



# Exploring the Predictive Validity of Drug Evaluation And Classification Program Evaluations

This Traffic Tech Technology Transfer Series report briefly summarizes a larger report, *Exploring the Predictive Validity of Drug Evaluation and Classification Programs*, Report No. DOT 812 959.

## Background

The Drug Evaluation and Classification (DEC) program was developed to assist those law enforcement officers known as Drug Recognition Experts (DREs) gather objective information on clinical and behavioral effects of drug use. DREs use a 12-step procedure based on scientific and medical knowledge about known signs and symptoms associated with various drugs. The purpose of the DEC procedure is to give the officer the necessary evidence to determine whether a subject is impaired, whether that impairment is due to drugs or a medical condition, and which of one or more categories of drugs might be responsible.

A comprehensive DEC assessment generally requires 45 to 60 minutes to complete and has more than 100 elements in numerical, narrative, and pictorial form documented during the DEC procedure. DEC-trained law enforcement officers use these elements to identify and evaluate behaviors and physiological indicators associated with seven different drug categories: central nervous system (CNS) depressants, inhalants, dissociative anesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics (opioids).

The primary objective of the study was to determine which combinations of drug-related signs and symptoms from the DEC protocol can most efficiently and effectively predict the drug category or combination used by the subject. A secondary objective was a detailed review of cases ruled out by DREs for not being impaired or due to medical conditions to determine any commonalities in the circumstances and characteristics of these cases.

This study is a statistical analysis evaluating all elements and combinations of elements DREs use in the 12-step procedure to evaluate a subject, to determine which elements are best at predicting impairment overall, and predicting specific drugs. It is important to note that this project was not meant to determine the accuracy of DREs at determining whether a subject is impaired, nor their accuracy at predicting specific drug classes. Rather, this project reviewed

previously confirmed DEC cases to determine which evaluative elements are best at indicating impairment to a DRE performing an assessment of a subject.

## Method

A sample of 2,253 DEC evaluations conducted on suspected drug-impaired drivers in which the evaluating officer opinions were confirmed by toxicological analysis of blood samples was obtained from 11 States geographically distributed across the United States. To be included, each case had to include the Drug Influence Evaluation (DIE) “face sheet,” narrative report, and toxicology report. The cases included drug categories and two-drug combinations commonly encountered by DREs: CNS depressants, CNS stimulants, narcotic analgesics, cannabis, CNS stimulants with cannabis, CNS stimulant with narcotic analgesics, CNS stimulants with CNS depressants, and cannabis with alcohol. In addition, a set of cases deemed “rule-outs” for medical and non-medical reasons were collected for a special review to determine their commonalities in the circumstances and characteristics. Information from the DIE face sheets, narrative reports, and toxicology reports were coded to create a database of measures for statistical analysis.

## Results

### Length of Evaluations

The average time that lapsed between the arrest of the subject and start of the evaluation was 52 minutes. Evaluations took an average of 54 minutes. The time to conduct an evaluation varied depending upon the drug category or combination involved. Rule-out cases required less time to complete than cases with drugs involved.

### Predictive Indicators

*Overall Predictability.* The findings revealed that 22 drug-related signs and symptoms obtained during the DEC evaluation significantly predicted the correct drug category responsible for the observed impairment. Based on this set of 22 drug-use indicators, an overall correct classification rate of 86.5% was obtained across four drug categories and no-drug cases. This classification rate shows how successful the set of 22 indicators is in correctly predicting the drug categories and confirms the validity of these drug-use indicators.

This high level of predictability was confirmed by constructing ROC curves for the CNS depressants and cannabis cases. These ROC curves provide an overall assessment of how well the set of 22 drug-use indicators predicts who did and did not use the category of drug, and the results showed a high level of effectiveness.

*Predicting Drug Category.* The researchers also found the set of drug-related signs and symptoms predicted some of the drug categories (e.g., cannabis) better than others (e.g., CNS stimulants). Within the set of 22 signs and symptoms, 13 were statistically significant predictors of the drug category (see the table below).

Signs and Symptoms	Predictive of Drug Category	Predictive of Drug Combination
Being under care of doctor or dentist	✓	
Condition of the eyes	✓	✓
Condition of eyelids	✓	✓
Mean pulse rate	✓	✓
Assessment of HGN	✓	✓
Convergence	✓	
Performance on OLS Test	✓	
Performance on WAT Test		✓
Eyelid tremors	✓	
Pupil size in room light		✓
Pupil size in darkness	✓	✓
Reaction to light	✓	✓
Rebound dilation		✓
Presence of visible injection sites	✓	✓
Systolic blood pressure	✓	
Muscle tone	✓	✓
Estimation of 30 seconds on MRBT		✓

*Predicting Drug Combinations.* Researchers found that the set of 22 drug-related indicators from the DEC protocol significantly predicted certain drug combinations. An overall classification rate of 75.6% was obtained for correctly classifying the four drug combinations and rule-out cases—about 10% lower than the analysis that predicted a single drug category. Some drug combinations were better predicted than others. The 12 key drug-related indicators contributed significantly to the prediction of drug combinations (see the table above).

*Best Indicators.* Note that there was overlap between the indicators that significantly predicted drug category and combination; 8 indicators were common to both (see the gray cells in the table).

*Indicator Groupings.* This study also investigated the contribution of specific groupings of drug-related signs and symptoms.



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Indicators related to the appearance and physiological response of the eye contributed the most to the prediction of both single-drug categories and drug combinations, followed by clinical indicators and performance on the psychophysical tests. Observations and statements made by subjects contributed the least to the prediction of drug category and were not statistically significant predictors of drug combinations.

## Qualitative Review of Cases

The qualitative analysis of cases ruled out for medical reasons revealed that the subjects were older, more likely to have been involved in crashes, and more likely to report being diabetic. A range of medical conditions and injuries were reported that were considered to have possibly influenced the evaluation or rendered the subject incapable of performing the tests.

## Summary and Discussion

The findings from this study suggest that DREs review a set of key signs and symptoms when determining the categories of drugs used by suspected drug-impaired drivers. Drug use indicators related to the appearance and physiological response of the eye were found to contribute the most to the prediction of the drug category/combination responsible for the impairment. However, prediction of the drug categories and combinations was not found to be perfect, pointing to the need to consider the other indicators from the evaluation and the observational skills of the DRE to assess the totality of drug symptomatology. The detailed review of medical rule-out cases revealed a variety of medical conditions that could have led to observations that either mimicked drug effects or that could not be distinguished from drug effects.

Further investigation of a large sample of medical rule-out cases could get a better picture of these types of cases. Focusing attention on the key signs and symptoms identified in this research, in training and practice, may enhance the validity, effectiveness, and efficiency of drug detection and identification by DREs and may lead to a more effective and efficient DEC program, improved enforcement of drug-impaired driving, and greater acceptance of the DEC program by the courts.

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