

# Analysis of acceleration data of the poles in Nordic walking

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Nordic walking, that is a walking with poles, is known as an effective aerobic activity that uses the whole body, including the muscles of not only the lower body but also the arms and the upper body. The benefits of Nordic walking are that anyone can begin easily regardless of the season, and the effect of the exercise is realized in a short time. Created in Finland, the popularity of Nordic walking is rising around Europe. Recently, Nordic walking has received increased attention from middle-aged people, even in Japan. Previous studies aimed at scientific verification of Nordic walking mainly focused on the alleviation of the load on the legs provided by the poles, and on the energy consumption. Although it is expected that the difference of the load on the legs and the energy consumption occurs with technical mastery of the poles, detailed research has not yet been conducted. The technique of using the poles is explained from a visual viewpoint at an instruction site. However, there is no research that has analyzed the pole work from the perspective of physical movements. Therefore, in our study we analyzed the techniques of both experts and beginners of Nordic walking in order to gather basic data about the differences between them. In this research, we developed a system to acquire data using 3-axis accelerometers attached to the tip and grip of the poles used in Nordic walking. The sensors do not disturb body movements because they have their own batteries and send data to a PC via wireless using ZigBee. We collected and analyzed the data from both experts and beginners using the system. The results of frequency analysis of the acceleration indicated that there were two or more large peaks in the data of the experts, while there was only one large peak in the data of the beginners. We suggest the peak around about 1 Hz in the both data sets indicates the pace of the walk. There is the peak in the beginners' data, while the experts' data has it and also a higher peak. The difference will be a useful index to differentiate between experts and beginners. We expect that it is possible to develop systems to improve pole work in Nordic walking by recognizing the index via signals such as vibration or sound.