Science Table Plots Brainstorm

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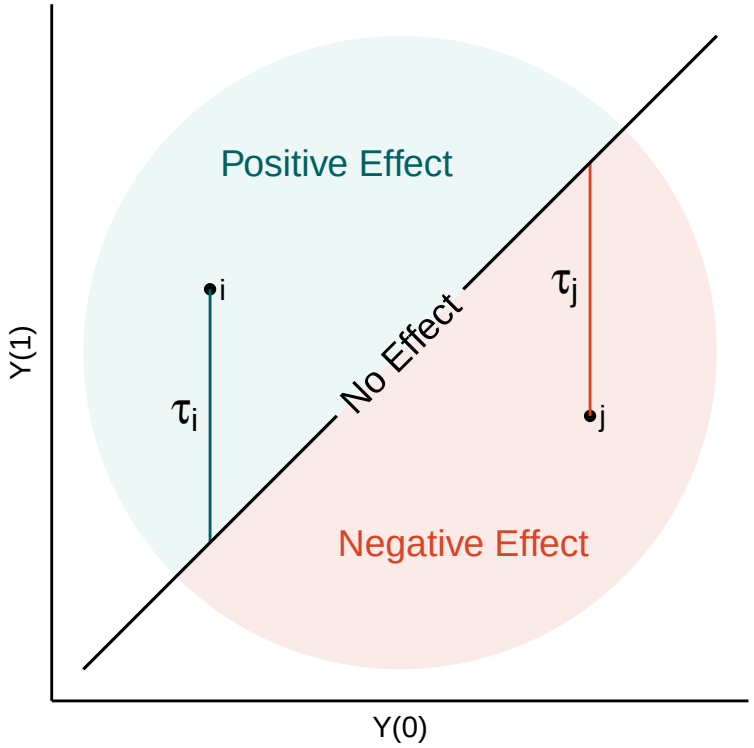
1 The Science Table Plot

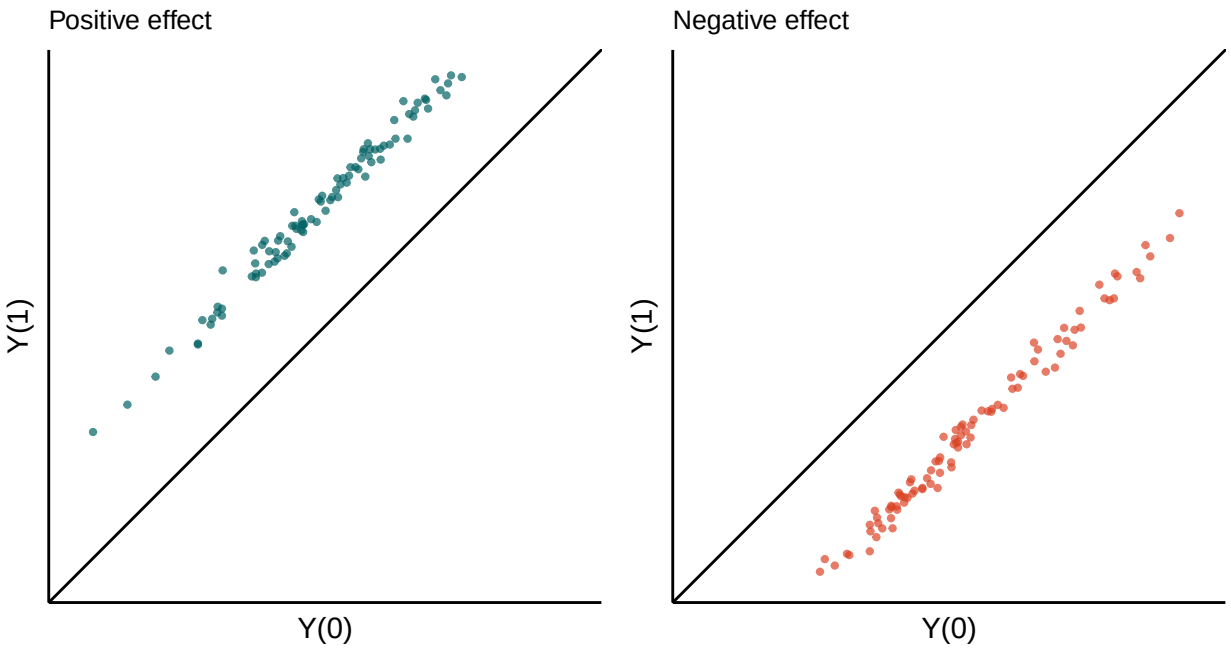
Many a graduate-level course on causal inference begins with a discussion of the *Science Table*: the complete set of potential outcomes for all individuals in a sample (**rubin?**). The science table – and the potential outcomes within it – become the teaching foundation for a variety of causal inference approaches. Herein, I propose a new teaching visualization, *the science table plot*, which depict individuals according to tehri treated and untreated potential outcomes. While in practice the science table plot, like the science table itself, is fundamentally unobservable, in the classroom the science table plot is a handy companion to the science table, underscoring and clarifying foundational causal inference concepts.



