Laboratory exercise:
Adaptive tracks and psychometric functions

The purpose of this assignment is familiarise you with the notion of psychometric functions and adaptive tracks from psychoacoustic testing, plus give you some experience in manipulating data in Excel and/or SPSS.

Run yourself through the 3I-3AFC format using SHaPS for notched-noise masking in the condition *Notch0* until you have 3 tests with thresholds reasonably similar to one another (within 5 dB). There are 6 results files generated from these tests. The .csv files can be opened in Excel, and they contain the trial-by-trial results from the task, with the following information:

Trial: trial number
Track
Level
Continuum
Standard: stimulus number on the continuum for the fixed stimulus (noise alone)
Comparison: stimulus number on the continuum for the comparison stimulus
(noise + tone)
Accuracy: 1 if correct and 0 if incorrect for that particular trial
Direction
LevittCount
Reversals: reversal number
StepSize
RespTime
TrialType
Time
**Answer:** the position of the noise with the tone (Left, Middle or Right)
RespKey: the response given by the listener

Once you start manipulating these files, save them as Excel files (.xls or .xlsx) so you can preserve the work you do in them.

Looking at individual adaptive tracks
Look at your adaptive tracks through RShell and write a description of the rules followed by the tracking algorithm. You will find it useful to read Levitt (1971) as SHaPS uses a modification of the 3-down 1-up rule (a link for this paper can be found on the course web site). How do step-sizes change throughout the track?

Using Excel, plot the comparison level as a function of trial number. Draw in the threshold calculated from the final 4 track reversals and comment on how well the calculated threshold seems to relate to the track. Compare your track to the one generated in RShell. Here's an example of a track as plotted in Excel:
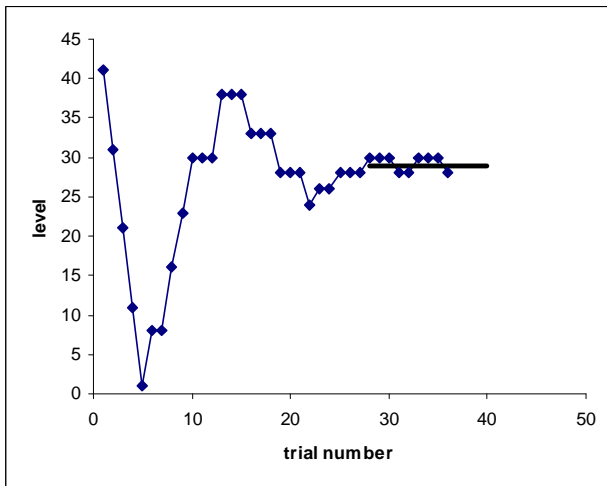
Creating a psychometric function

Collect together all the trials from all three tracks on a single worksheet, labelling each column appropriately. SPSS is very fussy about the length of the labels used, so use labels like: session,trial,std,comp,correct,dir,L,rev,step,latency,test,time,order,resp

Open your Excel file in SPSS, telling it to read the variable names from the top row. Save away this SPSS file with an appropriate name. You can then get SPSS to tally up your psychometric function using Analyze → Tables → Basic Tables. You should be able to generate a table that looks like the following, which should be included in your report:

comp	r	n
1	0	1
8	1	2
11	1	1
16	0	1
21	1	3
23	0	1
24	0	1
26	2	7
28	19	29
30	20	21
31	9	9
33	3	3
36	6	6
38	3	3
41	3	3

Here **comp** is the level of the comparison stimulus, **r** is the total number correct, and **n** is the total number of trials. Copy this table into your Excel file on another worksheet. You can then calculate the probability of being correct at each comparison level (**p**), and plot your psychometric function using a bubble plot so the size of the points you plot is related to the number of trials at that particular level.

TMTF 128
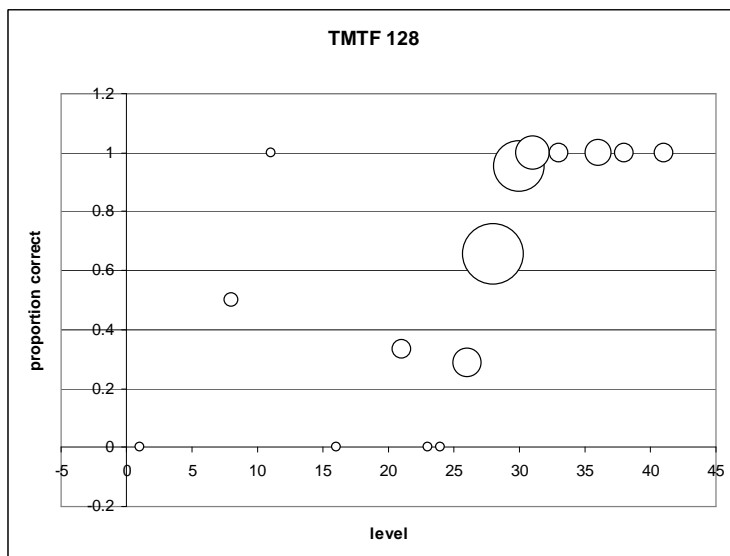
In this particular instance, you would see a plot something like this at left:

