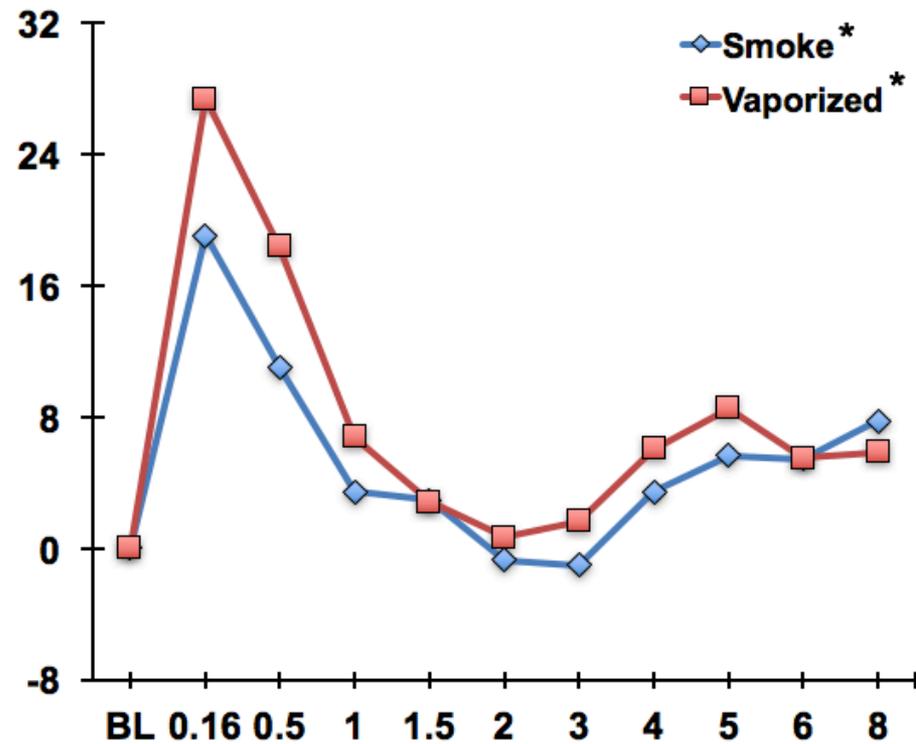


# Heart Rate

## 10 mg THC

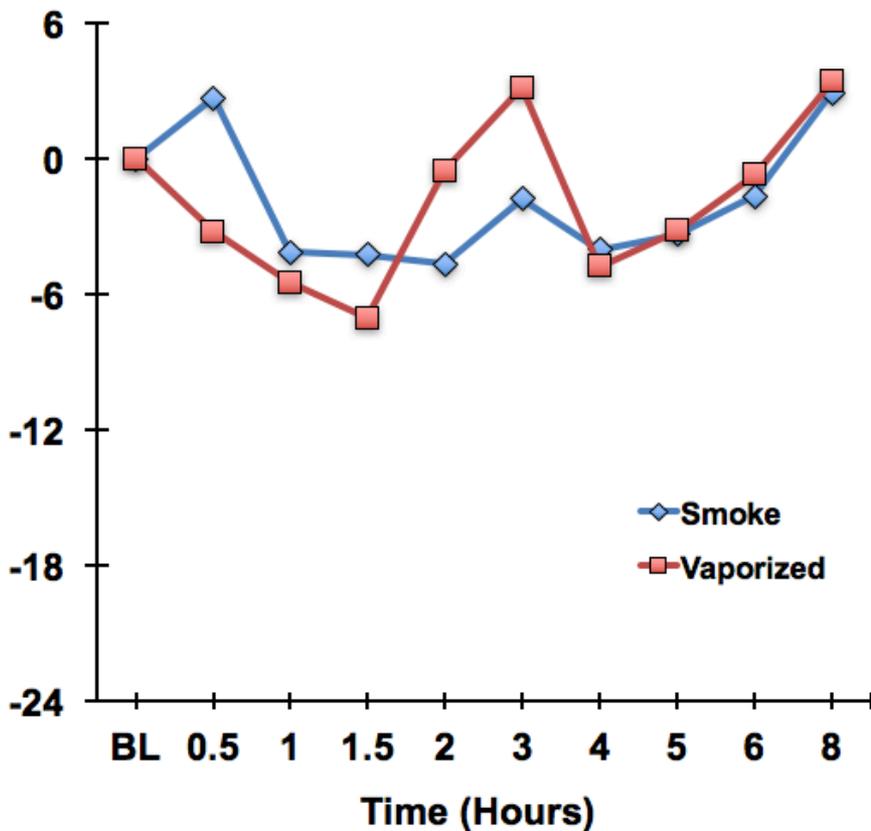


## 25 mg THC

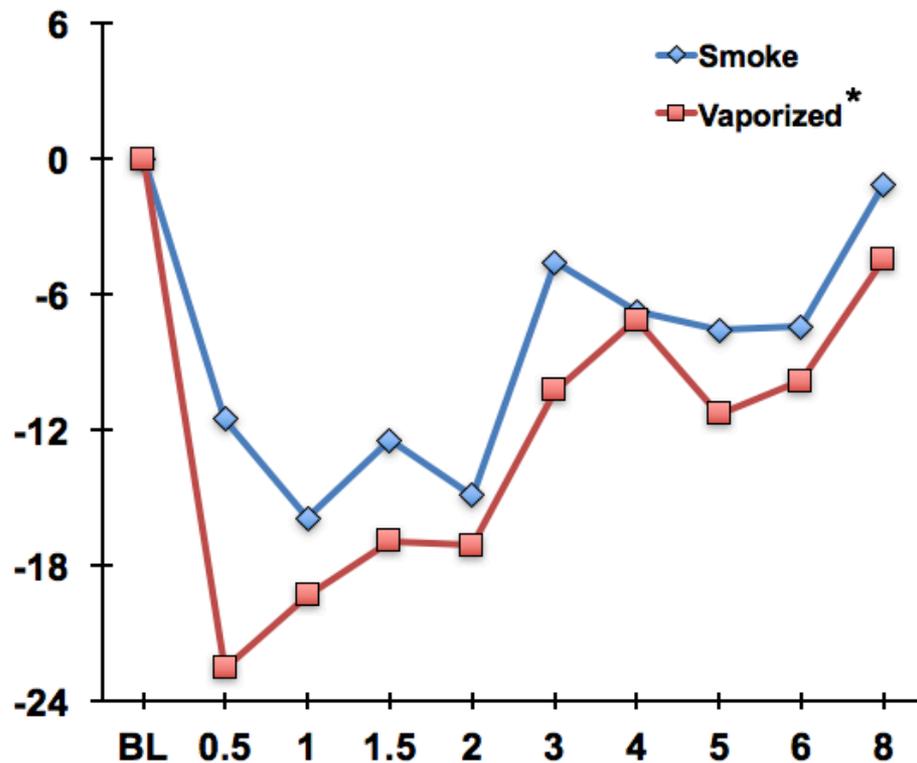


# Paced Serial Addition Task

## 10 mg THC

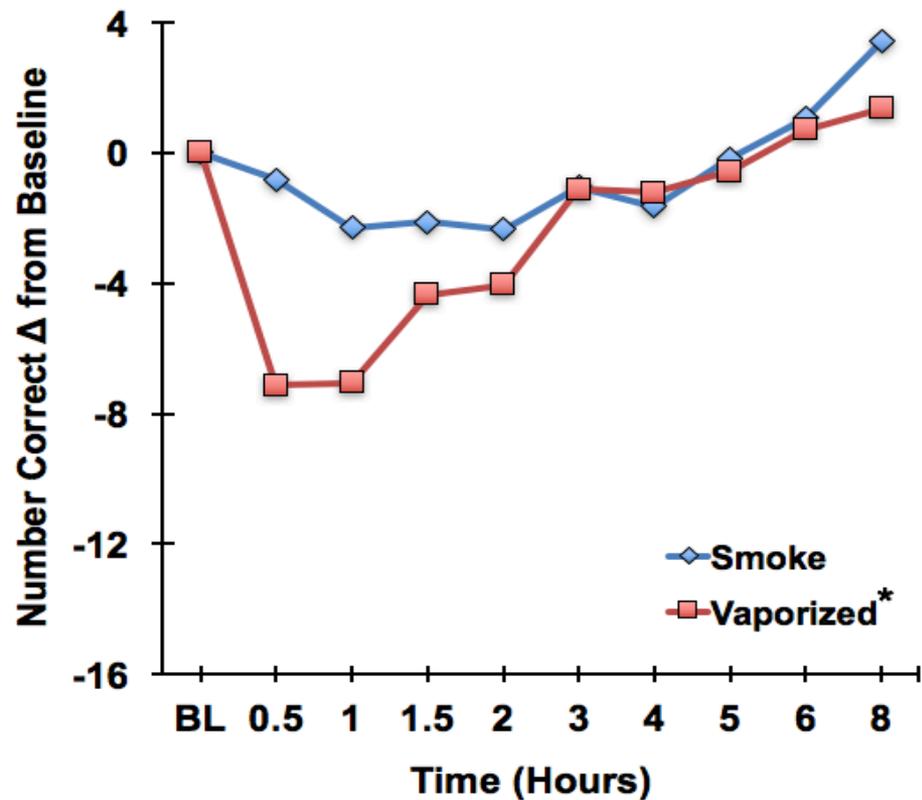


## 25 mg THC

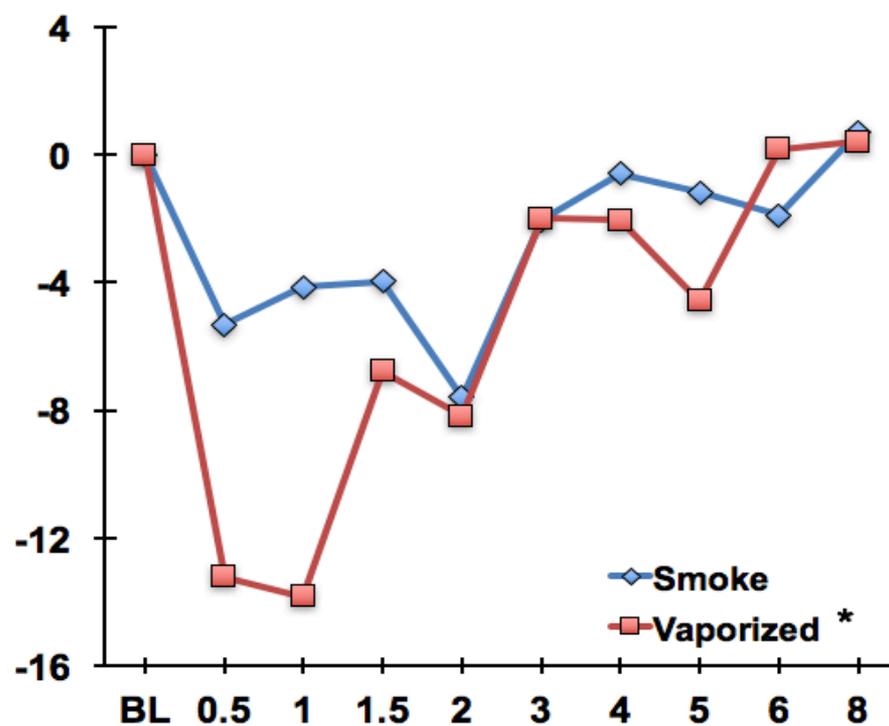


# Digit Symbol Substitution Task

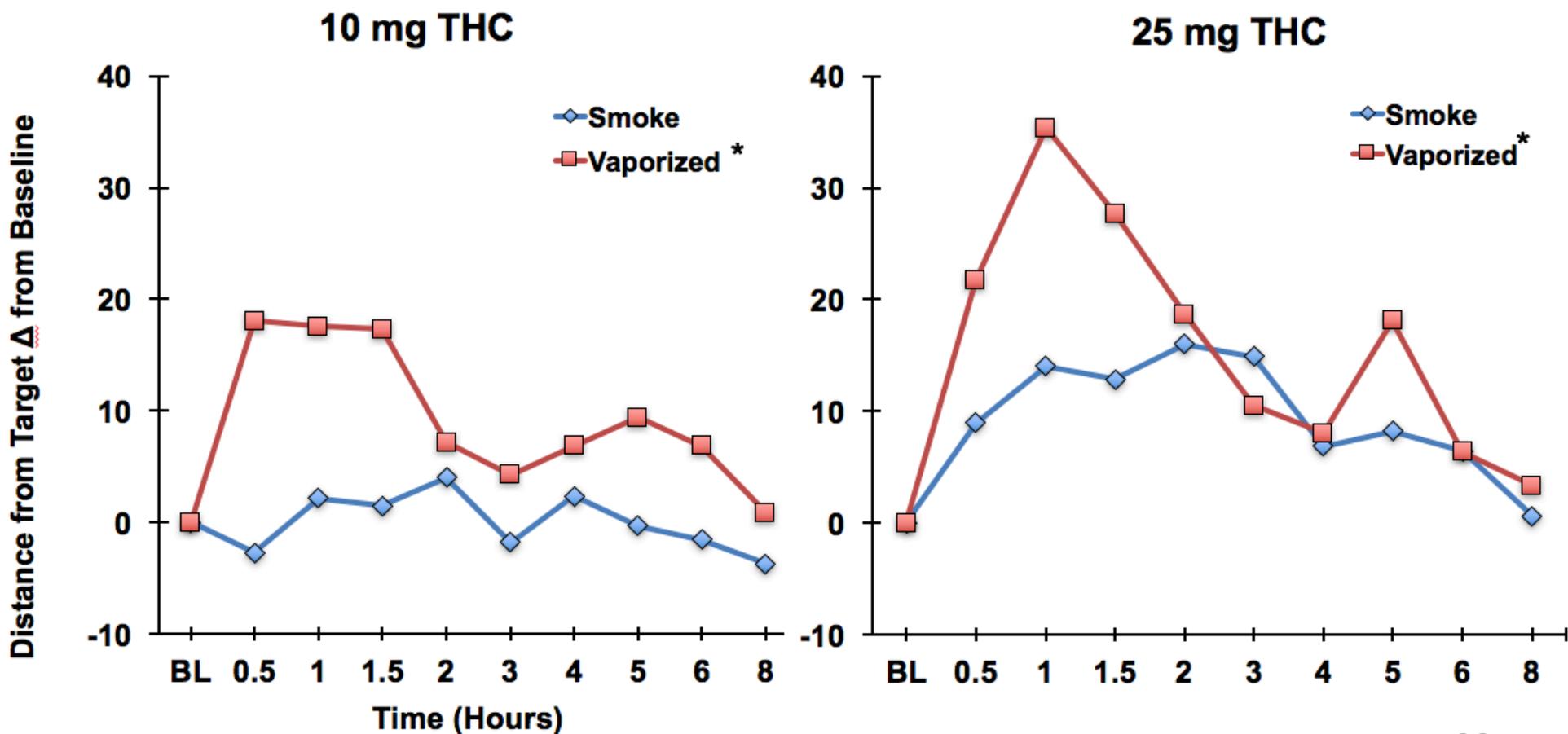
