All or Nothing: Issues Surrounding the Measurement and Analysis of Frequency of Use Data

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Background

The 'all or nothing' nature of drug use in treatment-seeking populations represents a potential pitfall for researchers who use frequency of use as a measure of treatment efficacy. The standard statistical tests, such as analysis of variance or regression, are predicated on the assumption that **outcomes are distributed normally**. Frequency-of-use data is often distributed **bimodally**, hence analysis with standard tests may lead to incorrect conclusions concerning treatment effectiveness. Using data from a real clinical trial, we outline a series of steps that can provide more robust inference of bimodal frequency of use data.

Step 1: Parametric Analysis – Figure 1

We analysed frequency-of-use data from a randomised controlled trial testing the efficacy of a tetrahydrocannabinol agonist (nabiximols) for treating cannabis dependence against placebo[1]. A longitudinal mixed-effects regression was performed, testing the between-group differences in number of days' use of illicit cannabis in the previous 28 days at four time points: baseline, 4, 8, and 12 weeks.

Step 2: Assumption Tests – Figures 2a and 2b

A histogram (**2a**) revealed this variable to be distributed bimodally. The extent of departure from normality was confirmed by a Quantile-Quantile plot (**2b**). Two approaches were used to address this problem (Steps 3 and 4).

Step 3: Dichotomisation – Figure 3

We calculated a 'percentage-change-from-baseline score' and then transformed this into a binary '≥50% reduction in days' use' versus '<50% reduction', which also favoured the Nabiximols group (p=**0.029**).

Step 4: Non-Parametric Analysis – Figure 4

A non-parametric longitudinal analysis, using the 'nparLD' package[2] in R, indicated the time curves for the treatment groups were not parallel (p=**0.003**), matching the results from the parametric analysis.

Discussion

When frequency of use variables are distributed bimodally, judicious use of assumption tests, transformation, and non-parametric techniques can be used to strengthen the credibility of the results from standard statistical tests.

Figure 1. Between-Group Difference in Days' Use of Illicit Cannabis in Previous 28 Days at Four Time Points

