

## Introduction

### Background

- Stroke survivors commonly present with reduced cardiorespiratory fitness (CRF) and impaired walking ability.
- Impaired CRF limits walking ability and functional recovery.
- However, the optimal aerobic training strategy to improve CRF and walking ability in stroke rehabilitation remains unclear.

### High-Intensity Interval Training (HIIT)

- HIIT alternates short bouts of high-intensity exercise with periods of recovery.
- It has recently gained attention as a time-efficient rehabilitation strategy after stroke.

### Purpose of Study

This study aimed to evaluate the effects of HIIT on cardiorespiratory fitness and walking ability in patients with stroke through a systematic review and meta-analysis.

## Methods

### Study Design

- This study was conducted as a systematic review and meta-analysis following the PRISMA guidelines.
- Randomized controlled trials comparing high-intensity interval training (HIIT) with conventional or moderate-intensity training in patients with stroke were included.

### Search Strategy

- A comprehensive literature search was performed in MEDLINE, EMBASE, Web of Science, and Cochrane CENTRAL.
- Studies published between 2005 and 2025 were screened using keywords related to stroke, high-intensity training, and aerobic exercise.

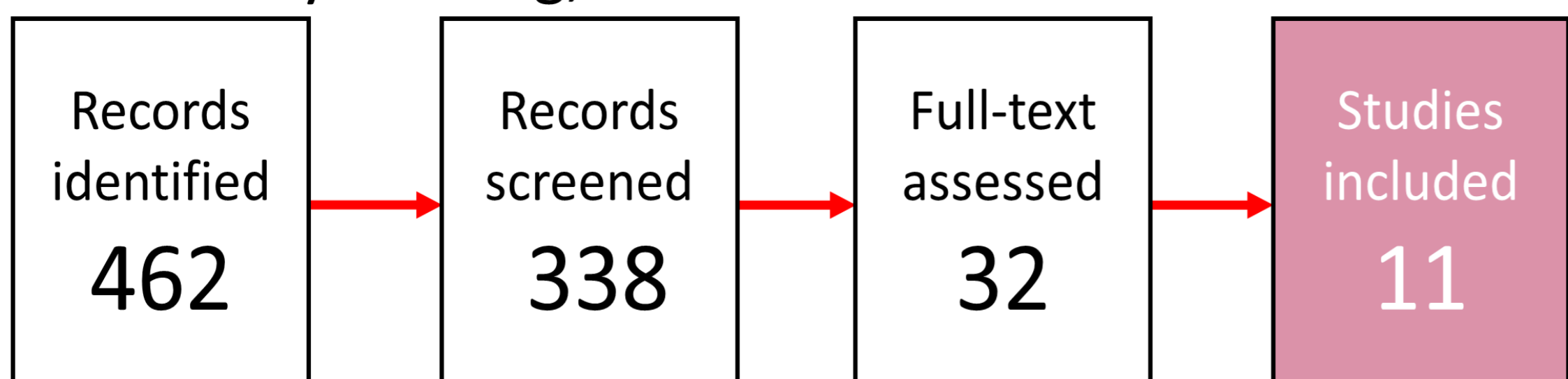


Figure 1. PRISMA flow diagram of study selection.

### Inclusion Criteria

Studies were included if they:

- were randomized controlled trials
- involved patients with stroke compared HIIT with moderate- or low-intensity training
- reported outcomes related to cardiorespiratory fitness or walking ability

### Outcomes and Analysis

- The primary outcomes were cardiorespiratory fitness (VO<sub>2</sub>peak) and walking ability (gait speed).
- A random-effects model was used to estimate pooled effect sizes with 95% confidence intervals.

