# Blood pressure rise with swimming versus walking in older women: the Sedentary Women Exercise Adherence Trial 2 (SWEAT 2)

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***Objective*** Swimming is often recommended in the prevention and treatment of hypertension. Few studies have investigated the effect of swimming training on blood pressure (BP). Our objective was to evaluate 6 months of supervised moderate swimming or walking on BP in previously sedentary, normotensive, older women.

***Design*** Women aged 50–70 years ($n = 116$) were randomly assigned to a supervised 6-month swimming or walking programme. They were further randomized to receive usual care or a behavioural intervention package.

***Methods*** Exercise comprised 3 sessions/week with a warm-up, cool down, and 30-min of moderate intensity walking or swimming. BP was recorded for 20 min supine, and 5 min standing. Assessments were made at 0 and 6 months.

***Results*** At baseline, mean supine BP (± SD) was 115.7 ± 1.3/66.8 ± 0.7 mmHg. Swimming improved swim distance by 78.1 m (29.3%) [95% confidence interval (CI); 66.7, 89.4] and walk time by 0.58 min (3.8%) (0.41, 0.74). Walking decreased walk time by 1.0 min (6.5%) (0.81, 1.19). After adjustment for initial BP, age, hypertension treatment status and change in weight, swimming increased supine and standing systolic BP relative to walking by 4.4 mmHg (1.2, 7.5) ($P = 0.008$) and 6.0 mmHg (2.6, 9.5) ($P = 0.001$), respectively. Supine and standing diastolic BP increased by 1.4 mmHg (−0.14, 3.0) ($P = 0.07$) and 1.8 mmHg (−0.02, 3.5) ($P = 0.05$), respectively.

***Conclusion*** Relative to moderately paced walking, regular swimming significantly elevates BP in previously sedentary, normotensive, older women. This finding may have important implications for exercise prescription in older subjects. *J Hypertens* 24:307–314 © 2006 Lippincott Williams & Wilkins.

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## Introduction

Moderate intensity aerobic exercise such as walking [1,2] and stationary cycling [3] has been shown to reduce resting blood pressure (BP) in normotensive individuals.

Swimming is often recommended by various authoritative groups as a mode of exercise for the prevention and treatment of hypertension and cardiovascular disease [4–6]. These recommendations are based on data from studies using other forms of aerobic exercise. This approach assumes that all of the benefits conferred from walking, running and cycling studies may also be applied to swimming. There is a paucity of information to support this assumption, and the assertion that the health benefits are similar to those achieved with walking, running and cycling may therefore be tenuous [7].

Blood pressure increases with immersion in water and with acute swimming, particularly in older individuals [8]. For the same heart rate (HR), mean arterial BP is higher with swimming compared to running [9]. Furthermore, BP in trained swimmers is higher than in other endurance-trained athletes [10,11]. In the only controlled (but not randomized) trial examining the effects of swimming training on BP, BP fell after 10 weeks in middle-aged hypertensive men and women [12]. Longer-term effects of swimming training in previously sedentary, older individuals with normal or controlled BP have not been investigated.

In the present study we hypothesized that a 6-month supervised, moderate-intensity walking programme in normotensive/controlled, non-obese older women would result in a greater reduction in resting BP compared with a swimming programme of similar intensity.

## Methods

### Participants

Women aged 50–70 years were recruited from media advertising. From 1312 telephone contacts, 212 women

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meeting the study entry criteria underwent further screening. Women were included if they were non-smokers, sedentary, that is, doing less than 30 min/week of moderate activity for 6 months prior, BP less than 160/100 mmHg, body mass index (BMI) less than 34 kg/m$^2$ and alcohol intake less than 210 ml/week. Those taking hormone replacement, BP or cholesterol-lowering medication were included. Participants unable to float or who were limited in their capacity to participate in exercise because of musculo-skeletal disorders, or with a history of diabetes, cardiovascular, respiratory or other chronic illness, were excluded. They underwent blood tests to screen for common abnormalities, a 12-lead resting electrocardiogram and a full medical examination. One hundred and sixteen women entered the study and gave informed written consent. The study was approved by the University of Western Australia Committee for Human Rights.

