Spontaneous synchronization of motion in a group of marathon runners

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Various synchronization phenomena have been reported in nature. Synchronization phenomena have also been reported to occur between people, such as the stride patterns of two people walking side by side [1], and are referred to as interpersonal synchronization. Interpersonal synchronization has been suggested to occur not only in daily activities such as walking [1] and simple limb movements [2]., but also in athletic situations such as sprinting [3]. Here we show a case of synchronization occurring among marathon runners. We analyzed the step timing of five runners who formed the leading group in the Osaka International Women's Marathon 2021. This marathon had a limited lead group of five or fewer runners and was held on a flat 2.8 km loop course, which controlled for the influences of group size and terrain. Based on each runner's step timing, the relative phase of each pair was calculated, and synchronization was evaluated by the localization of the relative phase occurrence distribution. As a result, pairs with significant localization at relative phases of 0° or 180° were observed (Figure 1). These results indicate that interpersonal synchronization can occur even during marathon competitions and influence step timing. We expect that our findings will provide new insights into understanding how and why human groups synchronize their motion.

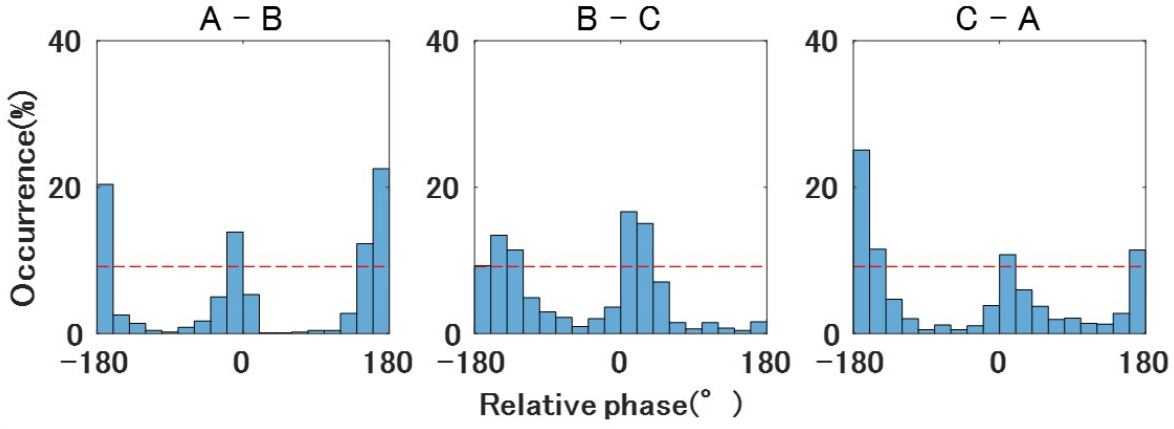

Figure 1: Typical examples of the relative phase distribution of each pair. A, B, and C represent the runner's ID. The red horizontal dotted lines were the significance threshold.

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