# Can We Predict What You Hear?

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## 1 Introduction

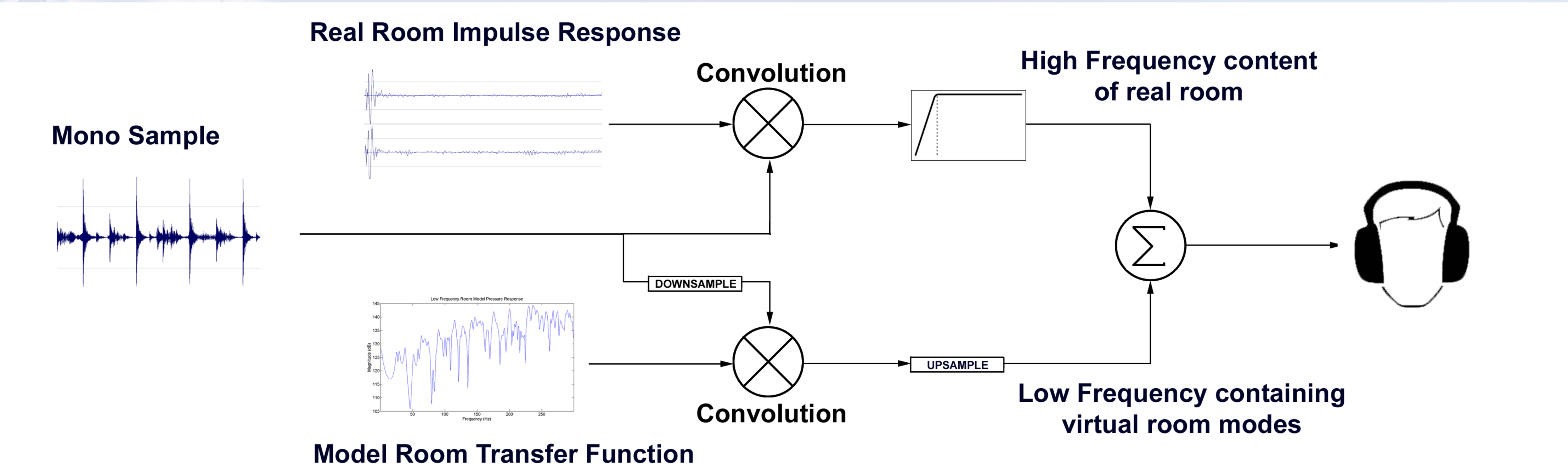
It has long been desired to control the soundfield within rooms, particularly at low freqeuncies where standing waves are present and degrade the sound quality.
Many researchers have attempted to design better rooms by optimising the dimensions, and producing an objective score to predict the reproduction quality of the room.
However, concerns have been raised as to whether these objective scores correlate with our perception. If they do not, designing rooms according to them is of no benefit.

## 2 Aim

To determine if subjective scores of room quality correlate with a proposed objective measure.

