Optic flow processing in the elderly

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Résumé

Aging impacts human observer's performance in a wide gamut of visual tasks and notably in motion discrimination. However, it remains unclear how the elderly are affected in their ability to process optic flow, the pattern of motion that falls on the retina during locomotion. Some studies found age effects on the discrimination of radial patterns while others did not. Also, perception of rotational patterns has only been little explored in the elderly. Here, we characterized optic flow processing in 42 participants over 70 years old (mean age: 73.83 ± 4.53) and 17 under 30 years old (mean age: 24.65 ± 4.41). All participants had a corrected visual acuity over 7/10 and reported no ophthalmological problems. Stimuli consisted of dynamic random-dot kinematograms (RDKs) projected on a wide and curved screen (56◦ x 44◦). For each of the three components of optic flow (translational, radial and rotational), participants were involved in a 2-alternative forced choice task (2-AFC) and had to report their perceived motion direction (leftward versus rightward for translational, inward versus outward for radial and clockwise versus anti-clockwise for rotational patterns). We manipulated motion coherency (i.e. the percentage of dots moving in the same direction) and estimated the thresholds corresponding to 80% of correct detection using an adaptive Bayesian procedure. From ANOVA and post-hoc statistical analyses, we found that older participants had higher thresholds for translational (27.97 ± 18.26 vs 17.3 ± 8.53 for the younger) and radial patterns (22.91 ± 17.14 vs 9.56 ± 6.11) but not for rotational patterns (19.1 ± 13.14 vs 25.66 ± 12.2). These thresholds were not affected by the addition of a 10◦ simulated scotoma in central vision. Reaction-times were also longer for all conditions in the elderly, which suggests that perceptual decision-making is slowed down in this population. Altogether, our results support the idea that optic flow processing mostly relies on peripheral vision in young and elderly participants and that selectivity to translational and radial patterns decreases with age.

Mots-Clés: optic flow, aging, motion processing, simulated scotoma

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