Triathlon is a triple-event endurant sport in which athletes compete sequentially in swimming, cycling and running. In order to determine the energy expenditure and heart rate during triathlon race, we tried to record ECG during triathlon competitions by using a newly developed waterproof Holter-electrocardiograph. Five college-level triathletes, 19-22 years old, 3 men and 2 women, volunteered in this study. ECGs in 4 subjects with Holter ECG (FM-180, Fukuda Denshi), 62/65/18 mm in size and 78 g in weight including a battery and an SD card, and heart rates (HR) in 2 subjects by HR monitor (TZ-MAX50, Acumen) were recorded during triathlon competitions in which wet-suits were used during swimming and drafting was not allowed during cycling. Three incremental exercise tests until exhaustion in swimming, cycling and running were carried out in the laboratory and oxygen consumption (VO2) and HR were monitored. Using the individual correlating equation between HR and VO2, energy expenditure during triathlon race was estimated. Except minimum artifacts during swimming, high quality recordings of ECG were obtained during triathlon race. No subject showed any arrhythmia except minimum numbers of premature beats.

Mean competition time (± SD) for Olympic distance (1.5 km swimming, 40 km cycling and 10 km running) was 2h35m21s ± 20m06s (n=5). Time for swimming, cycling and running was 29m07s ± 3m40s, 1h14m40s ± 6m02s, and 51m34s ± 11m19s, respectively. Total heart beats and heart beats for swimming, cycling and running were 27019 ± 3197, 4926 ± 643, 12989 ± 1108 and 9103 ± 1766 beats, respectively. HR for race and HR for swimming, cycling and running were 174.2 ± 5.8, 169.3 ± 10.3, 174.0 ± 5.4 and 177.4 ± 5.6 bpm, respectively. Total energy expenditure for Olympic distance triathlon race was estimated to be 2490.6 ± 200.5 kcal (n=3). Mean relative exercise intensity during Olympic distance triathlon race was 88.1 ± 2.1 % of VO2peak. In conclusion, 1) high quality recordings of ECG were successfully obtained during triathlon race. 2) ECG recording and HR monitoring revealed that Olympic distance triathlon is not only endurant but also intense sport with the HR as high as 175 bpm and with the relative exercise intensity as high as 88 %VO2peak. 3) Total energy expenditure to complete Olympic distance race was estimated to be about 2500 kcal.

Keywords: Triathlon, Energy Expenditure, Electrocardiography