## Results

### Study characteristics

- 11 RCTs included
- 551 participants
- 6 countries
- Common interventions: Treadmill HIIT, Cycling HIIT, Skating exercise

### KEY RESULTS

VO<sub>2</sub>peak  
**+3.12** mL/kg/min  
 Gait speed  
**+0.11** m/s

### Cardiorespiratory Fitness (CRF)

- HIIT significantly improved cardiorespiratory fitness vs control interventions.
- The pooled analysis showed a significant effect on **VO<sub>2</sub>peak (SMD = 1.05, 95% CI 0.48–1.62)**.
- The improvement exceeded the clinically meaningful threshold for VO<sub>2</sub>peak.

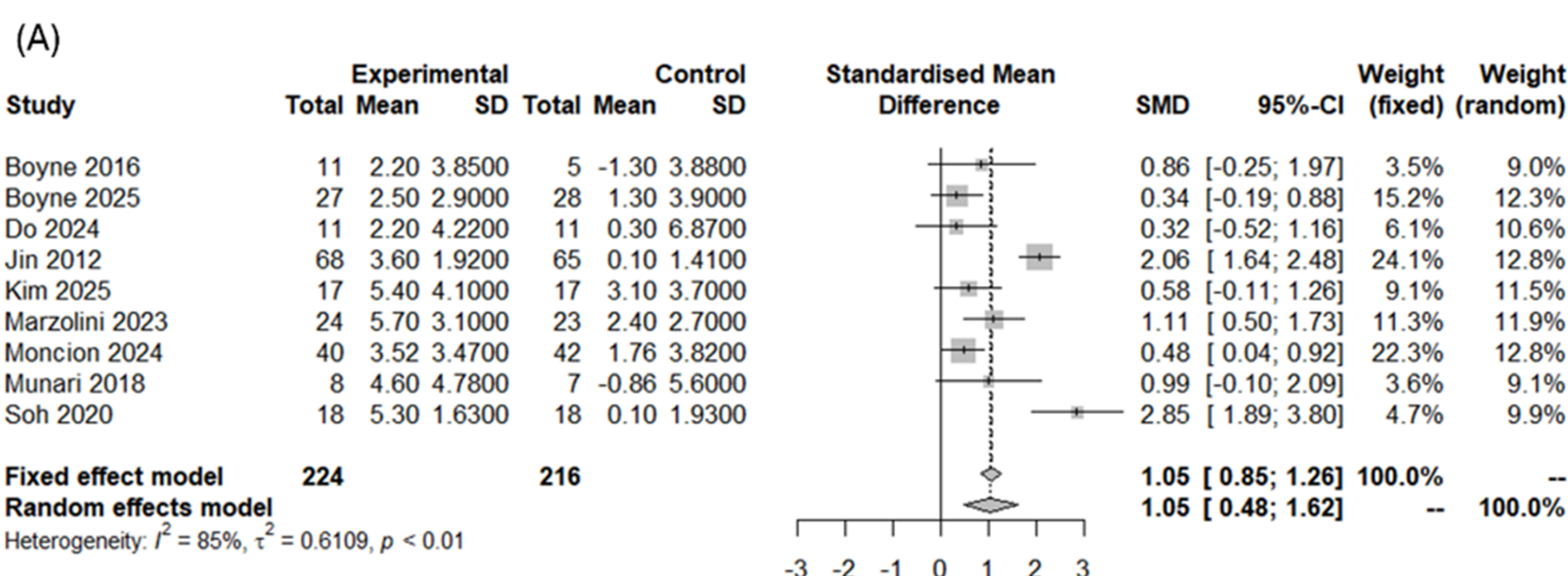


Figure 2. Forest plot of VO<sub>2</sub>peak.

### Walking ability

- HIIT significantly improved walking ability compared with control interventions.
- The pooled analysis showed a significant improvement in **gait speed (SMD = 0.61, 95% CI 0.19–1.02)**.
- This improvement suggests potential functional benefits for stroke rehabilitation.

