

UNIVERSITY OF
Otago

**Pragmatic Community
Based Exercise Prescription
- results of an RCT**

Hamish Osborne



Exercise Works

- Improves VO_2Max
- Reduced rates of CAD, Stroke, PVD
- Reduced rates of many forms of cancer
- Reduced rates of dementia
- Almost a panacea for preventive medicine

Exercise Doesn't Work

- Intervention studies show :
 - High early compliance
 - Poor late compliance
 - Despite this some lingering effect of exercise



Leisure Time Physical Activity and Mortality in Hong Kong: Case-control Study of All Adult Deaths in 1998

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Support Strategies for **W**hole-Food Diets, **I**ntermittent-**F**asting, and **T**raining

Departments of Medicine, Human Nutrition, Social & Preventative Medicine

Rachael W. Taylor, Melyssa Roy, Michelle R. Jospe, Hamish R. Osborne, Kim J Meredith-Jones, Sheila M. Williams and Rachel C. Brown.

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SWIFT Study

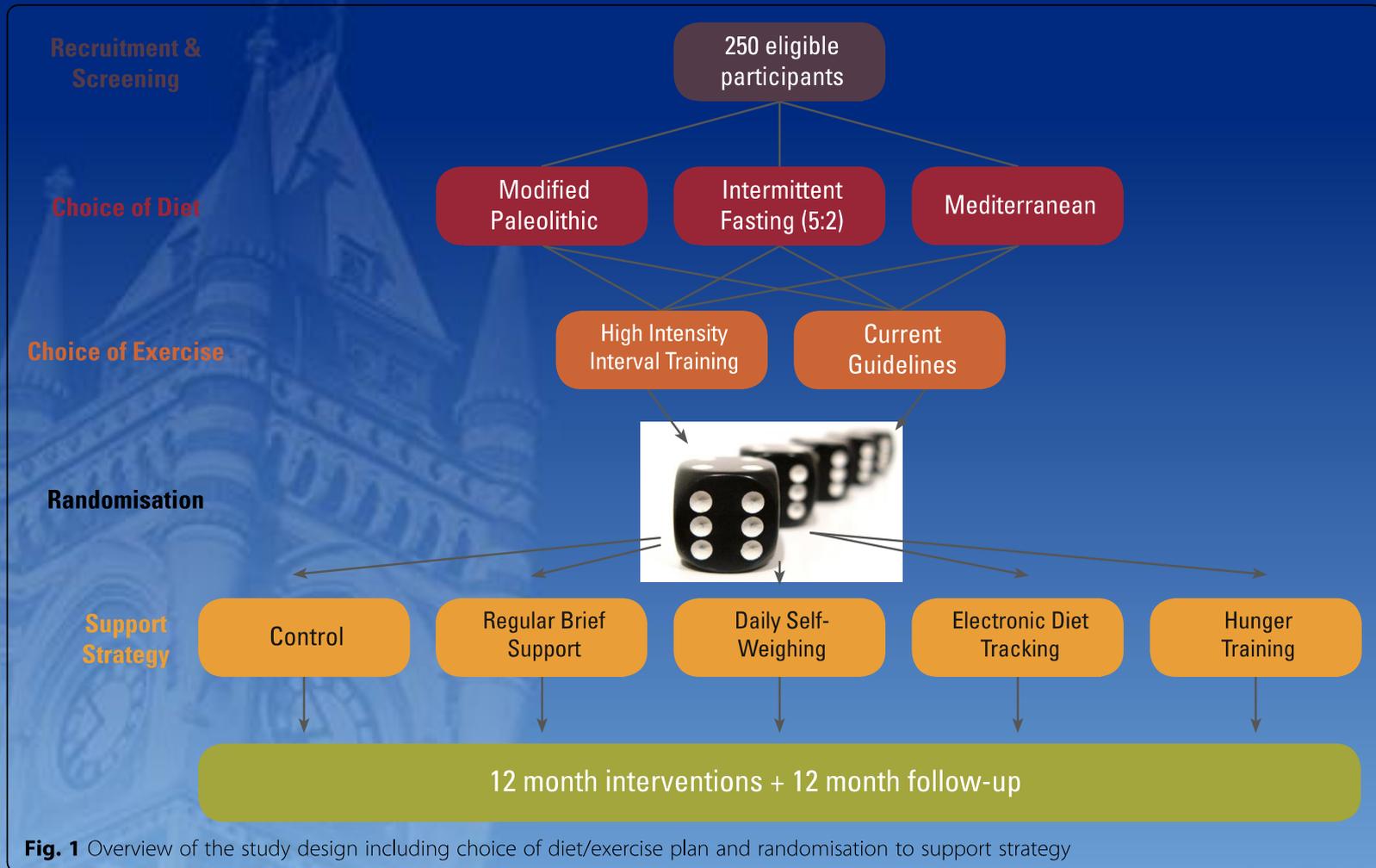
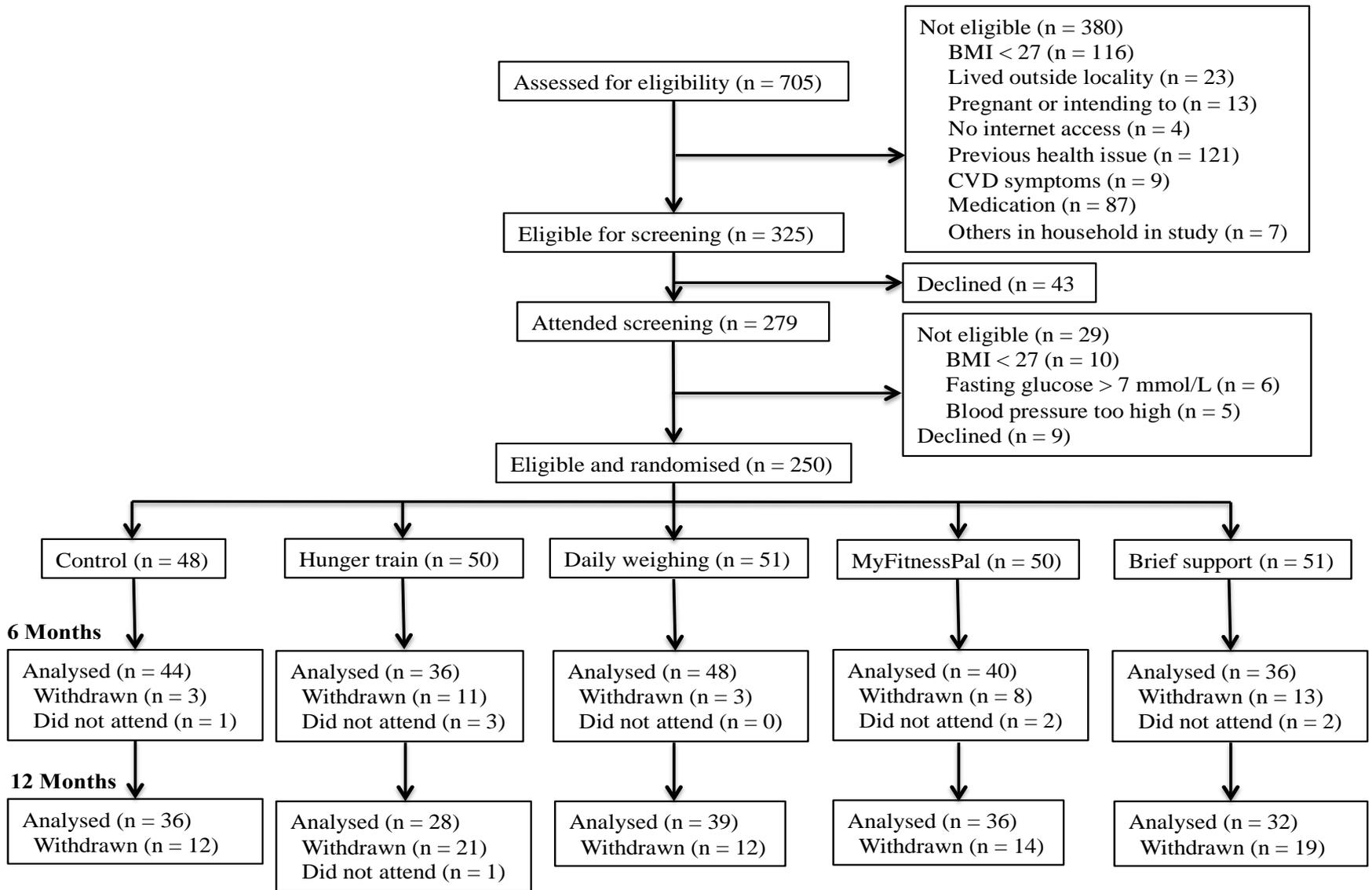


Fig. 1 Overview of the study design including choice of diet/exercise plan and randomisation to support strategy

Wait... they can choose??

