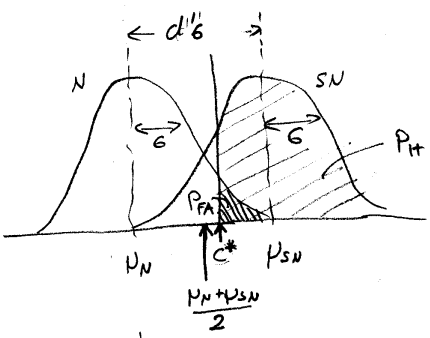
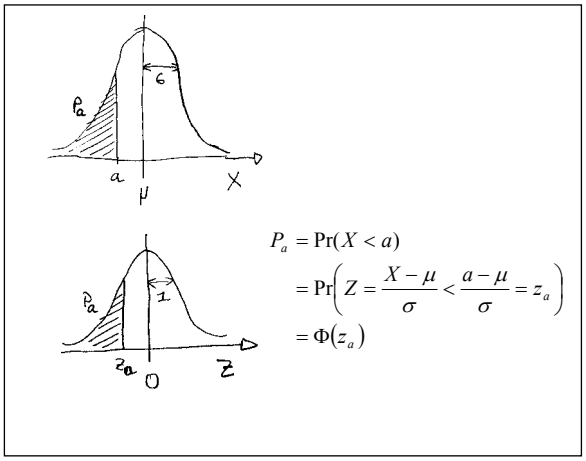
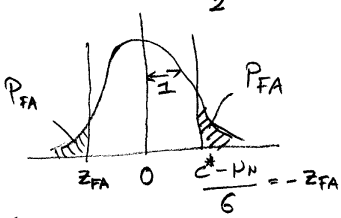
d' interpretation

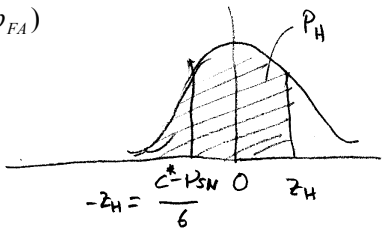




$$P_a = \Pr(X < a) = \Pr\left(Z = \frac{X-\mu}{\sigma} < \frac{a-\mu}{\sigma} = z_a\right) = \Phi(z_a)$$



$$z_{FA} = \Phi^{-1}(p_{FA})$$



$$d' = z_H + (-z_{FA}) = \frac{\mu_{SN} - c^*}{\sigma} + \frac{c^* - \mu_N}{\sigma} = \frac{\mu_{SN} - \mu_N}{\sigma}$$

$$z_H = \Phi^{-1}(p_H) = \frac{\mu_{SN} - c^*}{\sigma}$$

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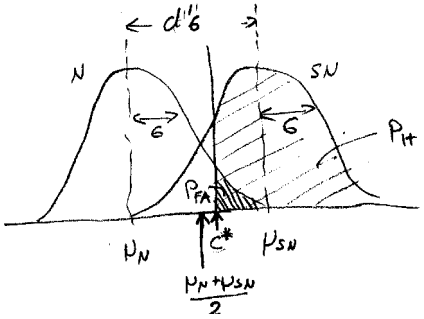
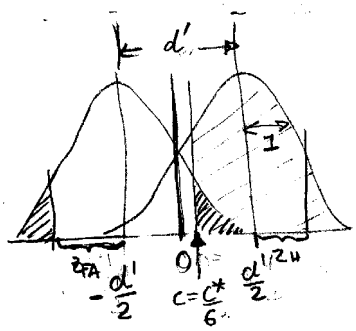
c interpretation



the response criterion c is the normalized distance from the midpoint between the two distribution means

$$c = -\frac{z_H + z_{FA}}{2} = -0.5\left(\frac{\mu_{SN} - c^*}{\sigma} + \frac{\mu_N - c^*}{\sigma}\right) = -0.5\left(\frac{\mu_{SN} + \mu_N}{\sigma} - \frac{2c^*}{\sigma}\right) = \frac{c^*}{\sigma} - 0.5\left(\frac{\mu_{SN} + \mu_N}{\sigma}\right)$$

origin and scale can be fixed by setting $\mu_{SN}+\mu_N=0$ and $\sigma=1$



After normalization, the distributions means correspond to d'/2 and –d'/2 respectively

$$\frac{\mu_{SN} - \frac{(\mu_{SN} + \mu_N)}{2}}{\sigma} = \frac{2\mu_{SN} - \mu_{SN} - \mu_N}{2\sigma} = \frac{\mu_{SN} - \mu_N}{2\sigma} = \frac{d'}{2}$$

and the response criteria c is separated by $-z_H$ and $-z_{FA}$ from these means. Therefore

$$\left.\begin{array}{l} c = -d'/2 - z_{FA} \\ c = +d'/2 - z_H \end{array}\right\} \quad c = \frac{(-d'/2 - z_{FA}) + (d'/2 - z_H)}{2} = -\frac{z_H + z_{FA}}{2}$$

Gabriel Baud-Bovy