

近位大動脈拍動緩衝機能に対する水中運動の効果

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Effects of Aquatic Physical Activity on Proximal Aortic Function in Middle-aged and Elderly Adults

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ABSTRACT

Aquatic exercise is ideal for older adults because it mitigates weight-bearing stress. However, the effect of aquatic exercise on central arterial properties (e.g., proximal arterial stiffness and aortic blood pressure [BP]), strong determinants of future cardiovascular disease, remains unclear. We determined if aquatic exercise would decrease arterial stiffness and central blood pressure. To do so, we performed two experiments: firstly, we compared central arterial properties of lifelong Japanese pearl divers (Ama) with age-matched adults living in the same fishing villages (Study-1). Secondly, we determine the effect of regular aquatic exercise on central arterial properties in middle-aged and older adults (Study-2). In Study-1, we recruited 115 female pearl divers (mean age: 65 ± 11 yr) as well as age-matched 50 physically inactive and 33 physically active female non-divers living in the same fishing villages in rural locations. Pulse wave velocity from the heart to the brachial artery (hbPWV; partly reflecting proximal aortic stiffness) and between the brachium and the ankle (baPWV; reflecting stiffness of abdominal aorta and leg arteries) were measured. No significant group differences were found in either brachial blood pressure or baPWV

among the groups. hbPWV was 5% lower in physically active adults and 9% lower in Ama compared with their sedentary peers ($P < 0.05$). There were no significant differences in central blood pressure among groups. In Study-2, central arterial properties were evaluated in twelve normotensives middle-aged and older peoples (mean age = 66 ± 9 yrs) before and after the supervised aquatic exercise program (90 min, 1 day/week, 3 months) which consisted of walking, stretching, and muscle strengthening in water. Following the training intervention, brachial and aortic systolic blood pressure and baPWV significantly decreased, whereas no significant change was seen in hbPWV. These results demonstrate that regular aquatic exercise, even at a low frequency, could mitigate cardiovascular disease risk in normotensive middle-aged and older people. The inconsistency of results between Study-1 and Study-2 might be attributed to the duration of experience (e.g. lifelong vs. 3 months).

要 旨

圧や動脈ステイフネスを改善できる可能性を示唆する。

本研究では、近位大動脈拍動緩衝機能に着目し、習慣的な水中運動の実施が動脈ステイフネスおよび大動脈血圧に与える影響を明らかにすることを目的とした。まず、動脈ステイフネスの適応における部位特性を検証するため、水中運動以外の有酸素性運動を習慣的に行っている中高年女性と同年代の海女（合計 198 名）とで、動脈ステイフネスを比較した。その結果、海女の近位大動脈ステイフネス指標が、同年代の運動習慣のない女性よりも有意に低値であることが明らかとなった。一方、腹部大動脈を主体とする動脈ステイフネス指標に有意差は認められなかった。次いで、健常な中高齢者 12 名を対象に、有酸素性運動を主体とする 3 か月間の水中運動教室の前後で、動脈ステイフネスおよび大動脈血圧を計測した。トレーニング後、中高齢者の近位大動脈ステイフネス指標に有意な変化は認められなかったが、上腕および大動脈収縮期血圧と baPWV に有意な低下が認められた。以上の結果は、低頻度かつ短期間の水中運動実施は、近位大動脈の機能的適応を生じえないものの、心血管系疾患の発症リスクである大動脈血