### Study design

Participants underwent a 6-week run-in period. During the last 2 weeks of this period BP, 24-h urine, fitness, physical activity, body weight and body composition were assessed. Women were stratified and matched for age and BMI, then randomly assigned by research staff via computer-generated random numbers (generated and held by the statistician) to either a closely supervised walking or swimming programme. They were further randomized to behavioural intervention or usual care. It was not possible to blind the participants, observers or intervention staff to the participant's group allocation.

### Exercise protocol

Participants attended supervised exercise three times a week for 6 months. Training HR was determined from the HR reserve ($HR_{res}$) [13]. Resting HR was taken with baseline BP assessments. Maximum HR was taken as the highest value of either the predicted maximum HR formula (220 – age), or the maximum HR on the baseline fitness tests. As maximal HR has been reported to be 10–13 beats lower in swimming compared to land-based activities [14] we also calculated post-hoc an adjusted intensity for swimming relative to a 10-beat lower maximal HR.

Sessions comprised of 10 min warm-up and 5 min stretching (stretching prior to water warm-up in the swim group) followed by 30 min of swimming, or walking at a moderate intensity (60–70% $HR_{res}$), 10 min cooling down and 5 min stretching. Initially women exercised at 50% $HR_{res}$ and by 8 weeks had progressed to 60–70% $HR_{res}$. Mean training HR measured by HR monitor (Polar Edge, Polar Electro Oy Kempele, Finland) after 15 and 30 min of exercise was used to determine training intensity (% $HR_{res}$).

Walking was completed as a continuous walk around ovals and parks. Swimming was in heated indoor and outdoor swimming pools (26.5°C). Initially swimming was completed as interval training. As fitness increased, the rest periods became shorter and the amount of continuous swimming increased.

### Behavioural Intervention

Previously, we developed a behavioural intervention package to encourage adoption and adherence to an exercise programme [15]. This package was given to half the participants, the others had 'usual care'.

### Measurements

#### *Physical activity and fitness*

Physical activity was assessed from the 7-day Physical Activity Recall questionnaire [16]. The 1.6 km walk test [17] was used to measure walking fitness. Heart rate monitors were used to record HR every minute and, at 1.6 km, the time was taken and maximal oxygen consumption estimated [17]. Two walks were performed 1 week apart, the lower time the baseline measure. Swimming fitness was assessed using the 12-min swim test [18]. Participants wore a HR monitor, and swam as far as possible in 12 min, with HR taken on completing the swim. Two tests were completed 1 week apart in the same covered, heated, 25-m pool. The longer distance was the baseline measurement. After 6 months, women completed a walk and swim test. All fitness tests were completed at least 48 h after the last exercise session.

At baseline and 6 months, swimming skill was assessed by a highly skilled swimming teacher from observation and a skill test. Subjects were rated as 'competent' or 'non-competent' swimmers and 'anxious' or 'not anxious' when swimming with their faces in the water.

#### *Blood pressure*

Blood pressure and HR were measured with the Dinamap 1846SX (Critikon Inc., Tampa, Florida, USA). The precision and accuracy of the Dinamap 1846SX has been demonstrated [19] and its use in the research setting supported [20]. Mean BP for each visit was calculated from 10 supine readings taken over 20 min and five standing readings over 5 min. Baseline BP was the mean of three separate visits at the end of baseline. At 6 months BP was measured as the mean from two separate visits [2]. All BP measurements were taken at least 48 h after the last prescribed exercise session and no other moderate or vigorous exercise. Participants were non-fasting but refrained from any caffeine-containing food or beverages in the preceding 2 h.

#### *Anthropometrics*

Height and weight were measured. Upper arm girth was measured using a steel tape measure (Rabone Chesterman, Birmingham, UK). A John Bull caliper (British Indicators Ltd, Bedfordshire, UK) was used to measure the triceps skinfold [2]. The upper arm girth and the triceps skinfold were used to estimate arm muscle girth [21].

### *Dietary compliance*

Participants were asked to maintain their usual diet, salt and alcohol intake throughout the study. Dietary salt intake was monitored from 24-h urinary sodium excretion [2]. Change in diet was monitored by a questionnaire, mean alcohol intake by the completion of 7-day retrospective diaries [2].

