Brain activity reflecting age-related differences in perceptual experience of cosmetic cream

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Background: Perceptual sensitivity tends to decline with age (Cain & Gent, 1991; Sekuler et al., 1980), which seems to be accompanied by changed neural responses in relevant brain areas (Moscovitch, 1982; Wang et al., 2005). For the tactile modality, this tendency has been shown by exploiting vibrotactile (Verrillo, 1980), thermal (Kenshalo, 1986), and grating stimuli (Tremblay et al., 2003). However, little is known about age-related differences associated with experience of cosmetic product on skin. In the present study using fMRI, we investigated whether brain activity reflects age-related differences in perceptual experience of cosmetic cream. Methods: Behavioral and fMRI data were collected from twelve young adult females in their 20's and twelve elderly females in their 50's-60's. We manipulated absorption rate (A_fast vs. A_slow) and oil content (O_high vs. O_low) of a basic mosturizing cream prescription, which yielded a total of four stimulus conditions. The stimulus formulations were designed by using Cetyl Ethylhexanoate, coconut oil, Caprylic/Capric Triglyceride, Cyclopentasiloxane, and Cyclohexasiloxane to manipulate oil content, and silica or cellulose gum to control absorption rate. The fMRI scanning session consisted of five functional runs each of which repeated four stimuli five times in a pseudo-randomized order. In each trial, the stimulus was applied to the back of the participant's left hand for 4 seconds. After 4 seconds of stimulus removal, there was a 2-second interval prior to the next trial. Participants underwent a bahavioral testing including preference rating outside the scanner. Results: According to stimulus conditions, significant differences in BOLD signal were observed between age groups in several brain regions. In the absorption rate condition, the left angular gyrus showed such difference; greater BOLD signal was associated with A_fast compared to A_slow stimulus only in the elderly group. In the oil content condition, those regions included the precentral and supramarginal gyri and the insula in the right hemisphere. Specifically, BOLD signal was greater in response to O_high than to O_low stimulus in the supramarginal gyrus of the elderly group, whereas in the precentral gyrus and the insula of the young group, BOLD signal was greater in response to O_low than to O_high stimulus. Behavioral preference response buttressed the fMRI results; the elderly group tended to prefer A_fast to A_slow and O_high to O_low stimulus. Conclusion: These results imply that elderly females differ from young adult females in their experience of cosmetic cream, which was reflected in differential brain activation patterns.