- ***NOT a randomised controlled trial of the diet and exercise interventions***
 - cohort analysis of the diet/exercise combinations probable
- Intended to be a 'real world' pragmatic trial
- Long term (2 years)
- Intended to truly test the efficacy of these interventions from a public health perspective



No significant connection between diet and exercise choices....

		Exercise groups		Total
		Current guidelines	HIIT	
Diet groups	Fasting	74	62	136
	Mediterranean	47	21	68
	Paleo	23	23	46
Total		144	106	250

P = 0.069 for chi-squared test

So what is this study supposed to show?

Wholefoods, fasting and sprinting...

Is this what everyone should be doing??

- How do people actually interpret and apply these kinds of guidelines?
- Do these approaches actually work over the longer term?
- What are the effects on:
 - weight
 - fitness
 - markers of health and disease
 - cardiovascular risk, inflammation, glucose handling etc
 - psychological outcomes

Choosing to do HIIT: *no gender differences*

	Exercise groups		Total
Sex	Current guidelines	HIIT	
Female	94	61	155
Male	50	45	95
Total	144	106	250

P = 0.133 for chi-squared test



Screening Findings

- Exclusions

- the young man with BMI of 49 who couldn't tolerate sub-max testing
- a 60 year old smoking woman with a really frightening family history of lots of SCDs
- one woman with a really loud new aortic murmur
- one really big man with a carotid bruit, (and then he confessed to bilateral calf pain during exercise as well)

- Medical Referral

- Very high RHR
- One had ? AAA
- one woman looked hypothyroid
- one “with interesting pinpoint pupils”
- One woman early onset dementia,
- One whose bipolar disorder was not controlled
- One with atypical pneumonia

Are people who choose HIIT *different*?

Demographics		Conventional	HIIT	P
Age (years)		44.0 (11.4)	43.2 (10.4)	0.595
Education	School only	28 (19%)	21 (20%)	0.063
	Post-secondary	44 (31%)	19 (18%)	
	University	72 (50%)	66 (42%)	
Ethnicity	NZEO	128 (89%)	92 (87%)	0.467
	Maori & Pacific	13 (9%)	12 (11%)	
	Asian	3 (2%)	2 (2%)	
Employment	Full-time	100 (69%)	77 (73%)	0.638
	Part-time	30 (21%)	21 (20%)	
	Not employed	7 (5%)	6 (6%)	
	Not answered	7 (5%)	2 (2%)	

Are people who choose HIIT already *healthier* ?

Health characteristic	Conventional	HIIT	P
Body mass index	33.0 (4.4)	33.0 (4.4)	0.948
Waist circumference	101.5 (12.4)	101.5 (12.6)	0.996
Body fat percentage	40.4 (7.5)	39.3 (7.2)	0.228
Fasting glucose	5.5 (0.7)	5.5 (0.6)	0.892
Systolic blood pressure	124 (15)	124 (16)	0.987
Diastolic blood pressure	78 (10)	79 (10)	0.757

Are people who choose HIIT already *fitter* ?

Fitness measure	Conventional	HIIT	P
Estimated VO ₂ max	28.6 (7.2)	29.0 (7.2)	0.668
Accelerometry...	Data not yet analysed...		

Statistical Analysis

The study was designed to have 90% power to detect differences of weight of 4 kg, assuming a SD of 15 kg and a correlation between repeat measures of $r=0.90$, using a two-sided test at the 0.05 level ($n=42/\text{group}$), with $n=250$ in total after allowing for 15% loss to follow-up (36). The primary analysis followed modified intention-to-treat principles. Outcomes at 6 and 12 months were calculated using linear mixed-models, adjusting for age, sex and baseline weight.

