Age Effects on Static and Dynamic Touch in Estimation and Discrimination Tasks

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Abstract

The perceived roughness of a touched surface is determined by spatial and vibratory cues arising during contact between that surface and the fingertips. Spatial cues can result from static contacts whereas sliding movements are necessary to produce vibratory cues to roughness. Understanding the interactions between exploration dynamics and perception is especially important in the elderly in whom the morphology and density of spatially sensitive mechanoreceptors (SA1's) are affected by age. To this end we assessed roughness perception under sliding and pressing contacts in younger and older adults. We measured both the subjective sense of roughness (using absolute magnitude estimation) and objective roughness sensitivity (using Two-Alternative-Forced-Choice procedures). Participants, ranging in age from 18 to 74, explored raised-dot surfaces with spatial periods (SP) of 1000-3240μm using sliding or pressing movements. In some blocks they reported their subjective sense of the surface's roughness, in others which of two surfaces was rougher. While there was no significant difference in subjective roughness ratings between older and younger participants, the slope of the functions describing perceived roughness were steeper with sliding than with pressing contacts. Subjective ratings using pressing contacts plateaued at SP 1800μm but continued to increase with sliding until SP 2680μm. A consistent pattern was found for roughness discrimination, with no age effects but improved perception under sliding compared with pressing exploration. Overall, we found that that sliding contacts, and likely consequent vibrational cues, not only improves roughness sensitivity but also affects subjective roughness of coarse surfaces in both young and older people.

Keywords: aging, touch perception, psychophysics

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