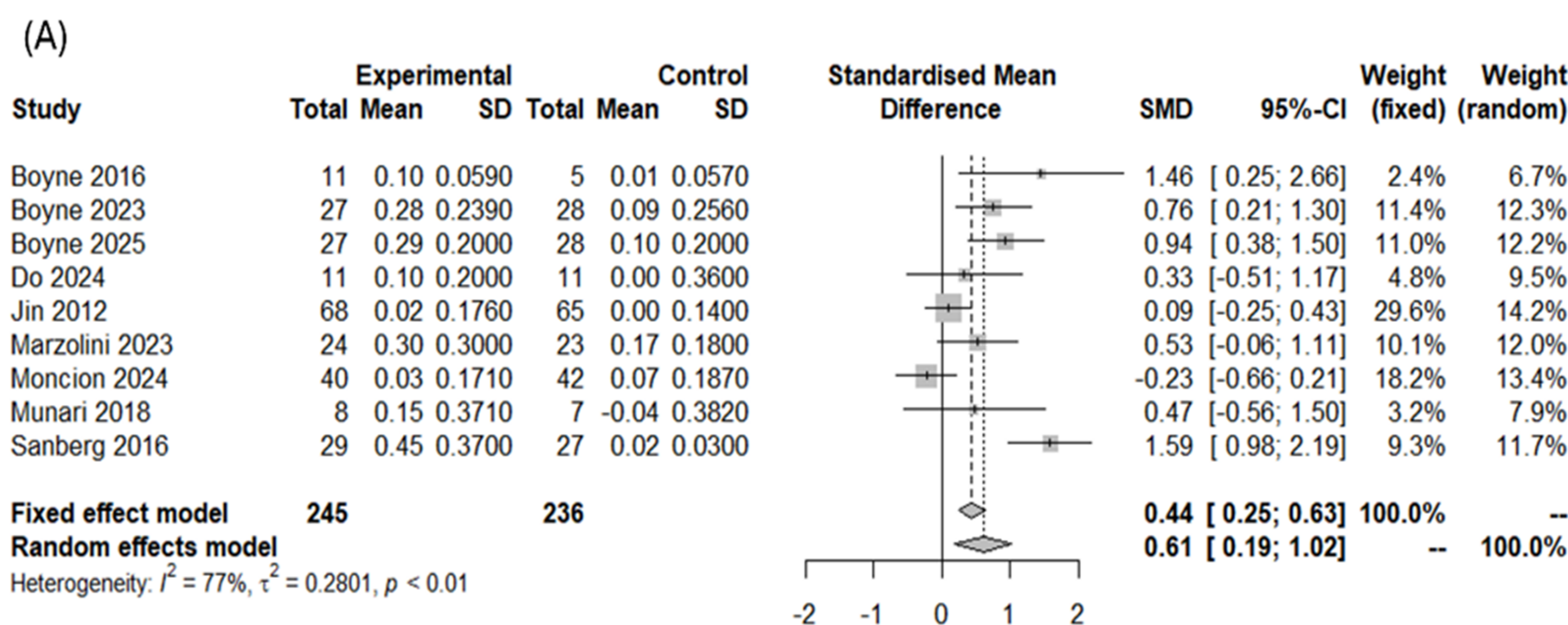


Figure 3. Forest plot of gait speed.

### Subgroup analysis

Greater effects were observed in:

