The Influence of Presentation Method on Auditory Length Perception

Brent C. Kirkwood

Technical University of Denmark, Ørsted·DTU

Listening Task

Eight subjects estimated the lengths of wooden dowels dropped onto a linoleum floor. Their length estimation accuracy was compared for three presentation methods: 1) live presentation of the stimuli, 2) headphone playback of binaurally-recorded stimuli, and 3) headphone playback of monophonically-recorded stimuli.

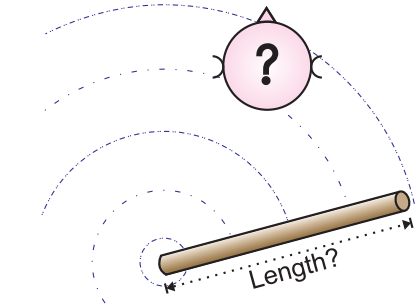
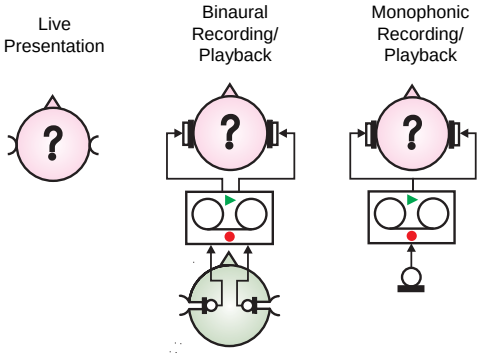


Diagram demonstrating acoustic wave propagation from a point struck by a dowel dropped onto a hard surface, just one of many positions from which sound can radiate.



Simplified diagram of the three presentation methods. Two microphones in ear canals of acoustic mannequin used in binaural recording technique. One stand-alone microphone in monophonic technique.

Experimental Setup

All listening, playback, and recording took place in a similar position in an acoustically-normal room. Dowels dropped on floor approximately 3 m behind test subject/ recording equipment.

Fixture used to help drop dowels in a uniform manner on every trial.

Dowel held against the top of a short ramp and released at trial time.

Dowels dropped and landed at a slight angle, followed by brief bouncing.

Dowels varied in length from 15 to 120 cm with a fixed diameter of 1.3 cm.

Acoustic mannequin seated in test subject's chair behind length-reporting apparatus.

Microphone used for mono recordings positioned above head.

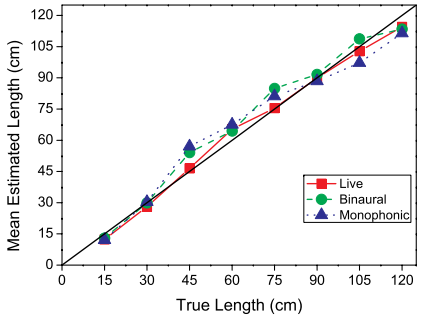
Dowels dropped on floor behind curtain.

Headphones worn by subjects during playback sessions are shown in foreground.

Perceived lengths reported by positioning a moveable surface in reference to a fixed surface.

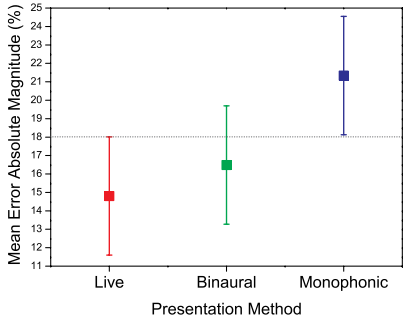
Accuracy Comparison

Mean perceived lengths for each presentation method were compared. No significant patterns were found in an analysis of variance.



Comparison of mean estimated rod lengths, as calculated from the average length estimates of each subject, for live, binaural, and monophonic presentation techniques.

Mean error magnitude was compared. The monophonic presentation method produced larger errors in an ANOVA using multiple comparison confidence intervals.



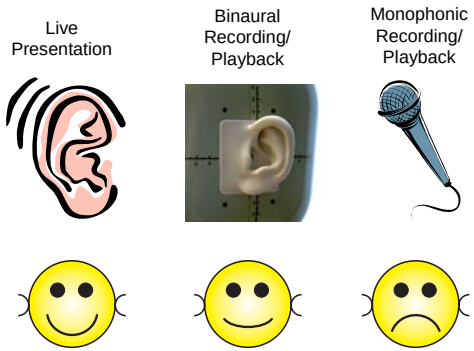
Comparison of mean estimate errors, as calculated from the average length estimates of each subject, for live, binaural, and monophonic presentation techniques.

Monophonic Audio Inferior

1. Variance in estimates of length are increased when using monophonically-recorded stimuli. There is apparently important spatial information present in acoustic stimuli that is compromised in a monophonic recording.

2. Binaurally-recorded stimulus presentation was not found to produce results that were significantly different than the live or monophonic presentation methods.

3. Presentation of binaural stimuli found *subjectively* superior to presentation of mono stimuli. Test subjects often believed they were listening to live stimuli when they were listening to binaural recordings. This was never true for the monophonic stimuli. When using prerecorded stimuli, binaural recordings can help to improve ecological validity through perceived realism.



Contact

Email: bck (a) visi.com

Web: http://brentkirkwood.com/professional/