### Statistical analysis

All results are expressed as mean with 95% confidence limits in brackets, except for baseline results, which are expressed as mean ± SD. The SPSS statistical software (release 11.5; SPSS Inc., Chicago, Illinois, USA) was used to analyse the data. Frequency counts and chi-squared analyses were used to determine BP medication, demographic data and retention. Within-group differences were determined from a paired *t*-test. Generalized linear models (GLM) analysis of variance with interaction and adjustment for baseline values were used to examine effects of the interventions on exercise adherence, exercise intensity, body weight, resting HR, measures of fitness and lifestyle compliance. GLM were used with BP as the dependent variable adjusted for initial BP, age, BP medication, change in body weight and change in arm muscle girth as indicated. Results were considered significant if $P < 0.05$. An a posteriori calculation indicated that the study had 90% power at $\alpha = 0.05$ to detect an exercise mode or behavioural intervention main effect on systolic BP of 5 mmHg.

## Results

### Baseline characteristics

Groups were well matched at baseline (Table 1) with no statistical differences between the groups. In the swim group, 18% were classified as 'not competent' swimmers and 80% were anxious about putting their face in the water.

### Behavioural intervention

The behavioural intervention did not have any significant effect on retention and adherence rates, BP, HR and body composition. Thus the results for the main outcome variables are presented for the walking and swimming groups.

### Retention rates and exercise adherence

After 6 months, 100 women were still in the study (Fig. 1). There was no significant difference in retention between the swimming or walking groups (85.7 versus 86.7%, respectively). Adherence to the number of prescribed exercise sessions was similar in the swimming and walking group 76.4% (69.5, 83.2) versus 74.3% (67.7, 80.9), respectively.

Both groups exercised at the target exercise intensity and there was no significant difference in intensity between the walking 59.7% $HR_{res}$ (57.9, 61.6) and the swimming group 60.9% $HR_{res}$ (59.0, 62.8). When the training intensity for the swim group was calculated using the adjusted maximum HR approach, training intensity was 66.5% $HR_{res}$ (64.5, 68.6), significantly higher than that of the walk group ($P = 0.001$).

### Physical fitness

Walk time was reduced by 1.0 min (0.81, 1.19) (6.5%) ($P = 0.001$) in the walk group and 0.58 min (0.41, 0.74) (3.8%) ($P = 0.001$) in the swim group. There was a significant difference in walk time between the walking and swimming group after 6 months ($P = 0.001$).

