IPRO343
IMPROVING COMMUNICATION QUALITY IN NOISY & DISTRACTING ENVIRONMENTS

ISSUE:
- No standards for talker characteristics on Public Announcement Systems
- Low speech intelligibility

RESEARCH OBJECTIVE:
- To assess the factors that affect speech intelligibility in noisy environments and recommend standards to improve talker characteristics in public announcement systems.

HYPOTHESIS:
- Speech intelligibility will decrease if duration is longer
- If speaking rate is increased, speech intelligibility will decrease
- Pitch will have no significant effect on intellibility

APPLICATIONS:
- Transportation announcement systems
- School public address systems
- Audible advertisements

RECORDING:
- IPRO 343 recording team took recordings from CTA platforms, trains, and buses, Metra Stations, and O'Hare airport.

EXPERIMENT OVERVIEW:

- RECRUITMENT:
  - 77 participants recruited (all IIT students)
  - Mix of native and non-native speakers of English
  - 65 out of 77 participants' results were kept for analysis

- DEVELOPMENT (SOUND & SOFTWARE):
  - Synthesized recordings used as stimuli for experiment
  - Recording extracted using text to speech application in MS Excel
  - MS Excel and PRAAT used to manipulate pitch, duration, and rate
  - Synthesized recordings composed of 8 shapes, 8 colors, and 4 directions
  - 8 Shapes: triangle, diamond, square, circle, star, cross, heart, and oval.
  - 8 Colors: yellow, blue, black, orange, red, white, green, and purple.
  - 4 Directions: up, down, left, and right.

PHASE 1 PREPARATION
PROJECT PLAN/ IRB
Noravidhya, Hyemin, Justo
RECORDING
Kevin, Brian, Scott, Shavanna
RECORDING ANALYSIS
Jessie, Karen, Justo, Noravidhya
MIDTERM PRESENTATION
Scott, Jessie, Crystal

PHASE 2 EXPERIMENT
RECRUITMENT
Karen, Jessie, Brian, Shavanna
MATERIALS
Kevin, Hyemin, Justo, Noravidhya
ADMINISTRATION
Brian, Scott, Jessie, Crystal

PHASE 3 CULMINATION
FINAL REPORT
Shavanna, Jessie, Brian, Justo
FINAL ANALYSIS
Jessie, Brian, Justo
IPRO DAY EXHIBIT
Hyemin, Kevin, Karen, Noravidhya
IPRO DAY PRESENTATION
Scott, Brian, Crystal

SOUND CONDITIONS:
- Participants listened to recordings under 12 different sound conditions

VISUAL STIMULI & EXPERIMENT INTERFACE:
- 40 recordings were embedded into the StarQuiz interface, allowing participants to complete the experiment at a computer workstation
- Visual stimuli was printed on stickers and placed on the keys of the keyboard for the experiment

EXPERIMENT ADMINISTRATION:
- 77 participants (IIT students) tested over 4 days
- Each participant listened to 40 different recordings
- Participants were compensated with pizza and refreshments after the experiment

Duration	Pitch	Rate	
Long	High	Fast	LHF
		Neutral	LHN
		Slow	LHS
	Low	Fast	LLF
		Neutral	LLN
		Slow	LLS
Short	High	Fast	SHF
		Neutral	SHN
		Slow	SHS
	Low	Fast	SLF
		Neutral	SLN
		Slow	SLS

ANALYSIS:
- Altering duration of messages and speaking rate improved intelligibility
- Listeners tend to lose interest when messages are longer
- Faster speaking rates are harder to comprehend compared to slower speaking rates
- Alteration in pitch is not effective in intelligibility as long as frequency is in range of human voice

Mean Duration

Mean Speaking Rate

Mean Pitch

RECOMMENDATIONS:
- Longer messages should be broken into shorter messages.
- When not feasible, longer messages should be spoken at slow speaking rates.
- For shorter messages, slow or neutral speaking rates should be used.