## 3 Method

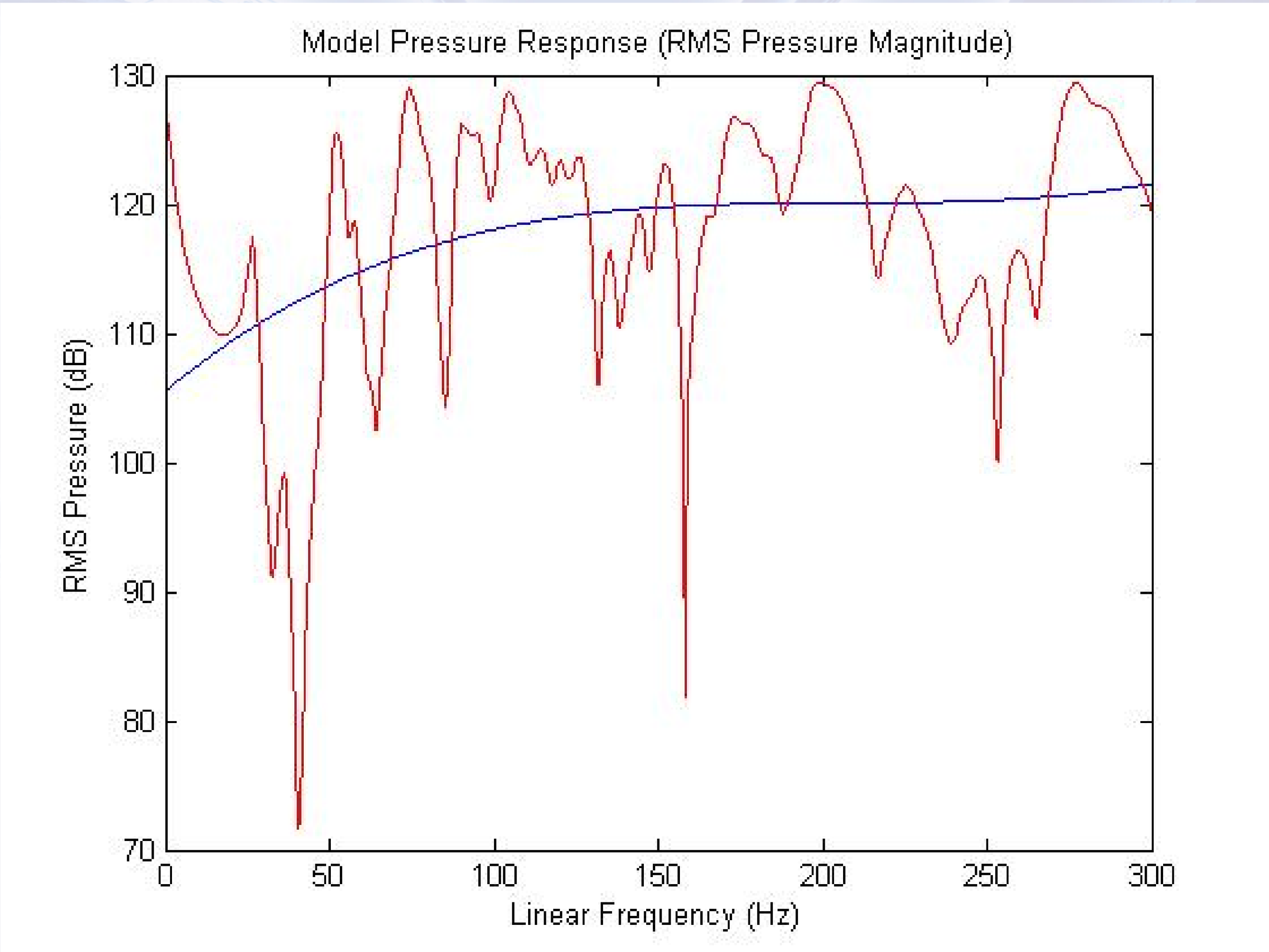
We can create rooms with a particular score or 'figure of merit' (FOM) for testing. We use an analytical model to generate a frequency response, which is then convolved with music to place the listener virtually within any room. This is a technique known as 'binaural auralisation'.




## 4 Obtaining a Score

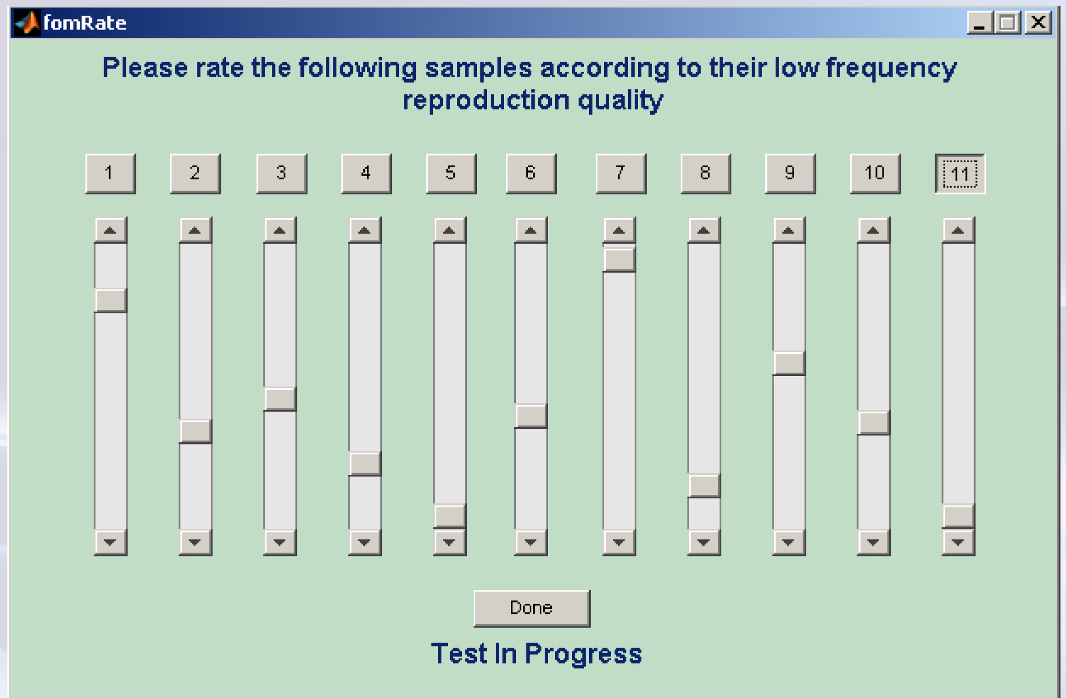
The proposed FOM is calculated by taking the average deviation between the rooms frequency response and a third order polynomial line fitted through it. This line represents a smooth response, and it is suggested that the closer to this case, the better the reproduction quality.

