

(5) **Hypnosis**

Some researchers claim that susceptibility to hypnosis can be acquired or improved through training. To investigate this claim six subjects were rated on a scale of 1-20 according to their initial susceptibility to hypnosis and then given 4 weeks of training. Each subject was rated again after the training period. In the ratings below, higher numbers represent greater susceptibility to hypnosis.

Subject	Before	After
1	10	18
2	16	19
3	7	11
4	4	3
5	7	5
6	2	3

Specify and perform the appropriate hypothesis test. What potential issues exist with this analysis?

we can use the sign-test. If  $X_i$  is the susceptibility before the training and  $Y_i$  the susceptibility after the training, then  $K := |\{i \in \{1, \dots, n\} \mid Y_i > X_i\}| \sim \text{Bin}(n, \theta)$  for some parameter  $\theta$ . We test  $H_0: \theta = 0.5$  vs.  $H_1: \theta > 0.5$ . In our case  $n=6$ .

In the sample above, we have 4 successes. The p-value is

$$P(K \geq 4) = \sum_{i=4}^6 \binom{6}{i} 0.5^i \cdot 0.5^{6-i} = \left(\frac{1}{2}\right)^6 \left(\binom{6}{4} + \binom{6}{5} + \binom{6}{6}\right) = \frac{1}{64} (15+6+1) = \frac{22}{32}$$

Hence we fail to reject the null Hypothesis. A problem with this test might be that it does not take the magnitude of the improvement in susceptibility into account.

$$\begin{array}{ccccccc} & & & & 1 & & & \\ & & & & 1 & & 1 & \\ & & & 1 & 2 & 1 & & \\ & & 1 & 3 & 3 & 1 & & \\ & 1 & 4 & 6 & 4 & 1 & & \\ 1 & 5 & 10 & 10 & 5 & 1 & & \\ 1 & 6 & 15 & 20 & 15 & 6 & 1 & \end{array}$$