

The present theory formulates empirically testable assumptions relating three fundamental psychophysical primitives which, for example in the case of loudness, are: a respondent's ordering of sound stimuli by loudness; the loudness of joint presentation of stimuli to the two ears on the assumption of identical ears; and judgments of two pairs of stimuli that are related by some given proportion (numerical factor). From these explicit behavioral assumptions, the theory arrives at a numerical representation of loudness (or other subjective intensity concept) that is specified except for a relatively small number of parameters. The psychophysical functions closely approximate power functions for most of the stimulus range except near the absolute threshold where the rise is more rapid and at the most intense levels where it levels off to an asymptote. Despite those deviations from a power function, the predictions for cross-modality matching are of pure power functions. The mathematics involved draws from publications in utility theory but with a reinterpretation of a the primitives.