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# The Effects of Amphetamines on Driving and Sobriety Test Performance

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# Victoria: Impairment Tests

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- In December 2000, the Victorian Government passed legislation authorizing Victoria Police officers to administer sobriety test to drivers suspected of being impaired by a drug/s other than alcohol
- These tests are used to obtain information on whether a driver is likely to be impaired by a drug other than alcohol
- Performance Impairment Tests (PIT-similar to SFSTs); Horizontal Gaze Nystagmus test and Walk And Turn test

# Sobriety test validation for drugs



- SFSTs are a sensitive measure of impairment associated with a Blood Alcohol Concentration (BAC) of up to 0.08% (*Burns and Moskowitz, 1977; Burns, 1987*)
- DEC Program (12 step procedure) is 90% accurate in identifying drug impairment (*Bigelow et al., 1984; John Hopkins*)
- DEC Program is 94% accurate in identifying the presence of a drug other than alcohol (not very accurate in determining the specific drug class) (*Compton, 1986; 173 Case Study*)
- DEC Program research are not a good example of the validity of these test for amphetamines (not many cases in previous research included this drug class)

# Sobriety test validation for drugs



- SFSTs are 46% accurate in predicting the presence of cannabis (3%THC) (consumed or not) (*Papafotiou, et al., 2004, submitted AAP*)
- SFSTs are 76% accurate in predicting driving impairment associated with cannabis consumption (*Papafotiou, et al., 2004, submitted AAP*)
- SFSTs are 10% accurate in predicting the presence of Temazepam (20mg dose) (*Papafotiou, et al., 2002, VicRoads report*)
- SFSTs are 20% accurate in predicting driving impairment associated with Temazepam consumption (*Papafotiou, et al., 2002, VicRoads report*)

# Results

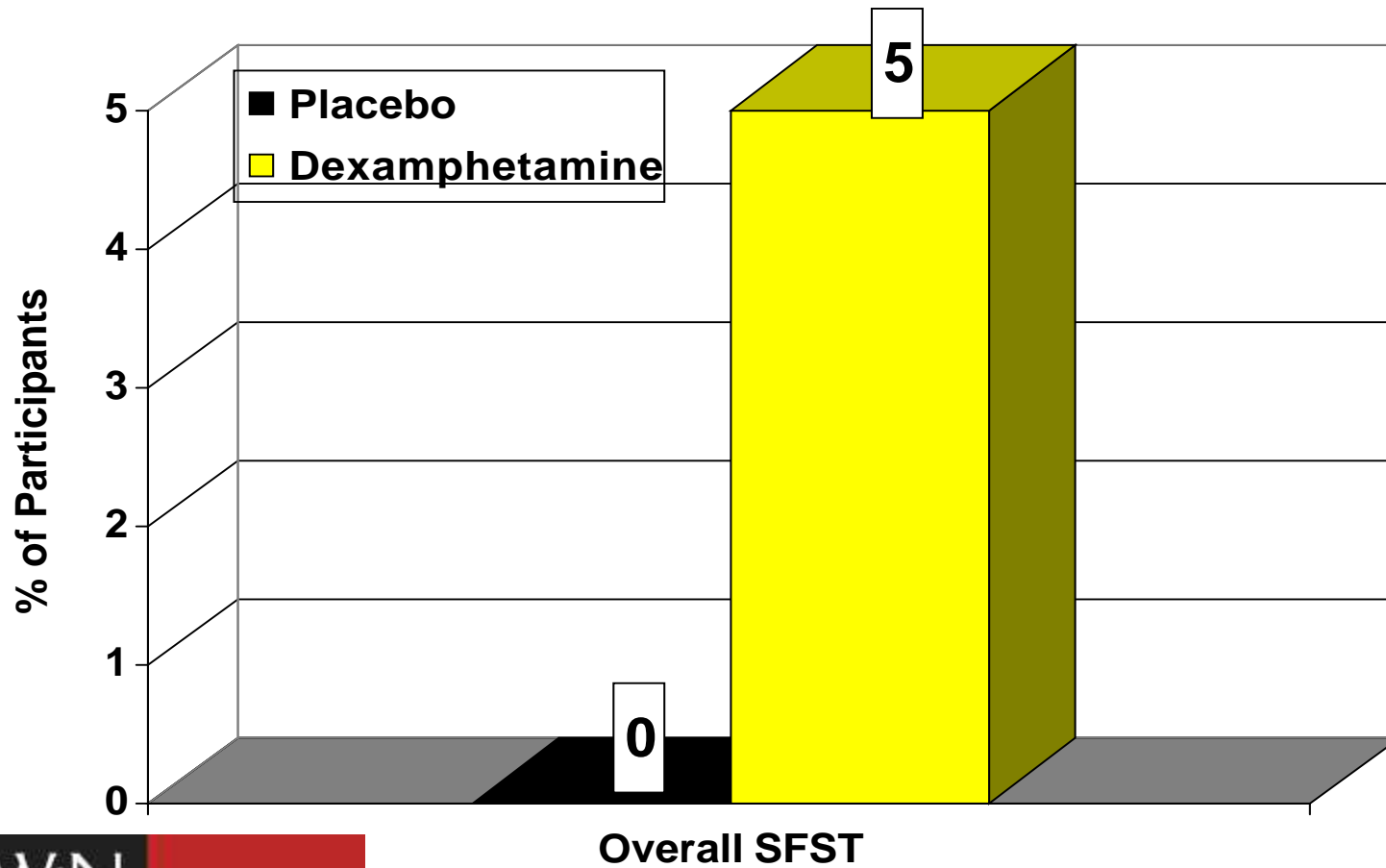
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- Overall SFSTs performance:
  - a test of difference in proportions was performed to establish whether there was a significant difference between the proportion of individuals impaired on overall SFSTs for both the dexamphetamine and placebo condition.



