

Abnormal auditory-visual crossmodal temporal-order judgments in Parkinson's disease

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Abstract Although the symptoms primarily associated with Parkinson's disease (PD) are motor and cognitive ones, sensory deficits may also be involved. Using auditory, visual, or somatosensory stimuli, previous studies have revealed a generalized disorder of temporal discrimination in PD patients. Here, we investigated whether PD patients show deficits also in a task of crossmodal temporal-order judgments for auditory (tone pulses) and visual stimuli (light flashes). Three experimental groups (PD, age-matched, and younger subjects; $n = 12$, each) were tested. In each trial, a sequence of five repetitive pairs of sound and light pulses (rate 1/s) was presented with various stimulus-onset asynchronies, and subjects indicated which modality came first. The just noticeable temporal difference in PD patients was larger than in younger, but not age-matched, subjects, suggesting a mere effect of ageing on discrimination precision. However, the point of

subjective simultaneity of PD patients was shifted towards stimuli with sound leading in time (mean + 41.9 ms), while the age-matched (- 41.0 ms) and the younger group (- 40.5 ms) both exhibited the well-known normal pattern of a shift towards stimuli with light leading in time. This deviation of PD patients in crossmodal perception indicates a considerable delay of auditory, compared to visual, processing. Because of the close connection of spatial and temporal factors in crossmodal integration in the brain, it seems likely that the apparent auditory delay has significant implications for crossmodal space perception in PD, e.g., with spatial localization of audiovisual speech. This is, however, yet to be clarified by future studies.

Keywords Crossmodal perception • Spatiotemporal integration

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