so much on visual inputs.

In contrast, in the subjects who showed a positive correlation in roll movements of the head and trunk, lateral perturbation of the head increased further as the roll of the trunk was added to the roll of the head, and the head became unstable relative to the space during walking. In the subjects aged 50 years and above who showed a positive correlation between roll movements of the head and trunk, lateral perturbation of the head was significantly greater during walking with the eyes open than in the subjects in 20's, resulting in instability of the head. In the subjects aged 50 years and above, a positive correlation was observed more frequently during walking with the eyes closed. This suggests that gait control based on the spatial orientation depends more on visual inputs. Thus, gait control based on the spatial orientation is considered to be declined, and movements of the head to become passive to those of the trunk, in a higher percentage of the subjects aged 50 years and above. These findings suggest that there is a latent decrease in the vestibular function in some healthy adults aged 50 years and above. A similar mechanism may be guessed also in children, in whom the vestibular function is immature, and patients with Parkinson's disease, in whom the basal nuclei are degenerated.[7,12)]

The findings concerning lateral movements of the head and trunk during walking with the eyes closed differed between the subjects in 50's and those aged 60 years and above. While the number of subjects who showed a positive correlation between movements of the head and trunk increased during walking with the eyes closed in those in 50's, 60's, and 70's, no significant difference was observed in lateral movements of the head and trunk between those in their 50's and those in 20's. Despite some deterioration of gait control based on the spatial orientation due to a latent decrease in the vestibular function, individuals in 50's are considered to be able to suppress lateral movements of the head and trunk to a low level, because top-down control to stabilize the posture primarily by stabilizing the head position during walking with the eyes closed is still sufficiently intact. In contrast, lateral movements of the entire body were significantly increased, and the gait became considerably

unstable in the subjects aged 60 years and above who showed a positive correlation during walking with the eyes closed. Thus, deterioration of gait control based on the spatial orientation is considered be further progressed in healthy adults aged 60 years and above compared with those in 50's.

E. Conclusion

We performed three-dimensional analysis of head movements and coordination of head and trunk movements during walking in healthy adults in 20's, 50's, 60's, and 70's to evaluate the effects of aging on walking.

Vertical movements and pitch and roll movements of the head during walking were significantly smaller with the eyes closed than with the eyes open in all age levels of the 20's, 50's, 60's, and 70's. It is guessed that suppression of vertical perturbation and preservation of the verticality of the head are important for maintaining stable gait in the absence of visual information.

While most of the subjects in 20's showed coordinated movements in which the head and trunk rolled in opposite directions (negative correlation) during walking as reported earlier, many of those aged 50 years and above showed rolling of the head and trunk in the same direction (positive correlation). In the subjects who showed a negative correlation in roll movements of the head and trunk, lateral perturbation of the head and trunk was reduced as they were cancelled by each other, so that the stability of head relative to the space during walking was maintained. In contrast, in the subjects who showed a positive correlation in roll movements of the head and trunk, lateral perturbation of the head increased further as the roll of the trunk was added to the roll of the head, and the head became unstable relative to the space during walking. The findings suggest that in young people the center of gravity is better stabilized during walking than in older people, and that young people are less dependent on visual input for spatial orientation in the brain than older people.

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F. 健康危険情報

なし

G. 研究発表

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2. 学会発表

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H. 知的財産権の出願・登録状況

なし

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