## Overall SFSTs





- Overall SFST performance not a good predictor of impairment associated with dexamphetamine (only 5%= 1 person)
- Heishman, *et al.* (1998) reported that the majority of subjects dosed with *d*-amphetamine were classified as not impaired by the Drug Recognition Examiners (DREs). In only 2% of cases where *d*-amphetamine was administered they were correctly judged to be impaired by the DRE.
- Shinar, *et al.* (2000) also found stimulants, specifically *d*-amphetamine, the most difficult to identify, with only 7.8% of cases correctly classified.

# Sobriety Tests individual signs



## ■ HGN test

Lack of Smooth Pursuit, Nystagmus at Maximum deviation, Nystagmus at 45°, Vertical Gaze Nystagmus

## ■ WAT test:

Cannot keep balance and Starts too soon (instruction stage), Swaying, Misses Heel to Toe, Steps off the Line, Arms Used to Balance, Improper Turn, Incorrect No. of Steps

## ■ OLS test:

Swaying, Arms Used to Balance, Hopping, Foot Down

# HGN test including HMJ

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- HMJ= Head movements/jerks
- Cannot keep head still while following a moving stimulus
- A head movement or jerk observed more than once is given a score of 2 (as though two signs are recorded)

# Previous data on HMJ

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- Sobriety tests including scoring HMJ are better correlated to DRIVING impairment associated with cannabis then when NOT including HMJ
- Scoring HMJ increased percentage of participants predicted as having consumed cannabis (46% to 56%) (placebo percentage not affected)
- Sobriety tests including HMJ are better correlated to DRIVING impairment associated with Temazepam then when NOT including HMJ
- Scoring HMJ increased percentage of participants predicted as having consumed Temazepam from 10% to 20% (placebo percentage not affected)