## 10 mg THC



## 25 mg THC

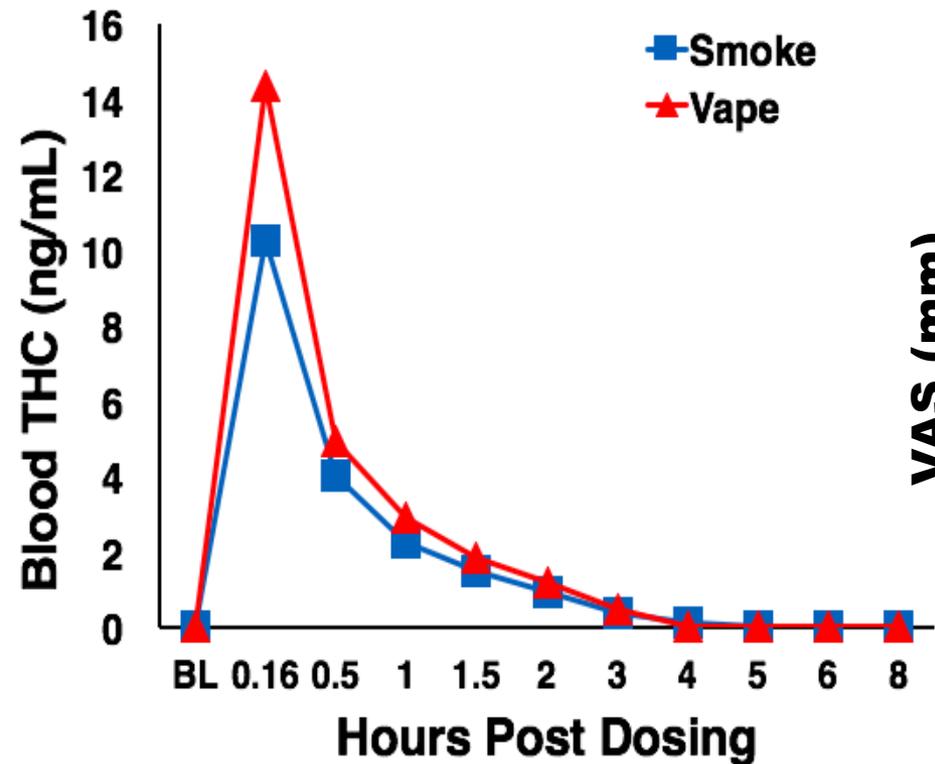


# Divided Attention Task

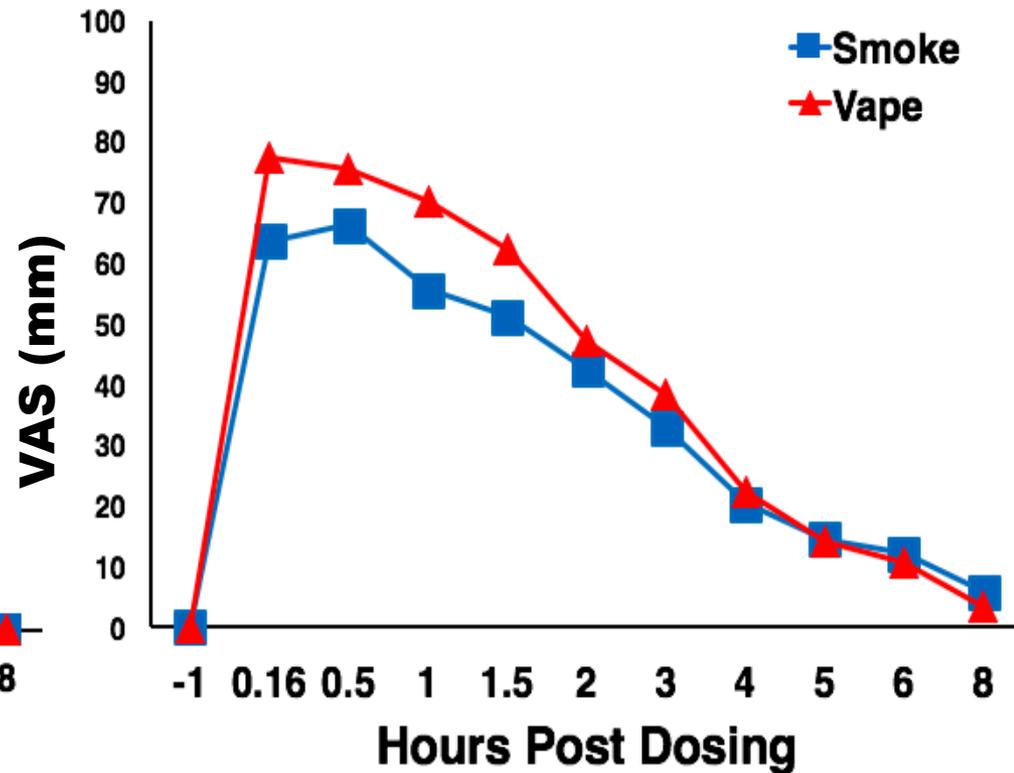


# Blood THC vs VAS Drug Effect at 25mg THC dose

## Blood THC

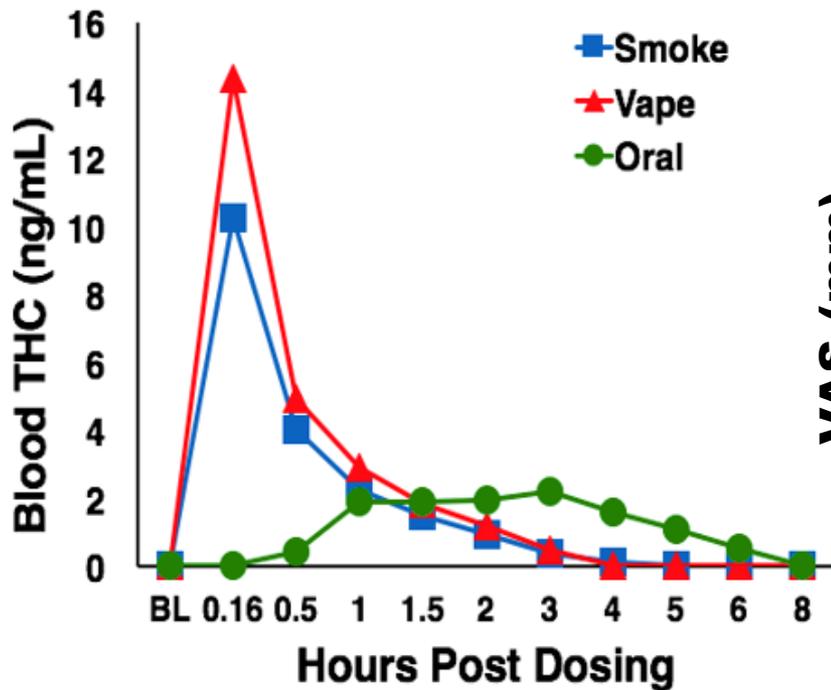


## Drug Effect

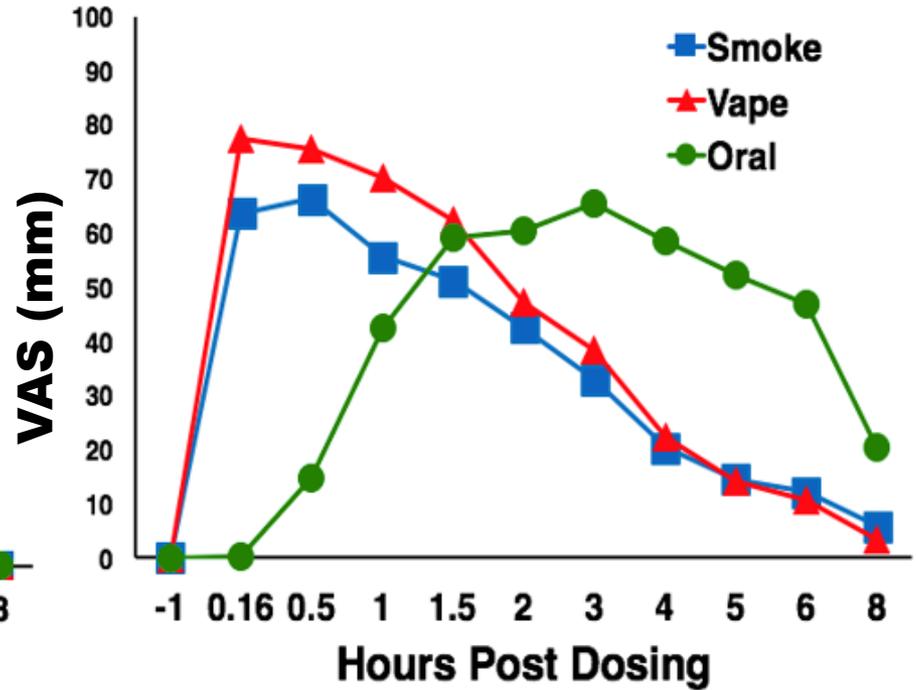