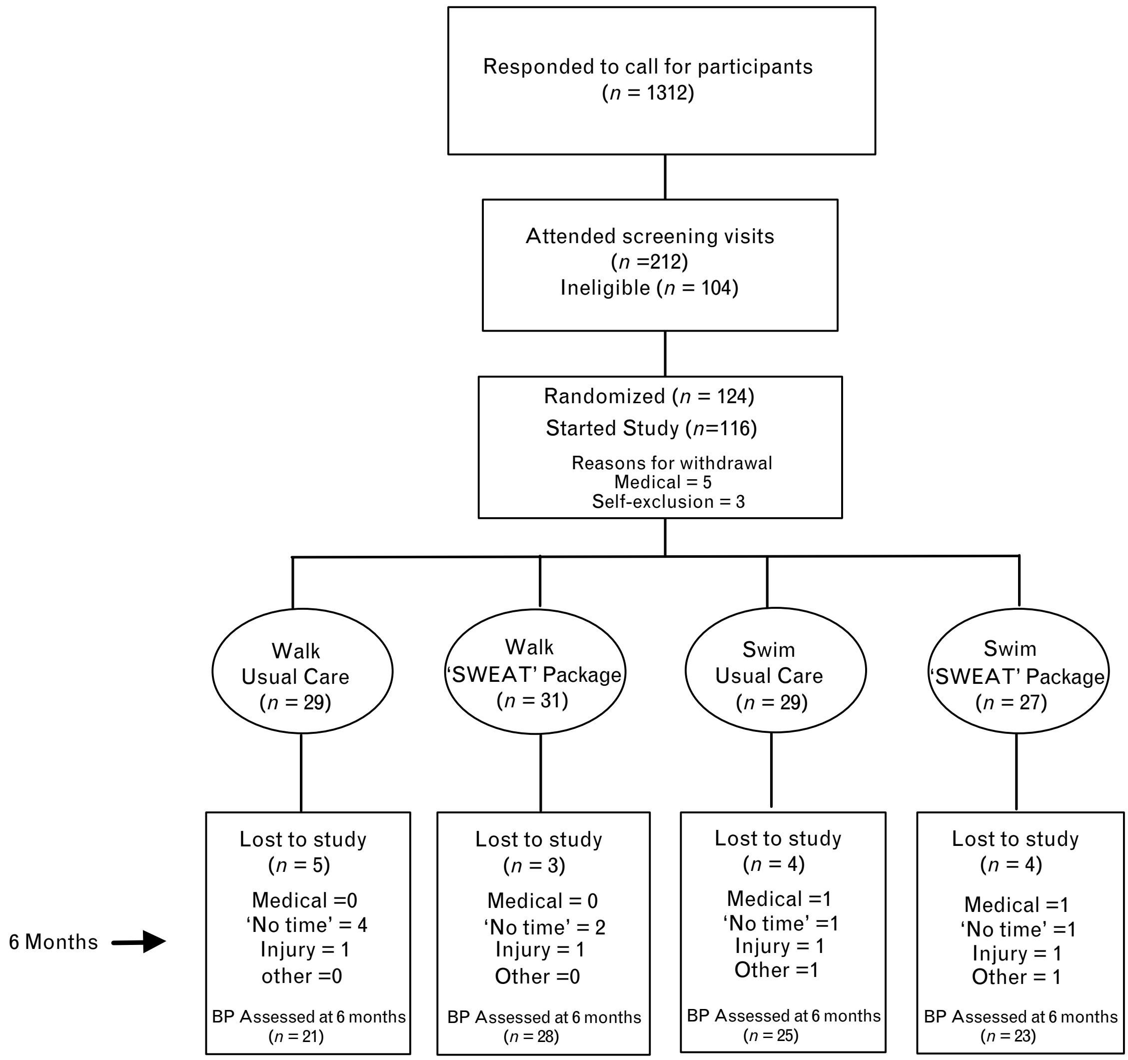
After 6 months the distance swum in the swim test increased by 78.1 m (66.7, 89.4) (29.3%) within the swim group ($P = 0.001$) with no significant change in the walk

**Table 1** **Baseline demographic and fitness characteristics of participants in the four study groups**

| | Walking | | Swimming | |
|---|---|---|---|---|
| | Usual care ($n = 29$) | 'SWEAT' package ($n = 31$) | Usual care ($n = 29$) | 'SWEAT' package ($n = 27$) |
| Age (years) | 55.03 ± 4.87 | 55.45 ± 4.93 | 55.93 ± 4.84 | 55.53 ± 4.69 |
| Height (mm) | 1635.8 ± 53.2 | 1633.0 ± 70.2 | 1646.7 ± 54.5 | 1635.9 ± 59.2 |
| Weight (kg) | 70.52 ± 9.85 | 70.99 ± 12.34 | 71.04 ± 7.69 | 69.69 ± 9.05 |
| BMI (kg/m$^2$) | 26.34 ± 3.43 | 26.53 ± 3.67 | 26.37 ± 2.98 | 26.31 ± 3.22 |
| 1.6 km walk time (min) | 14.73 ± 0.95 | 14.99 ± 1.14 | 14.66 ± 1.06 | 14.89 ± 1.21 |
| Swim distance (m) | 299.0 ± 65.8 | 284.3 ± 67.2 | 300.65 ± 81.1 | 288.3 ± 80.3 |
| $\dot{V}O_{2max}$ predicted (ml/kg per min) | 28.14 ± 3.28 | 27.00 ± 4.84 | 27.43 ± 3.90 | 27.62 ± 4.67 |
| Energy expenditure (kJ/kg per day) | 34.36 ± 1.45 | 34.26 ± 1.55 | 34.53 ± 1.83 | 34.34 ± 1.43 |
| Supine systolic BP (mmHg) | 117.3 ± 12.5 | 118.7 ± 16.0 | 113.6 ± 12.3 | 113.6 ± 10.5 |
| Supine diastolic BP (mmHg) | 68.3 ± 6.4 | 67.2 ± 9.1 | 66.4 ± 6.3 | 66.1 ± 6.8 |
| Supine heart rate (mmHg) | 69.2 ± 7.7 | 68.4 ± 7.5 | 66.1 ± 5.7 | 66.9 ± 6.5 |
| Drinkers (*n*) | 25 | 28 | 22 | 22 |
| Alcohol intake (ml/week) | 62.46 ± 62.11 | 56.28 ± 40.37 | 61.17 ± 79.77 | 60.00 ± 52.26 |
| Antihypertensive medication (*n*) | 5 | 3 | 3 | 3 |
| Postmenopausal (*n*) | 16 | 22 | 21 | 18 |
| Oral contraceptives/HRT (*n*) | 11 | 15 | 10 | 14 |