In this example we were interested in finding out if those features of the response which are affected by room ratios and source/receiver position were significant.



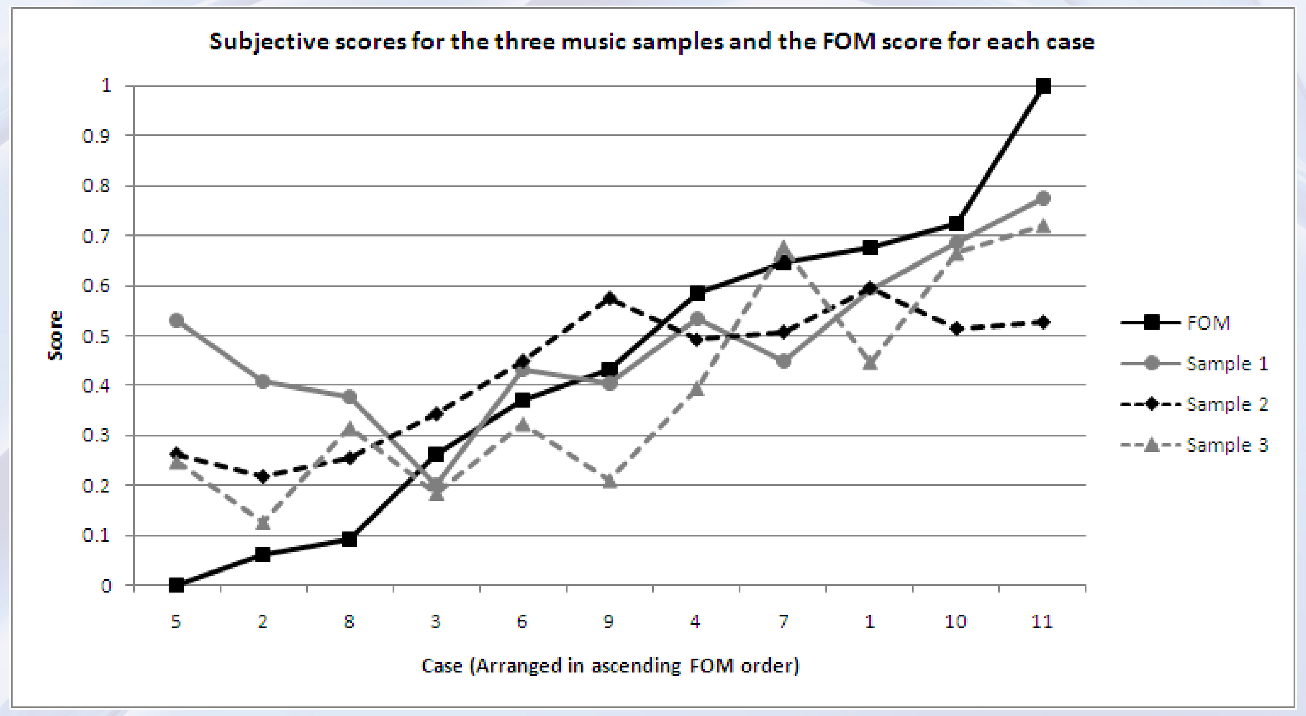

## 5 Testing

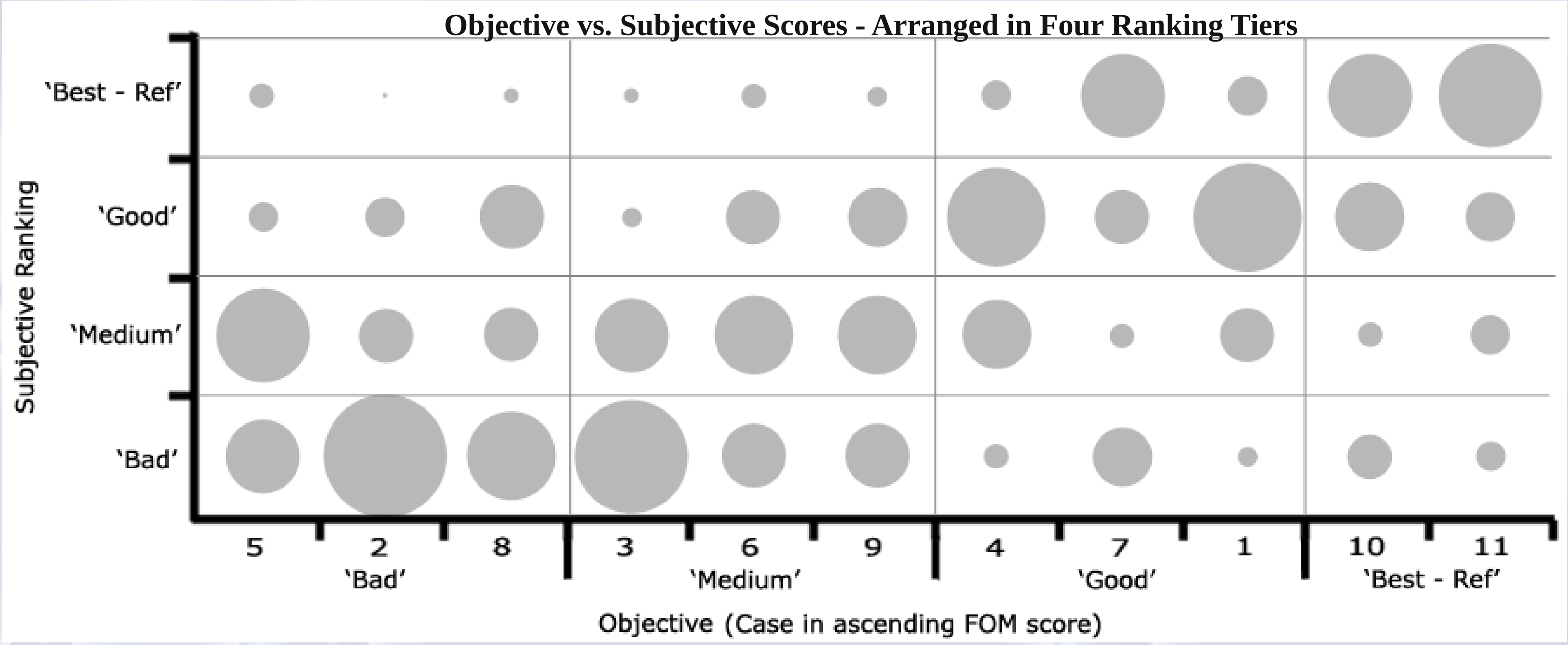
A Matlab program allows users to audition 11 virtual rooms, and rate these using a set of sliders. This test is repeated with three different music samples. 15 subjects were tested.




## 6 Results

The graph below shows the mean score for each virtual room case, for the three music samples, along with the predicted FOM. Below this, the bubble size represents number of subjects who ranked the cases as Best, Good, Medium or Bad (including all three music samples), and how this correlates to the objective measure.




## 7 Conclusions

1) A general trend can be seen - the cases with higher FOM are indeed scored higer by subjects.
2) A high standard deviation in subjective scores was noted, which means that agreement on 'good' or 'bad' sound is difficult to achieve.
3) Musical sample does not appear to be a significant factor, except in a few cases.
4) We may now look deeper into generally 'good' or 'bad' responses and find out what particular aspects may have led to their specific rating.
5) This can be used to inform design which is more aligned to what we actually prefer as listeners.