# Blood THC vs VAS Drug Effect at 25mg THC dose

## Blood THC



## Drug Effect



# PK/PD Correlations at 25mg THC dose

	Blood THC	Blood 11-OH-THC	Blood THCCOOH	OF THC
<b>Smoked</b>				
Drug Effect	0.51*	0.47*	0.57*	0.21
DSST	-0.18	-0.13	-0.16	-0.16
PASAT	-0.17	-0.02	-0.03	-0.04
Div. Attention	0.01	-0.03	0.00	0.01
<b>Vaporized</b>				
Drug Effect	0.54*	0.54*	0.56*	0.26*
DSST	-0.32*	-0.24*	-0.40*	-0.16
PASAT	-0.19*	-0.20*	-0.38*	-0.02
Div. Attention	0.14	0.11	0.25*	0.00

## Additional Observations

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- Higher ratings of paranoia, dry mouth, red/irritated eyes following vaporization
- 2 instances of vomiting, one in each route of admin at 25mg dose
- 1 instance of "hallucinatory" effects at 25mg dose when vaporized

# Limitations

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- Only infrequent cannabis users enrolled
- Limited range of doses
- Only one type of cannabis (high THC, low CBD) studied
- Other routes of administration and product types still need to be evaluated (transdermal, suppository, oils/concentrates, etc.)

# Summary

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- Vaporization appears to be a more efficient method of delivery (greater blood THC and subjective drug effects)
- Different time course across assessments
  - Blood THC and HR shorter than subjective DE and cognitive effects
- Correlations btw PK and PD modest at best
- THC in blood and oral fluid returned to zero within 4 hours of exposure