BMI, body mass index; BP, blood pressure; $\dot{V}O_{2max}$, maximal oxygen consumption; HRT, hormone replacement therapy. Values are mean ± SD. There were no significant differences between groups at baseline.

**Fig. 1**




Flowchart of participants from recruitment to completion of the assessment at 6 months. BP, blood pressure.

group −2.2 m (−8.3, 3.7) (−1.0%). The difference between the swim and walk group was significant ($P = 0.001$). All the swimmers who completed 6 months were rated as competent, although 25% remained anxious about face immersion.

### Body weight and body composition

Within-group changes in body weight, BMI, triceps skinfold and arm muscle girth are shown in Table 2. There was no significant difference between exercise mode in any of these variables.

### Lifestyle changes

Self-reported dietary changes, weekly intake of alcohol or 24-h excretion of urinary sodium (Table 2), potassium, calcium or creatinine (results not shown) did not change significantly between exercise groups.

### Blood pressure and heart rate

Figure 2 shows the unadjusted, within-group changes in supine systolic and diastolic BP and HR for the 97 women (three were not available due to illness and family commitments) who had BP assessed after 6 months. In GLM with adjustment for initial BP, age, hypertension treatment status and change in weight, there was a significant main effect of swimming to increase supine systolic BP relative to walking by 4.4 mmHg (1.2, 7.5) ($P = 0.008$). There was a similar increase of 1.4 mmHg (−0.14, 3.0) in supine diastolic BP, but this was not statistically significant ($P = 0.07$). Changes in standing BP followed a similar pattern, with increases of 6.0 mmHg (2.6, 9.5) ($P = 0.001$) and 1.8 mmHg (−0.02, 3.5) ($P = 0.05$) in systolic and diastolic BP, respectively, in the swimming relative to the walking group. When the analysis was repeated with change in alcohol intake or a change in arm

**Table 2 Within-group changes in body weight, BMI, tricep skinfold, arm muscle girth, alcohol intake, $\dot{V}O_{2max}$, urinary sodium and calcium excretion in the two exercise groups after 6 months of walking and swimming**

| | Walk ($n = 49$) | Swim ($n = 48$) |
|---|---|---|
| Δ Weight (kg) | −0.33 (−1.03, 0.36) | −0.89 (−1.51, −0.26)** |
| Δ BMI (kg/m$^2$) | −0.12 (−0.38, 0.13) | −0.33 (−0.56, −0.10)** |
| Δ Triceps skinfold (mm) | 0.22 (−0.98, 1.43) | 0.52 (−1.00, 2.05) |
| Δ Arm muscle girth (mm) | −6.05 (−8.91, −3.18) | −6.42 (−9.28, −3.60)*** |
| Δ Alcohol intake (ml/week) | −4.74 (−13.42, 3.93) | −2.21 (−12.87, 8.44) |
| $\dot{V}O_{2max}$ predicted (ml/kg per min) | 2.54 (2.00, 3.08)*** | 1.75 (1.27, 2.24)*** |
| Δ Urinary sodium excretion (mmol/day) | 4.14 (−26.74, 35.03) | −0.48 (−22.0, 21.03) |
| Δ Urinary calcium excretion (mmol/day) | 0.76 (−0.19, 1.72) | 0.17 (−0.39, 0.74) |

BMI, body mass index; $\dot{V}O_{2max}$, maximal oxygen consumption. Values are mean and 95% confidence intervals in parentheses. Significance of *t*-test for within-group changes: $^{**}P < 0.01$, $^{***}P < 0.001$.

muscle girth entered into the model, the results were unchanged. Within the swimming group the changes in BP from baseline to 6 months were similar for the group who were anxious about face immersion and those who were not.