Results

- On average lost weight = 3.1 kg (3.9-6.8kg) ($p \geq 0.084$)
 - No difference between any of the intervention groups and the control group
 - Similar for BMI, waist circumference, DXA measures of body composition, and blood pressure
 - No difference between exercise interventions

How do 'normal' people actually do HIIT?

Activities recorded by participants:

- **Exercise machines**
 - Exercycles, ellipticals, rowing machines, steppers
- **Using the local environment**
 - Running, stairs, hill-climbs, cycling
- **Home-based circuit exercises**
 - High-knee running, burpees etc
 - X-box programs
- **Commercial HIIT classes**
 - Crossfit, MetaFit, Boot-camps, True Grit etc
- **High intensity sports**
 - Futsal, martial arts, squash, netball

Did they do it hard enough?

YES!

- Almost all HIIT sessions analysed attained goal heart rates
 - *only one session from one participant inadequate*

**THOSE
BURPEES
WERE
FUN** 
...SAID NO ONE EVER

Biochemical Measures

1. Lipid profile
 2. HbA1c
 3. Inflammatory markers
 - High-sensitivity C-reactive Protein
 - Interleukin 6
 4. Adiponectin
 5. Ghrelin
- Intent is to capture the effect of the interventions on markers of health and disease:
 - Cardiovascular and diabetes risk
 - Inflammation (hsCRP, IL6)
 - Biochemical link between adiposity and cardiovascular outcomes (adiponectin)
 - Effect on appetite (ghrelin)

Results

Table 3. Difference in mean weight change at 6 and 12-month follow-up across all intervention groups with 95% confidence intervals

	12-month weight change (kg)				
6-month weight change (kg)	Control	0.8 (-2.1, 3.7)	2.2 (-1.0, 5.3)	1.7 (-0.9, 4.3)	-1.1 (-3.8, 1.6)
	0.3 (-1.5, 2.2)	Daily weighing	1.4 (-2.1, 4.8)	0.9 (-2.1, 3.9)	-1.9 (-5.1, 1.3)
	0.7 (-2.3, 3.6)	0.3 (-2.6, 3.2)	MyFitnessPal	-0.5 (-3.5, 2.6)	-3.2 (-6.4, -0.1)
	1.1 (-0.9, 3.2)	0.8 (-1.2, 2.8)	0.5 (-2.4, 3.4)	Brief support	-2.8 (-5.5, -0.1)
	-1.8 (-3.8, 0.2)	-2.1 (-4.2, -0.1)	-2.5 (-5.4, 0.5)	-2.9 (-5.1, -0.8)	Hunger training

Psychology And Eating

None of the interventions had adverse effects on disordered eating, depression, anxiety, stress.

Significant improvement in

- depression scores in the hunger training (-3.05, -5.61 to -0.50, $p=0.019$)

- brief support (-3.16, -5.70 to -0.62, $p=0.015$)

reduction in anxiety scores in the

- brief support group compared with control (-1.84, -3.67 to -0.02, $p=0.048$).

None of the monitoring strategies significantly affected intuitive eating, external eating, emotional eating, or eating restraint compared with the control group

