VARIATIONS IN THE 'NORMAL' ELECTRO-CARDIOGRAM

OF A YOUNG ATHLETIC POPULATION

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Routine bipolar electro-cardiograms, using the classical leads, were taken for 814 first year male students of Physical Education, ages 18 to 22. Clinical examination and tests of physical fitness showed all to be free from detectable disease and physical abnormalities. All had recently achieved a high standard in competitive sport (generally of County Junior standard, or above).

Similar information was obtained from 31 young international class swimmers aged 14 to 17, and electro-cardiograms were obtained from a control group of 870 first year university students of Arts and Science.

The incidence of 'abnormal' E.C.G. s was calculated, and the shapes of the Q and S waves were studied. Using lead II, three patterns of Q wave were found, and have been coded: A = no Q wave (R upstroke continues from the P-R segment); B = R wave arising at a right angle from the P-R segment; C = negative Q wave deflection. The S waves have been coded similarly: 1 = no S wave; 2 = right-angle between downstroke of the R wave and the S-T segment; 3 = measurable negative S wave; 4 = negative S wave greater in amplitude than the positive R wave.

Amongst the physical education students 4% appeared in each of the categories A1, A2, A4; 12% were in A3. Most were in category B: 11% B1, 13% B2, 25% B3, 3% B4. In category C: 7% C1, 6% C2, 10% C3, 1% C4. At first it was thought that the deeper negative waves indicated a lack of cardiovascular recovery, but a preliminary inspection of other tests upon the same subjects does not confirm this. In a small number of subjects, E.C.G.s were repeated after a period of several weeks of a hard training programme. As a result, the amplitude of the negative waves decreased, sometimes enough to justify a change of coding, but this aspect of investigation is being extended.
The distribution in the control population of Arts and Science students was similar except that category C was smaller and B4 larger. Amongst the 31 swimmers there was a similar distribution of Q and S wave patterns. A number of 'abnormalities' were noted in 450 of the physical education students on whom more complete records were made: P wave abnormalities 6%; axis deviations - right 7%, left 2%; R wave abnormalities 2%; bundle-branch block 1%; the S-T segment was elevated in 4% and depressed in 1%; T wave abnormalities in leads I and II, 1%, but inverted or iso-electric T waves in lead III were present in 28%. Amongst the young swimmers a similar ratio was found, but 75% had inverted T waves in Lead III. Amongst the undergraduates there were only 10% with inverted T waves, but the frequency of the other 'abnormalities' was similar.

The young age of the population might account for axis deviations and negative T waves, and further study is needed amongst fit adolescents and young adults to assess the significance of these conditions. The detection of pathological conditions from a single E.C.G. is fraught with difficulties, but repeated recordings over a period of time are of value in assessing the level of attainment in a training programme.