# Results

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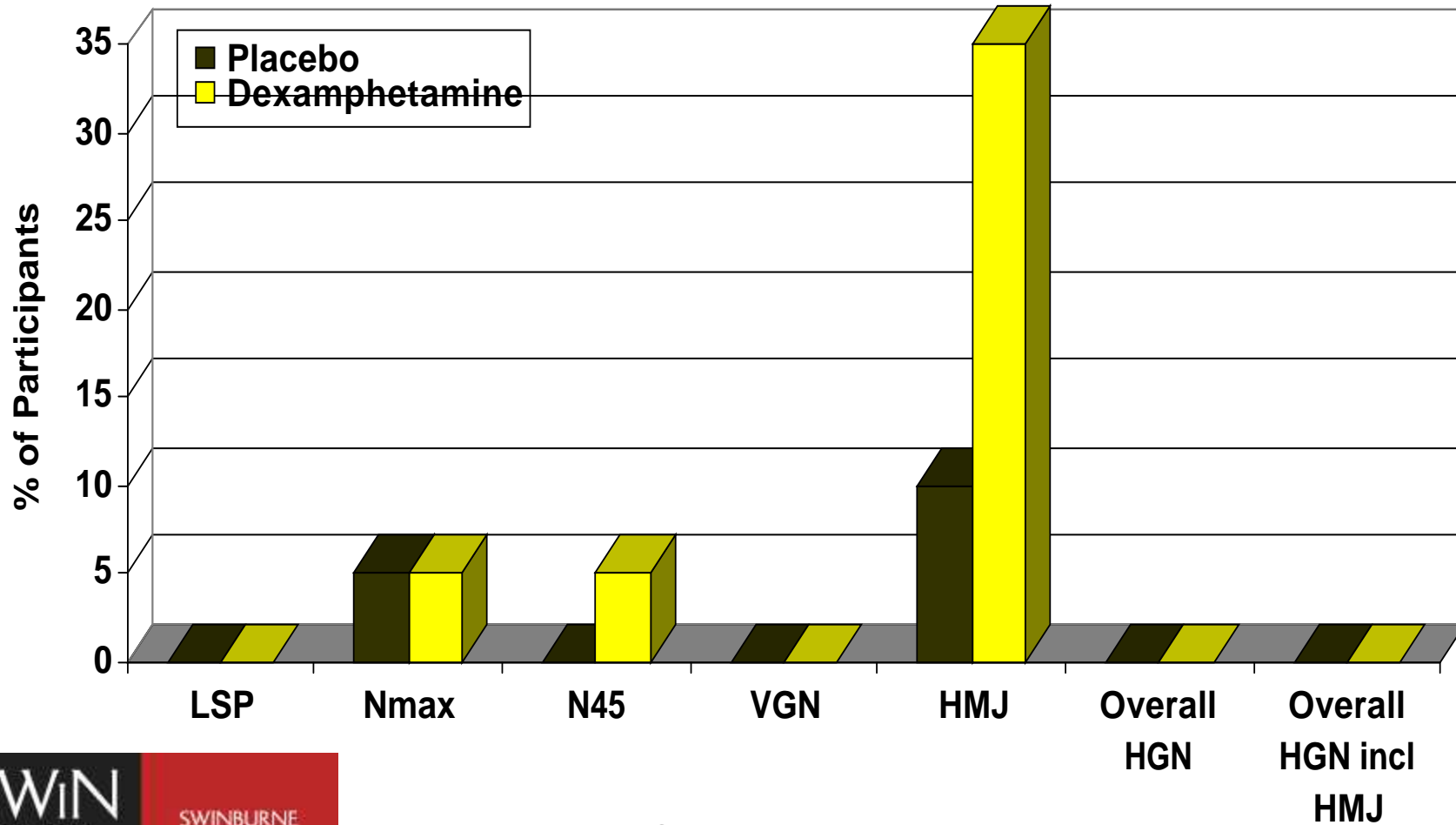


- Each individual sign in the SFSTs
- ➔ Wilcoxon signed ranked test was performed to determine if there was a significant difference between the presence of a particular sign in the placebo condition, compared to the dexamphetamine condition (to explore what specific signs/errors were observed on the SFSTs as a result of dexamphetamine consumption)

