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Detecting Changes in Pupil Response Trajectories to Light after Cannabis Consumption

Introduction/Purpose:

With the current trends to legalize marijuana for recreational use, an objective measure of acute impairment is needed to define driving impairment. While multiple tests of functional impairment are conducted in the Standard Field Sobriety Test, research demonstrates limited ability to detect impairment for habitual users of marijuana. However, a potential test for functional impairment is pupillary light reflex (PLR), and unlike other measures, research is mixed on the whether this test reliably detects impairment in marijuana users. We explore differences between non-smokers, occasional and daily smokers of marijuana in a sample of 84 participants as part of X study.

Methods:

ROC analyses were conducted on models to discriminate between smokers and non-smokers using either a single value summary of PLR, such as the point of minimal constriction, or the full trajectories of PLR. Additionally, using function-on-scalar regression (FoSR) from the functional data branch of statistics, we estimate differences between trajectories of PLR by categories of daily, occasional or no marijuana use.

Results:

ROC analyses showed a higher AUC for the model using the full trajectories of PLR compared to the model of using single value summaries of the PLR (AUC: 0.71 vs 0.68). FoSR models estimated statistically significant differences between both occasional and daily users when compared to non-users. No statistically significant differences were estimated between occasional and daily users.

Discussion (Conclusion [as per journal]):

By applying functional data statistical methods to PLR, we have shown differences between non-users and both occasional and daily smokers of marijuana. With further study of PLR, these methods may provide a simple and efficient method to determine driving impairment from marijuana use.

Practical Application:

As the rate of marijuana consumption increases, a simple, efficient and objective test of driving impairment is vital for ensuring driver and passenger safety on our roadways. By using methods from functional data, we can use PLR to develop a test of functional impairment from marijuana use.