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Person identification from biological motion: information content of discrete Fourier components

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Human observers are able to learn to discriminate individuals shown as point light walkers. The walking pattern of a person can be represented very accurately using discrete Fourier analysis. Here, we represent walking data by decomposing them into an average posture and the first five harmonics, and we investigated their role for person identification from biological motion. Observers learned to identify seven male walkers from one of three different viewpoints: 0 deg (frontal view), 30 deg, or 90 deg. The displays were previously normalized with respect to the shape of the walker and his walking frequency. Non-reinforced test stimuli were generated by first computing an average walker and then replacing either only the first, second, or third to fifth harmonics of this average walker with the respective harmonics of the individual original walkers. Results show that the first harmonic contributes most information to the identification of the walkers. The second harmonic alone is still sufficient for the task, but this is not the case for the higher order harmonics. No differences in performance were found between the three viewpoint groups. Walkers can be identified best if shown from the same viewing angle as in the training sessions, but there is also a significant transfer to other angles. There was a marginal effect of the test view, with the 90 deg view producing the worst performance. There were no significant interactions between the type of harmonic and the training view or the test viewpoint, respectively. We conclude that individual walking patterns can be represented adequately with the use of two Fourier-harmonics and that the visual system is not able to detect subtle differences between point light walkers beyond this representation.

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