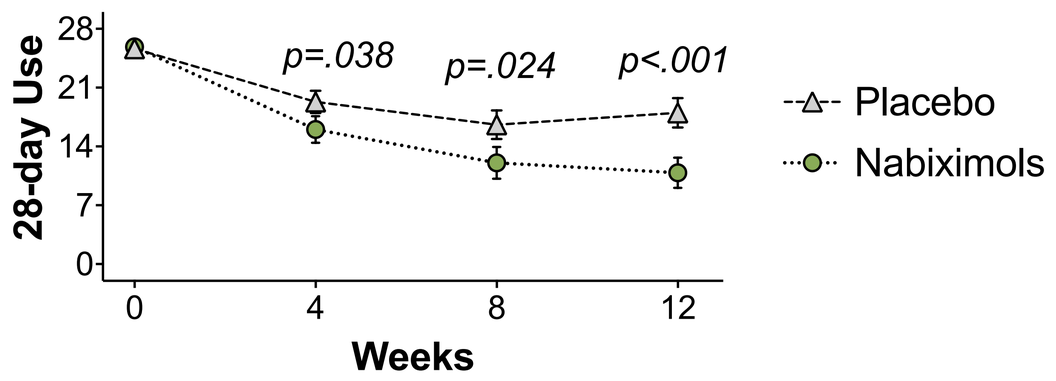


Figure 2. (a) Histogram and (b) QQ-Plot of 28-Day Frequency of Use Data

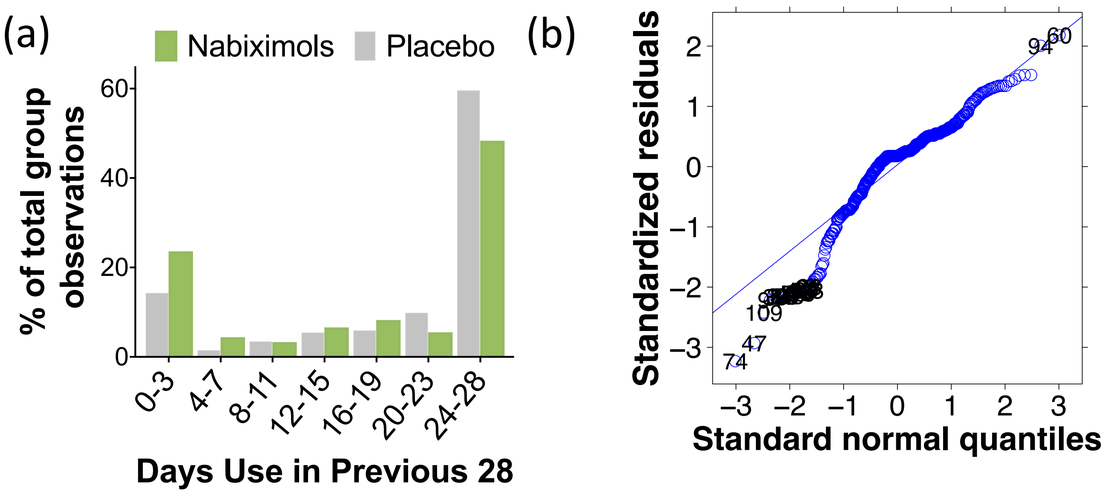


Figure 3. Proportion in Each Group Who Reduced Days' Use by Half or More at Week 12 Relative to Baseline

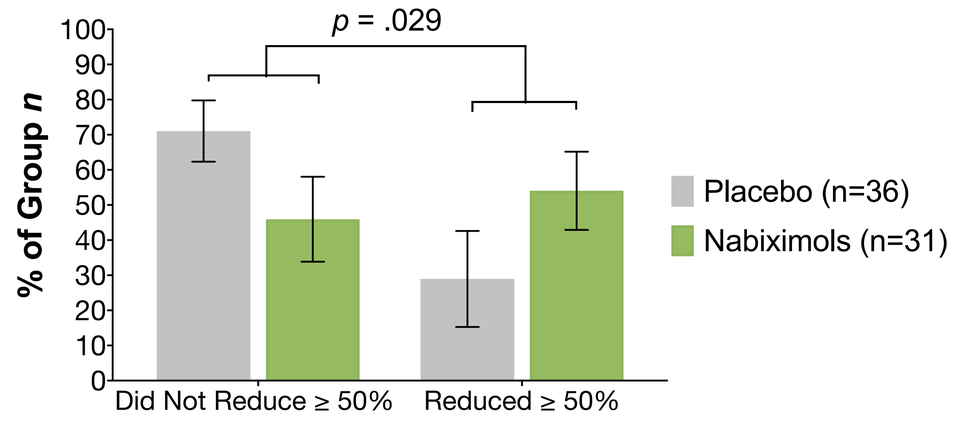
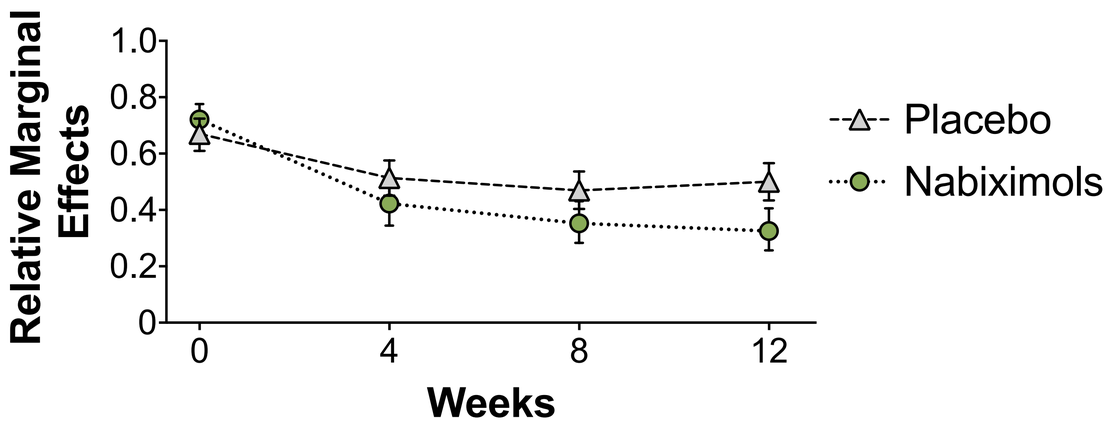


Figure 4. Non-parametric Analysis of Between-Group Differences in Days' Use of Illicit Cannabis



Disclosure of Interest: Study drugs (nabiximols and placebo) were provided free of charge by GW pharmaceuticals.

[1]Bhardwaj et al. 2018 [2]Yoguchi et al., 2012

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