- Participants ≤60 years
- Intervention duration >20 min

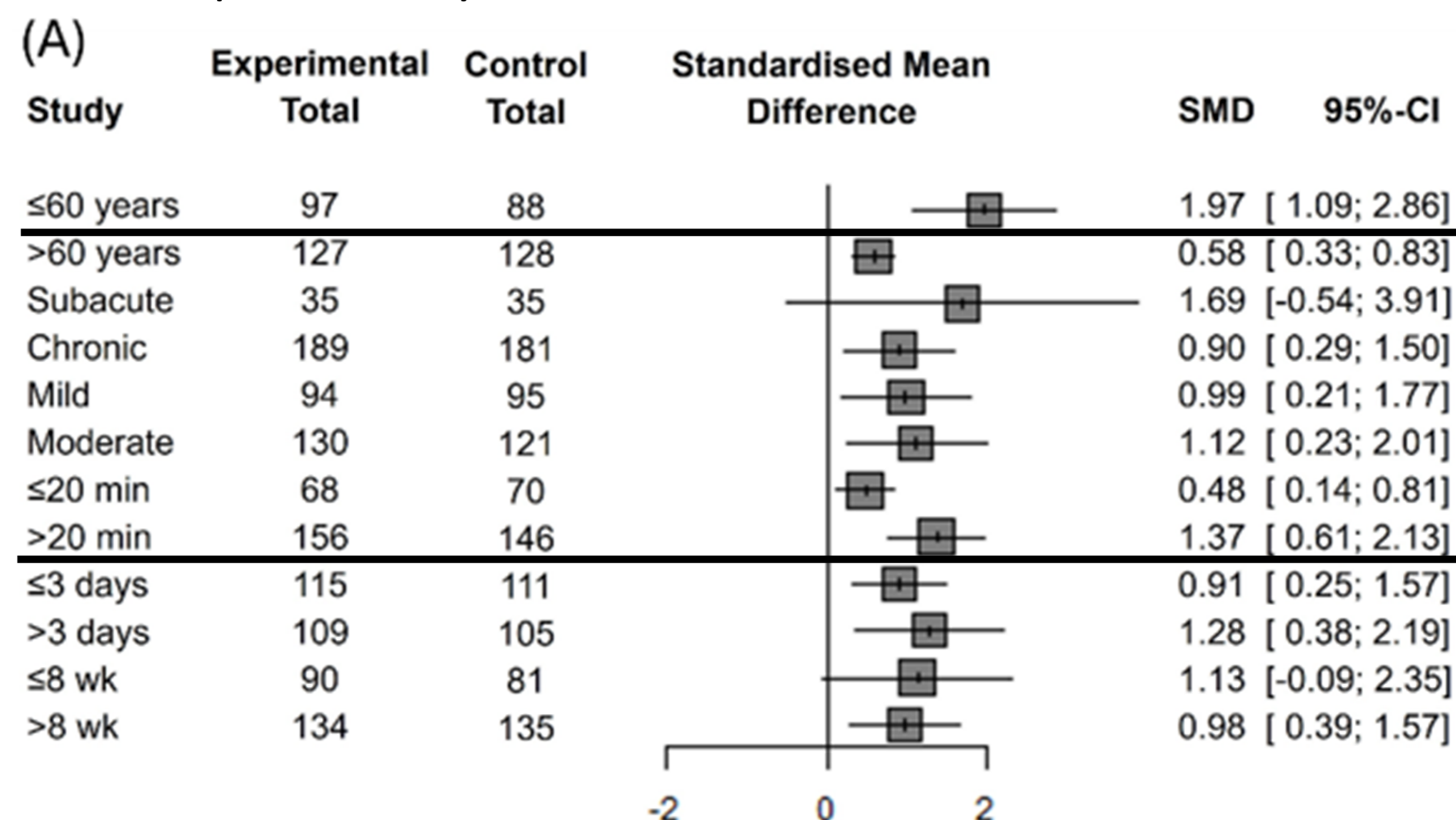


Figure 4. Subgroup analysis of CRF.

## Results

- HIIT significantly improves cardiorespiratory fitness and walking ability in stroke survivors.
- Greater benefits were observed in younger patients and with exercise sessions longer than 20 minutes.

## TAKE-HOME MESSAGE

### HIIT improves outcomes in stroke rehabilitation

- VO<sub>2</sub>peak increased by **+3.12** mL/kg/min
- Gait speed increased by **+0.11** m/s
- Sessions longer than 20 minutes showed greater benefit