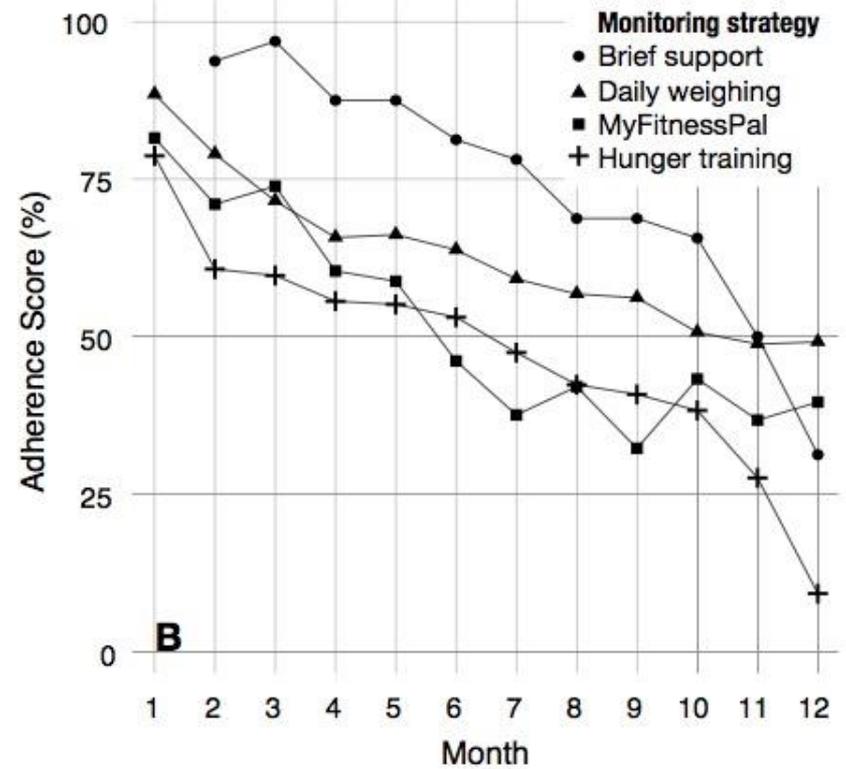
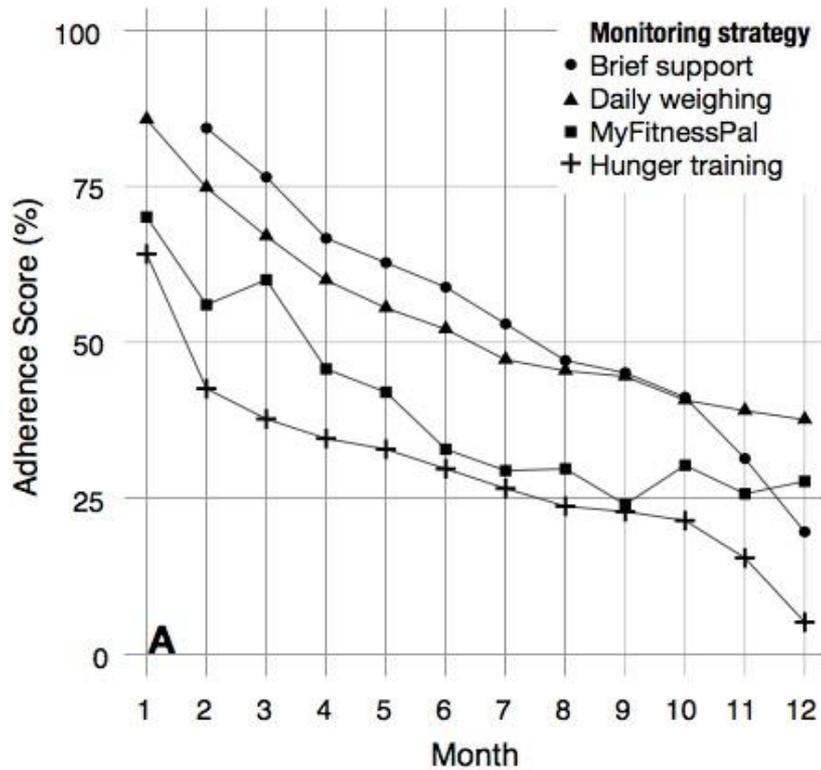
Blood Markers

On average 35 minutes of moderate to vigorous PA daily, no significant differences between intervention groups (all $p \geq 0.076$).

Estimated VO_2max did not vary between groups (all $p \geq 0.056$)

There was no significant difference in any of the blood markers (all $p \geq 0.086$), including HbA1c, CRP, and cholesterol measures.

Compliance



Drop outs

More likely to be

younger ($p=0.003$),

female ($p=0.011$)

Pacific ethnicity ($p=0.015$),

no significant differences

baseline weight ($p=0.685$),

BMI ($p=0.175$),

education ($p=0.122$),

retention across intervention groups ($p=0.139$)

Adverse Events in HIIT group

- one new diagnosis of angina
- one confirmed CVA
- one breast Ca
- one pregnant

Difference between HIIT and 5x30 walks

- Group analysis
 - no difference between groups
 - no difference between support mechanisms
- No change in submax fitness tests
- No difference between groups on any health markers
- Subgroup analysis showed those who complied best lost the most weight

Can they do HIIT when we're not watching?

YES!

