

Effect on Frequency Changing of Tactile Feedback on Touchscreen Devices

Keywords: frequency discrimination, tactile feedback, human perception

As people get older their senses deteriorate; Verrillo (1980) found out that the loss of perception dramatically increases above 50 years old. Yet many electronic touchscreen devices rely on people’s senses for interaction. Haptic feedback, such as vibrations, uses a person’s sense of touch to enhance the user-device interaction adding feedback to visual or audio cues. The aim of this project is to investigate the ability to perceive tactile effects in relation to age. Such that we might ascertain the potential use of haptics to reduce the barriers older people face when interacting with touchscreen devices, especially those with visual impairments. This should lead to improved design and usability of touchscreen devices for the future populations.

This paper has studied how the finger sensitivity changes with respect to age for the differentiation of tactile effects. The study focused on two frequency ranges around 125Hz and 250Hz, presenting a pair of vibrations to participants for discrimination. Participants were asked if the sensation was the same or different for each pair. At each frequency base (125Hz and 250Hz) 11 pairs were tested with a differential change of 5Hz and 25Hz, respectively, with each pair being tested twice. In total, 33 people were included in the test, 17 participants between 20 to 40 years old and 16 between 60 to 90 years old. Figure 1 shows the senior participant was evaluating the designed tactile effects.



Figure 1: Senior participant on tactile testing

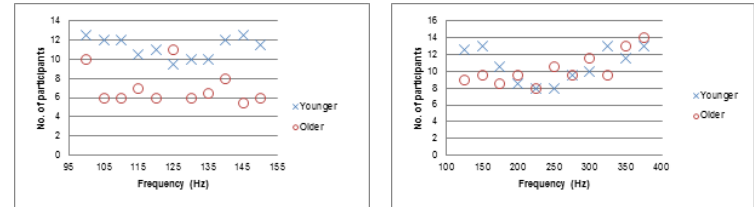


Figure 2: Number of correct responses at each frequency for younger (20-40) and older (60-90) participants around each range base (125Hz and 250Hz).

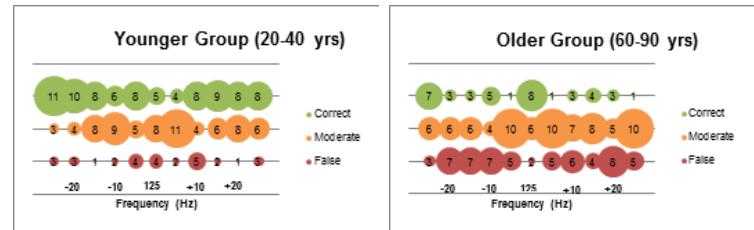


Figure 3: Discrimination results at 125Hz ± 25 for younger and older group

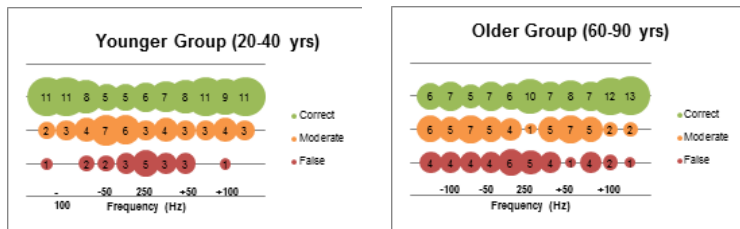


Figure 4: Discrimination results at 250Hz ±125 for younger and older group

Table 1: Discrimination results legend for Figure 3 and 4

	Test result
Correct	Identified correctly both times
Moderate	Identified correctly once
False	Did not identify correctly either time

From the graphs in figure 2 to 4 and with table 1, it can be concluded that the younger group follows the similar trend within the range around 125Hz and 250Hz, the ability to discriminate does not change significantly. However, in the older group, the performance increases significantly at the higher frequency (250Hz), compared to the differential change at around 125Hz. Showing a larger frequency differential aided the correct identification of a change in vibration frequency.

References

VERRILLO, R. T. 1980. Age related changes in the sensitivity to vibration. *Journal of Gerontology*, 35, 185-193