# Results



## ■ HGN test



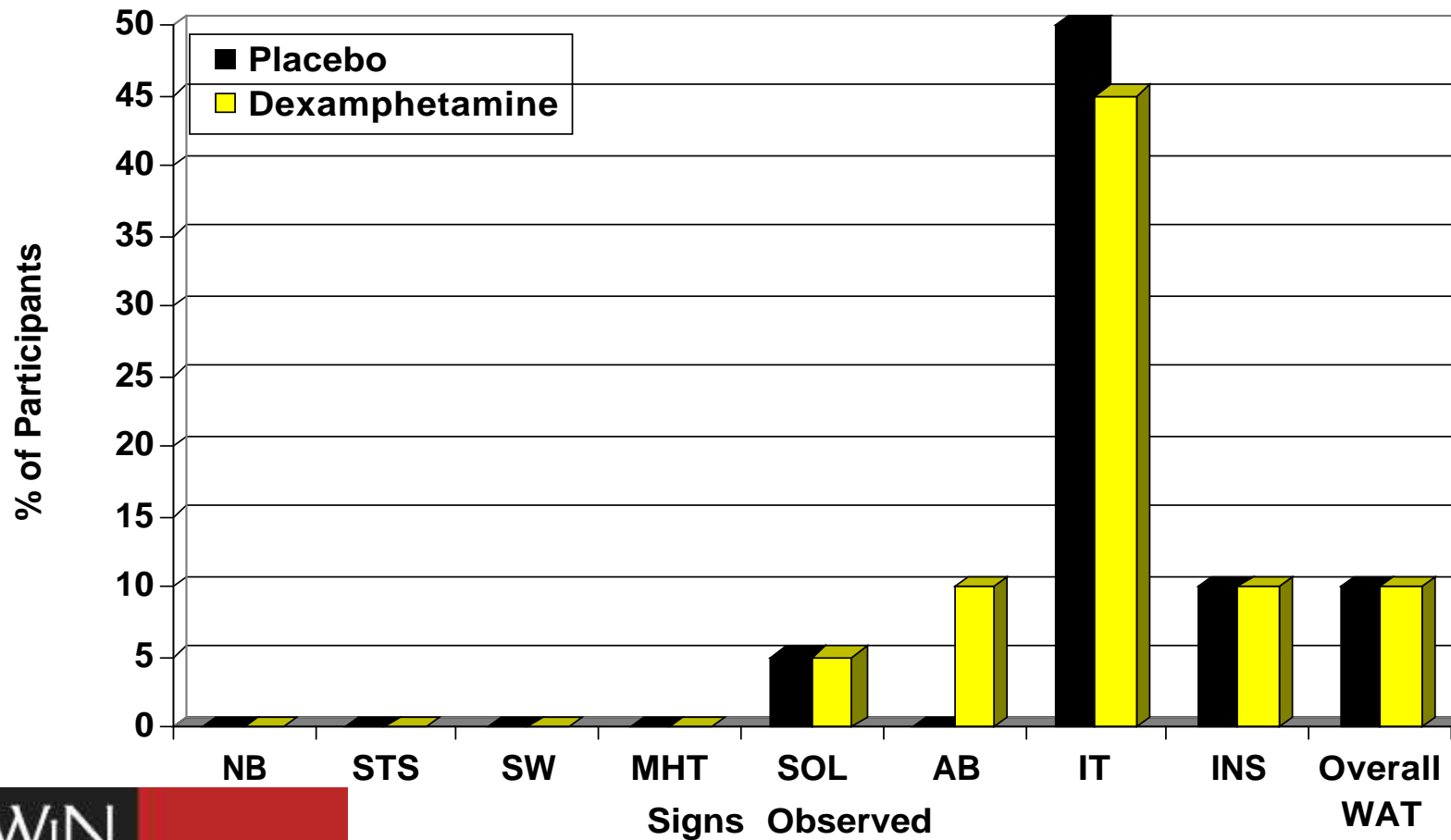
Signs Observed



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- Stimulants do not affect performance related to HGN, LSM, VGN (DRE manual, 1993)
  - Eye signs not useful for stimulant (Adler and Burns, 1994, Page, 1998; Shinar, *et al.*, 2000)
  - The classic ocular sign of stimulant use is dilated pupils that react slowly to light (Page, 1998)
  - HMJ was observed more frequently observed in the dexamphetamine condition than any other HGN sign, as well as any other sobriety test sign. HMJ was the only error to approach statistical significance ( $T = 10$ ,  $p = .096$ )