There were similar within-group reductions in supine HR with both walking and swimming 3.6 beats/min (5.1, 2.2) versus 3.0 beats/min (4.2, 1.9), ($P = 0.001$), respectively. Within-group changes in supine HR for the two groups are shown in Fig. 2. Standing HRs were also reduced ($P = 0.001$). There was no significant difference in change in HR between those who walked and those who swam.

There was no difference in the BP and HR responses between the women who were taking hormone replacement therapy (HRT) and those who were not taking HRT.

## Discussion

In this randomized, controlled comparison of walking and swimming in normal or controlled BP, non-obese, sedentary older women, we have demonstrated that, relative to walking, swimming increases supine systolic BP by 4 mmHg. This increase in BP was independent of any change in weight, arm muscle girth, or lifestyle changes such as salt or alcohol intake. To our knowledge we are the first group to investigate the longer-term effects of a supervised swimming training programme of moderate intensity in normotensive, older women without well-developed swimming skills.

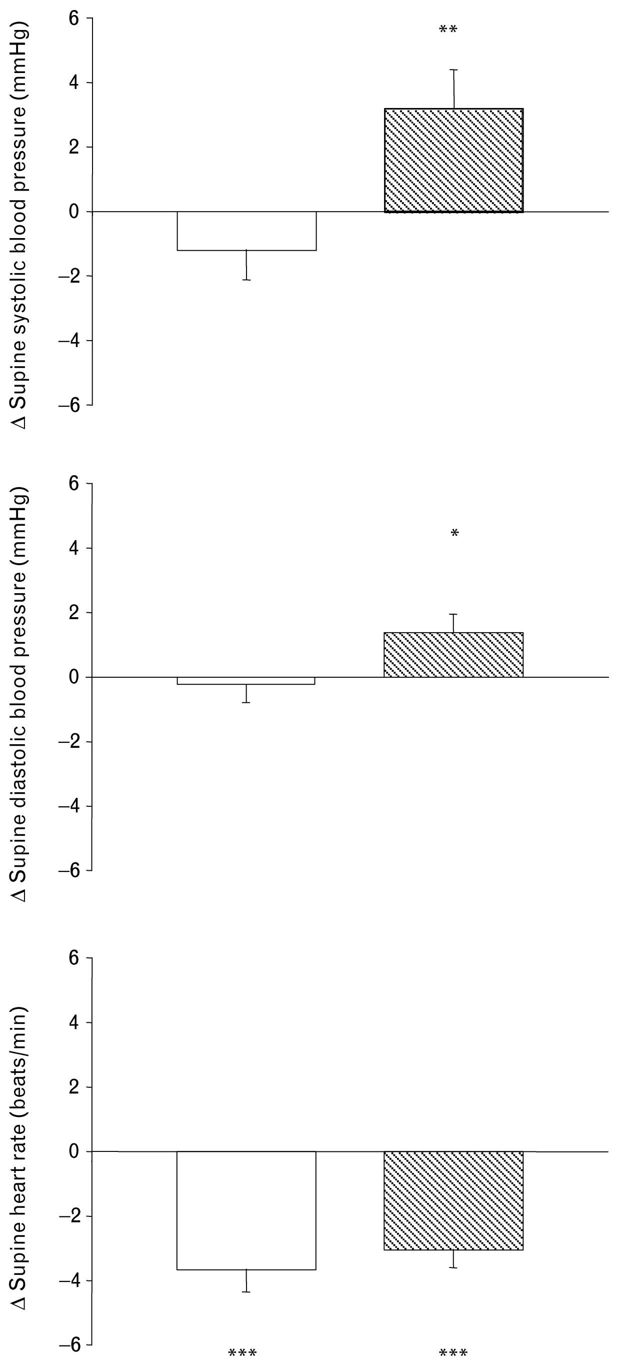
Exercise training reduces BP in normotensives [1–3]. A recent meta-analysis of 54 randomized controlled trials showed that aerobic exercise was associated with a significant reduction of 3.8 mmHg in systolic BP and 2.6 mmHg in diastolic BP in both normotensive and hypertensive groups [22]. We have previously demonstrated that a similar exercise programme of moderate intensity in older women reduced systolic BP after 6 months, and both systolic and diastolic BP after 18 months [2]. The changes in BP with walking in the current study were consistent with our previous findings.

