

Let  $\psi(x; \theta)$  be a base psychometric function that runs from 0 to 1 as stimulus intensity  $x$  runs from small to large. The base function  $\psi$  has parameters  $\theta$ , which we don't care about here.

Let  $g$  be the guess rate – probability correct when subject just guesses when stimulus value is at its smallest.

Let  $l$  be a lapse rate – on this fraction the subject doesn't see the stimulus and thus just guesses.

Then the probability correct is given by

$$\begin{aligned} &lg + (1 - l)(g + (1 - g)\psi(x; \theta)) \\ &= g + (1 - l)(1 - g)\psi(x; \theta) \\ &= g + (1 - g - (l - lg))\psi(x; \theta) \end{aligned}$$

Thus, the observed high stimulus value percent correct in this parameterization is  $1 - (l - lg)$ . This makes intuitive sense. On some trials where the subject doesn't see the stimulus, the subject will guess correctly, so that the observed high stimulus value percent correct is slightly higher than  $1 - l$ .

In the mQUESTPlus implementation of the Weibull psychometric function, the probability correct is coded as

$$\begin{aligned} &1 - (l' - (g + l' - 1)(1 - \psi(x; \theta))) \\ &= 1 - l' + (g + l' - 1) - (g + l' - 1)\psi(x; \theta) \\ &= g + (1 - g - l')\psi(x; \theta). \end{aligned}$$

with  $g$  and  $l'$  the guess and lapse rates as parameterized in the mQUESTPlus function. Here the observed high stimulus value percent correct is  $1 - l'$ . That is, in this parameterization,  $l'$  is giving the directly observed drop from perfect performance at high stimulus values.

By inspection, we have  $l' = l(1 - g)$  and  $l = l'/(1 - g)$ .

(Note that the value of  $g$  cannot sensibly be 1 for a reasonable experiment.)

So, the two forms can make equivalent predictions, but a little bit of translation is required to shift the lapse parameters for one to the lapse parameter for the other.