## ■ WAT test

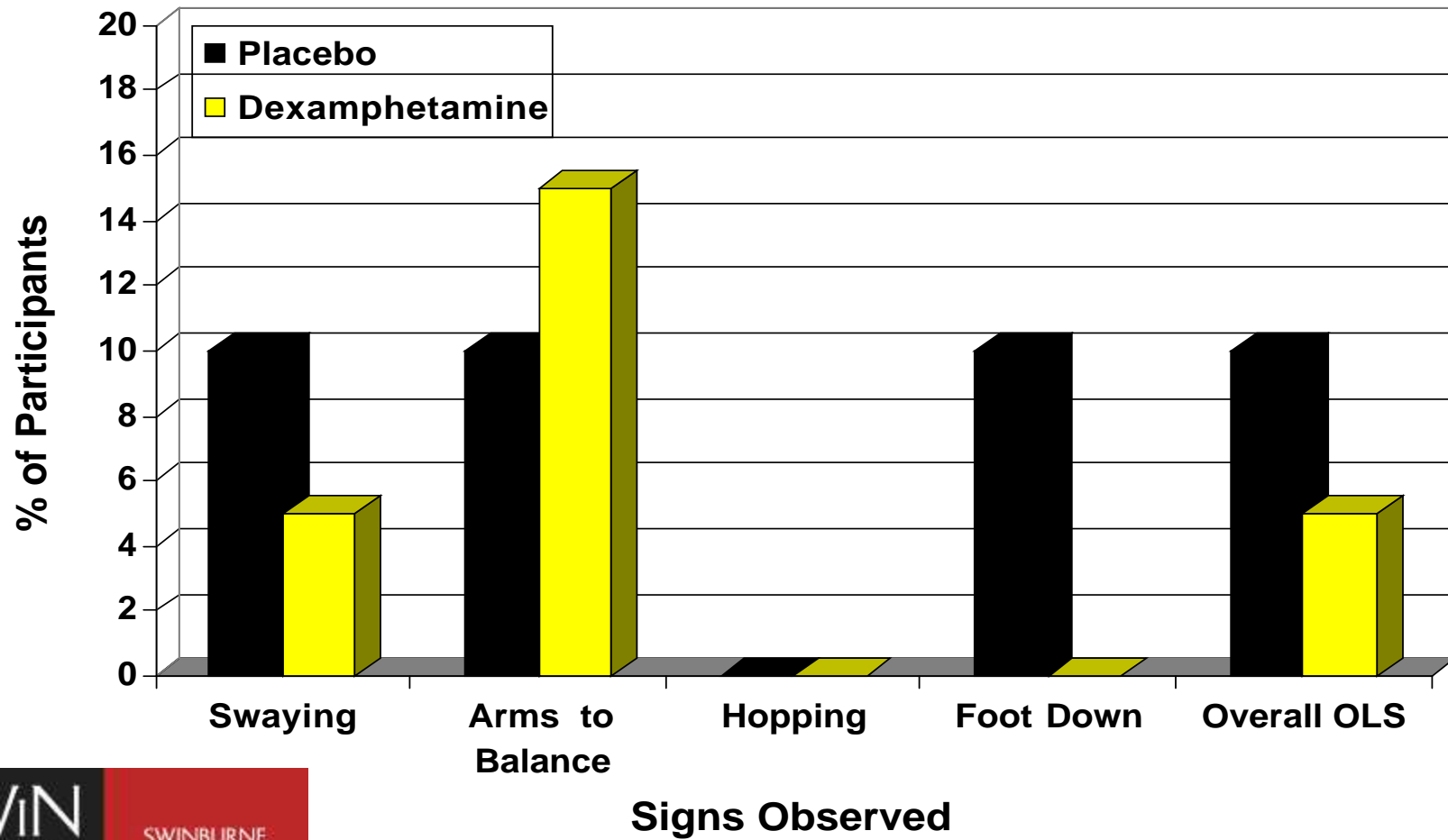




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- The WAT was the best predictor of impairment associated with the consumption of dexamphetamine
  - Improper Turn (IT) occurred frequently across both the placebo and the dexamphetamine condition (50% in placebo, 45% in dexamphetamine), which has also been observed in our cannabis research (32% in placebo, 41% in cannabis)
  - IT is likely to be observed irrespective of drug consumption, administrators should be cautious when evaluating an individual as impaired based on the observation of IT