- Baseline heart rate recordings over one week
 - unsupervised HIIT sessions
 - completed by 84/104 (80.7%) of participants
- Could choose any activity:
 - *'that uses most of your body and is very hard to do within seconds'*
 - included sports and commercial programs
- Different activities and protocols suggested
 - range of exercise types
 - submaximal and maximal
 - intervals from 20 seconds to 4 minutes



HIIT Success

- No useful predictors of who succeeded based on baseline demographics
- Those who succeeded were the only group who changed their attitude to exercise

Did they do HIIT?

Table 3. Duration of exercise above threshold recorded during HIIT sessions by participants providing recordings

<u>Timepoint</u>	n	Time spent above threshold during HIIT			
		Time above 80%	Time above 90%	Total time above 80%	Total time above 90%
		<u>HR_{max}</u> /session (min)	<u>HR_{max}</u> /session (min)	<u>HR_{max}</u> /week (min)	<u>HR_{max}</u> /week (min)
Baseline unsupervised	83	8.5 (9.9)	3.4 (6.4)	22.7 (31.3)	9.2 (19.0)
3 months	56	10.9 (11.1)	4.3 (6.3)	24.7 (27.9)	9.6 (14.3)
6 months	40	10.8 (11.6)	4.0 (6.9)	24.7 (25.0)	9.2 (15.9)
9 months	35	13.3 (25.5)	5.7 (19.7)	23.8 (33.0)	8.8 (23.8)
12 months	29	10.6 (10.9)	4.6 (7.5)	21.3 (25.4)	9.5 (18.4)

Participates in Regular Exercise[§]

No

Yes

No CV[†], Metabolic^{**},
or Renal Disease

AND

No Signs or
Symptoms^{***}
Suggestive of CV[†],
Metabolic^{**}, or
Renal Disease

Medical
Clearance^{****} Not
Necessary

Light to
Moderate^{**}
Intensity Exercise
Recommended

May Gradually
Progress to
Vigorous^{***}
Intensity Exercise
Following ACSM
Guidelines^ϕ

Known CV[†],
Metabolic^{**}, or
Renal Disease

AND

Asymptomatic

Medical
Clearance^{****}
Recommended

Following Medical
Clearance, Light* to
Moderate^{**}
Intensity Exercise
Recommended

May Gradually
Progress as
Tolerated Following
ACSM Guidelines^ϕ

Any Signs or
Symptoms^{***}
Suggestive of CV[†],
Metabolic^{**}, or
Renal Disease

(Regardless of
disease status)

Medical
Clearance^{****}
Recommended

Following Medical
Clearance, Light* to
Moderate^{**}
Intensity Exercise
Recommended

May Gradually
Progress as
Tolerated Following
ACSM Guidelines^ϕ

No CV[†], Metabolic^{**},
or Renal Disease

AND

No Signs or
Symptoms^{***}
Suggestive of CV[†],
Metabolic^{**}, or
Renal Disease

Medical
Clearance^{****} Not
Necessary

Continue
Moderate^{**} or
Vigorous^{***}
Intensity Exercise

May Gradually
Progress Following
ACSM Guidelines^ϕ

Known CV[†],
Metabolic^{**}, or
Renal Disease

AND

Asymptomatic

Medical
Clearance^{****} for
Moderate Intensity
Exercise Not
Necessary

Medical Clearance
(within the last 12
months if no change
in signs/symptoms)
Recommended
Before Engaging in
Vigorous^{***}
Intensity Exercise

Continue with
Moderate^{**}
Intensity Exercise

Following Medical
Clearance, May
Gradually Progress as
Tolerated Following
ACSM Guidelines^ϕ

Any Signs or
Symptoms^{***}
Suggestive of CV[†],
Metabolic^{**}, or
Renal Disease

(Regardless of
disease status)

Discontinue
Exercise and Seek
Medical Clearance

May Return to
Exercise Following
Medical Clearance

Gradually Progress
as Tolerated
Following ACSM
Guidelines^ϕ

Safety issues in HIIT prescription

What are the implications?

- HIIT is mostly safe
- BUT... it is not appropriate to prescribe HIIT without risk stratification
 - ASCM questionnaire
- Further medical assessment is likely to be required for many people
 - Overweight, inactive 'healthy' people are still at moderate risk
 - Assessment can almost always be done at the primary care level
 - Medical evaluation is still important!



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