Our finding of an increase in BP with swimming, although controversial, should not be entirely unexpected. The physiological responses and adaptations that swimming training evokes are complex and are different from those of land-based aerobic activities [11]. Posture is different, the body is subject to the effects of hydrostatic pressure and facial immersion, and there are the possible effects of water temperature and the increased thermal conductivity of water. Furthermore, swimming has a predominance of arm-work compared with other activities. However, why BP should remain elevated at least 48 h beyond the last bout of swimming is less clear.

In young trained swimmers, mean arterial pressure is higher during swimming compared with running at sub-maximal and maximal workloads, even though cardiac output is similar [9]. Acute bouts of swimming have been reported to produce unexpected increases in BP and HRs in older swim-class participants [8]. We were careful to measure BP at least 48 h after exercise, to minimize any acute effects. Higher systolic and diastolic BP and HR have been observed in trained swimmers when compared with trained runners and untrained men [11] and other endurance-trained athletes [10].

In contrast to our results, Tanaka *et al.* [12] reported a reduction in seated and supine systolic BP after 10 weeks of swimming training in middle-aged hypertensive men and women, but that study differed in several ways from our intervention. First, all participants had a baseline BP in the hypertensive range (140–170 mmHg) and only one was on antihypertensive medication [12]. In our study only four participants were in this range at baseline and 14 were on antihypertensive medication. Second, several of the women in our study were not skilled swimmers and none could swim continuously for 10 min at recruitment. Initially, swimming training was done as interval training. The rest intervals were reduced to 5–20 s as fitness increased and swimming became more continuous. Although a possibility, it is unlikely that the difference

**Fig. 2**




Within-group mean change (+ SEM) in supine systolic and diastolic blood pressure and supine heart rate in the walking (white bars) and swimming (hatched bars) group after 6 months. $***P < 0.001$, $**P < 0.01$, $*P < 0.05$.

in training between walking and swimming would account for the observed differences in BP. Even though our participants' skills greatly improved, some remained anxious about swimming with their faces in the water. However, this perceived anxiety did not result in any differences in pre- versus post-BP in those who were anxious and those who were not. The intensity of the training was similar to that reported by Tanaka *et al.* [12], with the duration of our sessions being 30 min compared with 45 min. Third, our participants were randomly assigned to walking and swimming, whereas Tanaka *et al.* [12] allowed some individual choice of group. This may have resulted in further differences in the level of anxiety about swimming between the two studies. Fourth, our participants were all women, and it is possible that this may have influenced the results. Finally, Tanaka *et al.* [12] reported the mean water temperature to be 27–28°C, whereas the water temperature in our study was 26.5°C. Vasoconstriction evoked by the response to cooler skin temperature in water and the resulting increased total peripheral resistance has been proposed as the reason for an increase in BP during and immediately after swimming.

The predominant use of upper body muscles compared to lower body musculature used in walking and running might explain the increase in BP in swimming. Astrand *et al.* [23] demonstrated higher BP in arm cycling compared with leg cycling at the same oxygen consumption. At a given sub-maximal oxygen consumption, BP is higher when small muscle groups are worked compared to large muscle groups [24]. Weight lifters have demonstrated higher BP than swimmers and runners [11].

Several studies have evaluated the hormonal and haemodynamic responses to water immersion and swimming, in an attempt to explain the mechanisms responsible for cardiovascular adaptations to a non-gravity environment. They have been characterized by great variation in the age and characteristics of the subject, whether the exercise was completed recumbent or upright, which has made comparisons between such studies difficult. Further, studies that carefully take into consideration such variations will be necessary if the underlying mechanisms of the long-term blood pressure changes observed in our study are to be understood. Potential mechanisms include the role of thermoregulation, neural and renin–angiotensin and sympathetic responses to swimming training.