## ■ OLS test

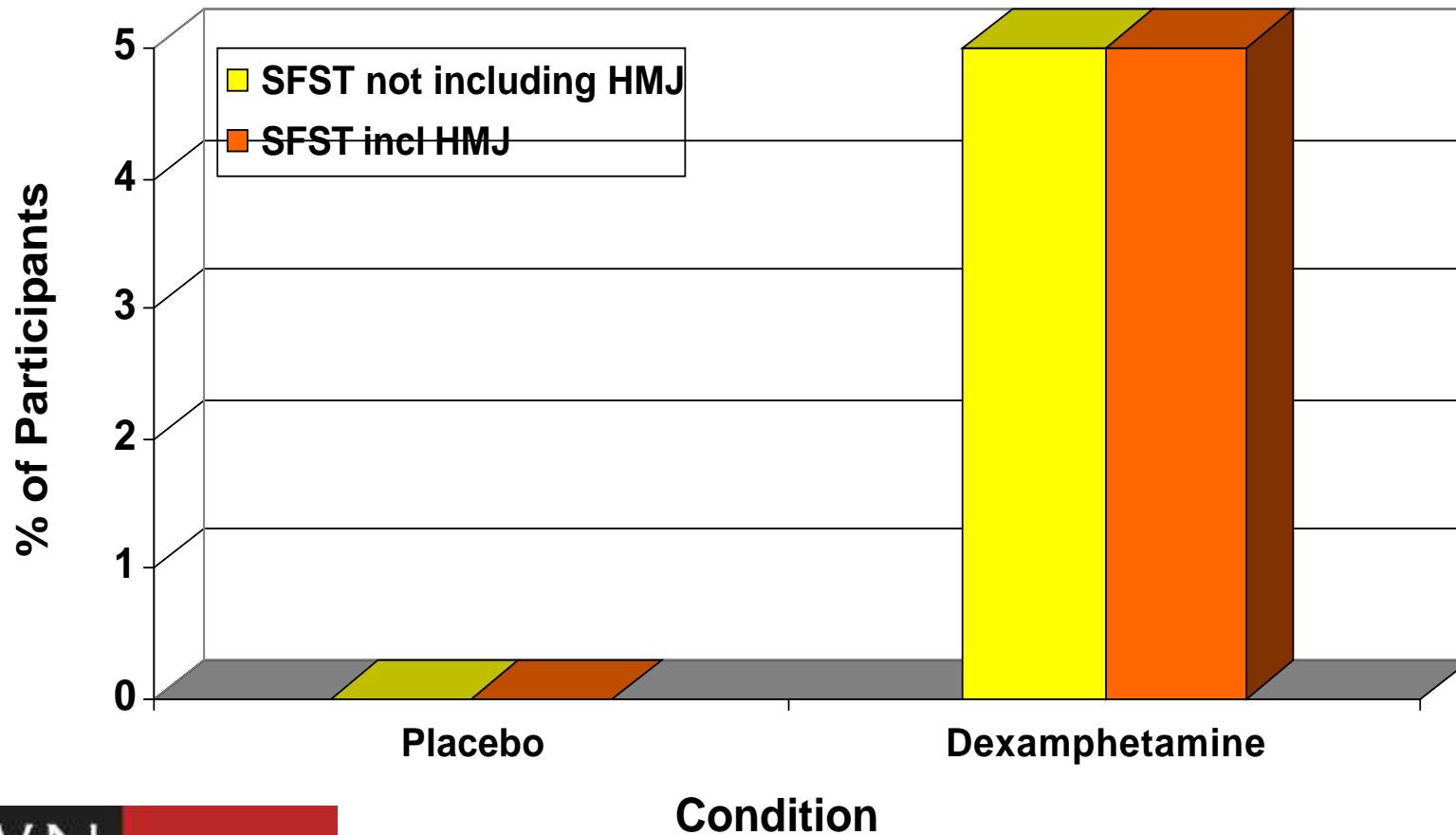




- Individuals made less errors during the dexamphetamine condition in contrast to the placebo condition
- Heishman et al., 1998 found a decrease in errors on the OLS test. This decrease in errors was the third best predictor of the presence or absence of *d*-amphetamine (other best signs were physiological)
- Amphetamines have also been shown to enhance performance (Cami, *et al.*, 2000; Shenberger *et al.*, 1998; Weiss and Laties, 1962), perhaps due to increased concentration on one specific task (ie. Tunnel vision effects)



## ■ SFSTs including HMJ





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- The absence of a significant increase in percentage with HMJ may be associated with traditional signs of the SFSTs not effectively demonstrating the presence of dexamphetamine.
  - Traditional signs in the SFSTs do not effectively screen for dexamphetamine consumption



- However, HMJ was the sign that was best related to dexamphetamine, as it was observed most frequently in the dexamphetamine condition (33%) than any other tradition sign of the SFSTs used ( $p=.09$ )
- The observation of HMJ may also be relevant to the theory that amphetamine induce tunnel vision. In the HGN test, individuals may concentrate heavily on following the stimulus moving across the visual field and therefore forget, or fail to also concentrate on keeping their head still

# SFSTs and driving errors



Dexamphetamine	SFSTs performance	
Driving Performance	IMPAIRED	NOT IMPAIRED
IMPAIRED	1 TRUE	18 FALSE
NOT IMPAIRED	0 FALSE	1 TRUE



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- Driving performance after the administration of dexamphetamine was correctly classified as IMPAIRED or NOT IMPAIRED in only 10% of cases (2 people)