In a science table plot, individuals are depicted according to their treatment and control potential outcomes. In this setting, a subject's individual treatment effect is graphically represented as their vertical distance to the diagonal line representing $Y(0) = Y(1)$ (Figure 1A), and different areas of the plot represent positive, negative, or neutral responses to treatment. Average treatment effect, then is the average distance of all points to the diagonal. Other estimands which focus on just a subset of the sample, such as the average

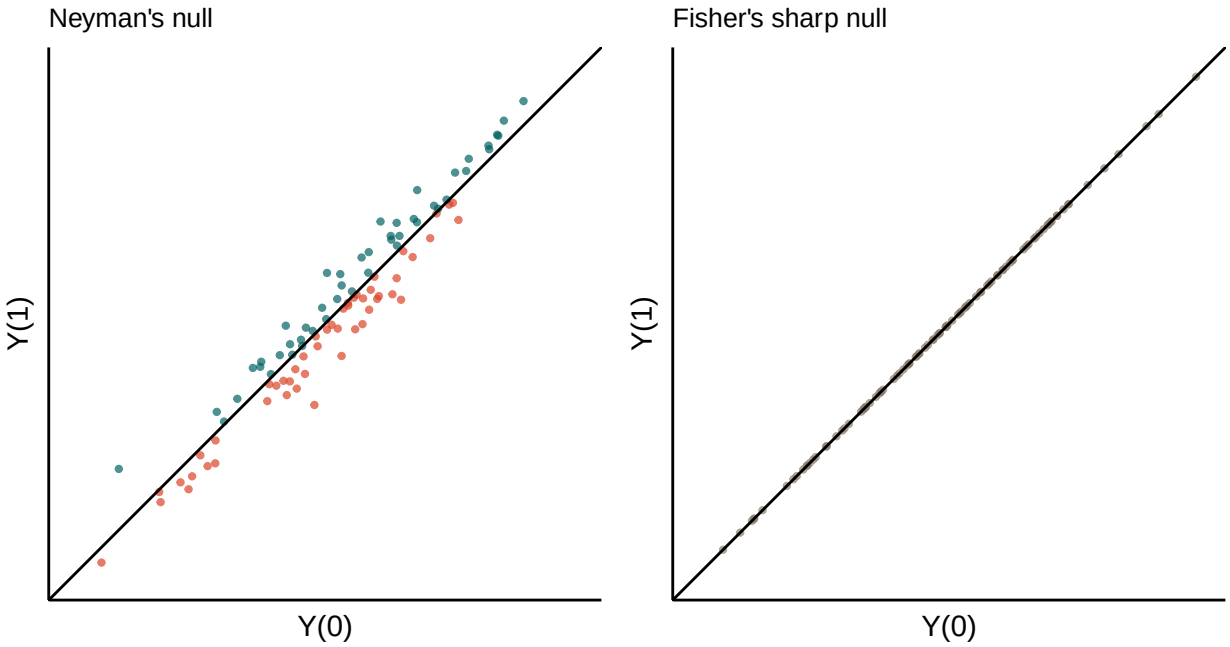
treatment effect among the treated, are simply the average distance to the diagonal for all points in the subsample.

The next plot visualizes two commonly assumed scenarios for treatment response: a relatively homogenous additive treatment effect, and a relatively homogenous negative one.



2 The null hypotheses

Science Table plots offer an interesting visualization of the two major "null" hypotheses of causal inference. Figure 1C illustrates Neyman's null hypothesis: the average treatment effect is zero, but individual treatment effects may still vary. This is in stark contrast to Fisher's sharp null (Figure 1D), in treated and control potential outcomes are identical for all individuals in the study. This juxtaposition in particular may be an intuitive illustration in educational settings.


Neyman's null
Y(1)
Y(0)
Fisher's sharp null
Y(1)
Y(0)