Vasoconstriction and hydrostatic pressure have been shown to increase central blood volume [25], resulting in a rise in blood pressure, cardiac output and a rise in natriuretic peptides, which could account for increased natriuresis and diuresis that have been observed with swimming [26]. This, in turn, could reduce blood pressure, with a possible compensatory mechanism of activation of the renin–angiotensin–aldosterone axis and an increase in blood pressure in the long term. In support of this notion, 4 weeks of stationary cycling has been shown to reduce BP and renal but not cardiac sympathetic activity [27]. The increase in blood pressure with swimming training could be due to such an increase in renal sympathetic activity, with a consequent increase in renin release and an increased re-absorption of water and sodium.

A further hypothesis for elevated blood pressures seen in trained swimmers could be reduced baroreceptor sensitivity [11]. Alternatively, a reduction in vascular resistance has been proposed as another possible mechanism for the BP-lowering effect of land-based exercise [28]. However, the evidence from swim training studies is inconsistent. A programme of swim and circuit training in middle-aged men and women reported no changes in systolic BP, a reduction in supine total peripheral resistance, but no change in resting calf conductance or blood flow [29]. A reduction in BP with swim training was not associated with a reduction in vascular forearm resistance [12].

One limitation of our study was the reliance on predicted maximal HR in determining exercise intensity, and this may have affected the accuracy of our assessments. By adjusting for the peak HR achieved on the fitness tests, we minimized the effect on the accuracy of the calculation. We have reported previously that exercise of moderate, but not vigorous, intensity lowers BP in older women [2]. While some have supported this finding, others have not, and a recent meta-analysis concluded that exercise intensity has not been shown to influence BP change [22]. Although post-hoc analysis revealed that the adjusted exercise intensity was significantly higher for the swimmers, they were still within the prescribed moderate intensity range, and both groups had similar ratings of perceived exertion. Thus it is unlikely that such a relative difference could account for the observed differences in BP. Another limitation was the estimation of fitness from the walk and swim test, instead of a maximal exercise test with the measurement of maximal oxygen consumption. It is unlikely that any inaccuracy in this measure would have influenced the BP results, as changes in maximal oxygen consumption are not related to BP reductions [2]. The results of our study are limited to normal or controlled BP in non-obese, sedentary older women.

Swimming is an attractive mode of exercise for the overweight, the less mobile and the older individual. However, benefits of regular swimming on cardiovascular health have not been demonstrated. Total physical activity, running, weight training, rowing and walking, but not swimming, have been associated with a reduced risk for coronary heart disease (CHD) [30]. On the other hand, swimming has been shown to be a safe mode of exercise in cardiac rehabilitation, with no reports of increased mortality or adverse effects in a 10-year programme [31].

On average, our subjects were normotensive at baseline and remained so even with the observed increase in BP. The number of women who became hypertensive was not significantly different between groups. This increase in BP may have been a physiological adjustment to the water environment that persisted in the long term. It is important to emphasize that swimming training significantly improved walking and swimming fitness, and had effects similar to walking on other measures, such as body weight.

In conclusion, inactivity is a major risk factor for hypertension and cardiovascular disease. Finding ways to initiate and maintain a physically active lifestyle, particularly with older adults, is a challenge to the practitioner. Providing variety in the modes of activity is a strategy used to promote increased physical activity. Swimming has been recommended as an alternative to land-based activity, particularly for older individuals, those who are obese or those who have limited mobility. Our finding of a significant elevation in BP with moderately paced swimming relative to walking, has important implications for the mode of exercise recommended for cardiovascular health in older subjects. However, the clinical significance of our findings needs to be evaluated further, especially in other populations, such as those with hypertension. Swimming still remains a viable mode of physical activity, with the potential to improve cardiovascular fitness. Meanwhile these results suggest that a recommendation for sedentary older individuals to take up swimming, particularly if they are novice swimmers, should be made with caution and regular BP monitoring.

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