Optimal allocation to maximize power of two-sample tests for binary response trials

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We study allocations that maximize the power of tests of equality of two treatments having binary outcomes. When a normal approximation applies, the asymptotic power is maximized by minimizing the variance, leading to Neyman allocation that assigns observations in proportion to the standard deviations. This allocation, which in general requires knowledge of the parameters of the problem, is recommended in a large body of literature. Under contiguous alternatives the normal approximation indeed applies, and in this case Neyman allocation reduces to a balanced design. However, when studying the power under a non-contiguous alternative, a large deviations approximation is needed, and Neyman allocation is no longer asymptotically optimal. In the latter case, the optimal allocation depends on the parameters, but turns out to be rather close to a balanced design. Thus, balanced design is a viable option for both contiguous and non-contiguous alternatives. Finite sample studies show that balanced design is indeed generally quite close to being optimal for power maximization. This is good news as implementation of balanced design does not require knowledge of the parameters.

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