  - SFSTs are a better predictor of driving performance associated with dexamphetamine than predicting whether the drug had been consumed (10% compared to 5%).
  - Consistent with our cannabis research where SFSTs are a better predictor of driving performance associated with cannabis (76%) than predicting whether cannabis had been consumed (46%)



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- Supports the use DEC Program that includes a 12-step testing procedure (physiological signs/drug symptoms) to predict the presence of a drug.
  - Driving Impairment associated with dexamphetamine involves: attention, particularly divided-attention, scanning of visual field and aspects of information processing, specifically, reaction time, and stopping at stop signs (dexamphetamine-induced tunnel vision)
  - These sobriety tests do not assess cognitive processes such as scanning of the visual field (HGN test looks at ocular signs not scanning capability) and sobriety tests do not assess reaction time

# Conclusion

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- A dose of 0.42mg/kg dexamphetamine does not impair performance on sobriety tests (PIT/SFSTs: HGN, OLS and WAT test)
- There is no significant relationship between driving impairment associated with dexamphetamine and performance on sobriety tests (very low percentage of correct classifications)
- Scoring HMJ may lend some information regarding drug intoxication, and it is likely that since this sign was the observed frequently at this low amphetamine dose, it is likely to be observed in greater percentages at higher amphetamine doses



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■ Thank you