TMTF 128
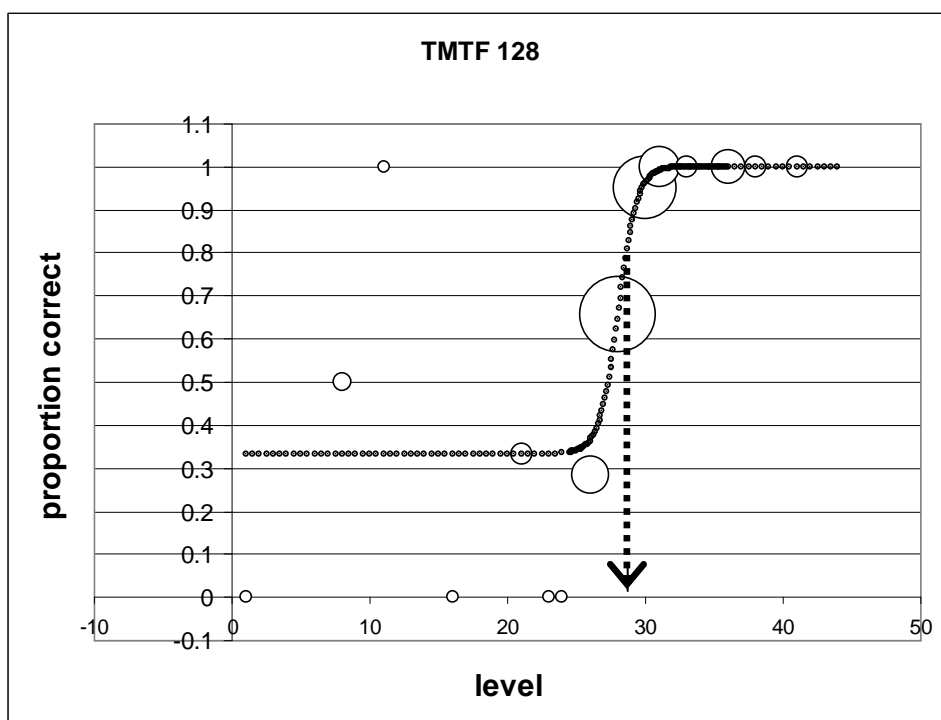
Sketch a sigmoid (S-shaped) curve by eye to the data points, weighting larger symbols more. Towards the left-hand side, your function should flatten out at chance level (⅓) because you used Triples 3AFC format. Here's an example at left, with a threshold of about 28:

From your fitted psychometric function, determine the stimulus level that leads to 79% correct (the level tracked by the 3-down 1-up rule. How does this compare to the median threshold of your 3 tracks?

Up until now, you can express all your results in terms of stimulus number on the continuum. Now take your best estimate of the threshold (perhaps an average of the median of the 3 tracks and your estimate from the psychometric function). Convert those to genuine physical values (here the SNR in dB) by subtracting 31 from the stimulus number, and compare the value with others near you. It should be about 20 dB.

Summary of what you should produce

- A short (one-paragraph) summary of the stimuli in the particular test you used, and a description of what physical variable that is being manipulated.
- A description of the adaptive psychophysical procedure
- A plot of one adaptive track with the calculated threshold drawn in, and a sentence or two about the correspondence
- Your psychometric function in a table
- Your psychometric function as a bubble chart with an appropriate sigmoid function drawn in (by hand is fine), and a threshold indicated.
- A few sentences about the threshold derived from the adaptive tracks, and from the psychometric function
- A calculation of what the threshold represent in physical terms, and a comparison of this value to one obtained in a previous study

You need not hand in this work but you must do it. Brevity is all!

Reference List

Levitt, H. (1971). Transformed up-down methods in psychoacoustics. *Journal of the Acoustical Society of America, 49,* 467-477.