

**EXERCISE & DIET FOR WEIGHT LOSS  
IN OBESE PATIENTS WITH  
OBSTRUCTIVE SLEEP APNOEA (OSA)  
– A PILOT STUDY**

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# Rationale

- **Obesity is a major risk factor for OSA** Bearpark et al 1995
- **Associated morbidity and mortality** Young et al 1993, Nieto et al 2000
- **Limitations of current treatment for patients with mild – moderate disease** Engleman et al 2002, Robinson et al 2004
- **Epidemiological evidence suggests weight loss improves sleep disordered breathing** Peppard et al 2000, Newman et al 2005
- **Anticipate ancillary benefits in cardiovascular risk and neurobehavioural function**



# Aims

- **Implement an effective weight loss & exercise program in patients with OSA**
- **Assess adherence**
- **Measure the effects on clinical outcomes and sleep disordered breathing (SDB)**



# Study Design

- **Single centre 4 month uncontrolled cohort study**
- **Intervention – Diet and Exercise**
- **Pre-post assessment**



# Subjects

- **n = 12, Apnoea Hypopnoea Index (AHI) > 10, no significant desaturation**
- **BMI  $\geq$  30 kg/m<sup>2</sup>**
  - **Waist circumference  $\geq$  100cm males,  $\geq$  95cm females**
- **No excessive daytime sleepiness**
- **No significant medical or psychological comorbidities**
- **No insulin-requiring diabetes, liver or renal disease**
- **Able to exercise**



# Diet

- **Very low energy diet - Optifast®**
  - **Weeks 1-8: 3 meals/day**
  - **Weeks 9-12: 2 meals/day**
  - **Weeks 13-16: 1 meal/day**
- **Dietician at beginning of study, week 9, week 13, plus as required**



# VLED - Optifast<sup>®</sup>

- < 800kcal energy/day
- recommended daily allowances of
  - high quality protein
  - fibre
  - minerals
  - vitamins
  - trace elements
  - essential fatty acids



# VLED – Optifast®

- **Main metabolic & physiological effects (apart from weight loss)**
  - **Initial small protein loss**
  - **Mild ketosis**
  - **Fall in serum total cholesterol, LDL cholesterol, triglycerides**
  - **Improved glucose metabolism**
  - **Fall in blood pressure**
  - **Increase in serum urate**

Mustajoki & Pekkarinen 2001



# VLED – Optifast<sup>®</sup>

## ➤ Contraindications

- Type 1 diabetes
- Any severe systemic or organ disease
- Major psychiatric disease

## ➤ Austin Health weight loss clinic

- n = 100 consecutive patients, VLED 3x/day 3 months, long term maintenance VLED 1x/day
- 10% weight loss at 3 months, maintained 11.9% at 6 months
- 20% dropouts first 12 weeks, 10% 12 months



# Exercise

## ➤ Baseline

- Cardiopulmonary exercise test, functional strength (1-RM)

## ➤ Intervention

- Individualised program
- Supervised, hospital based, evenings
- Weeks 1-8: 3 times/week
- Weeks 9-16: 1 time/week
- Home program on non attendance days



# Exercise

## ➤ Weeks 1-16:

- Resistance training 3 times/week
- 80% 1-RM, 8-12 repetitions, 3 sets

## ➤ Weeks 5-16:

- Aerobic training 5 times/week
- 80%  $\text{VO}_2$  peak, 20-40 minutes



# Outcomes

- **Weight loss, including anthropometry**
- **Sleep disordered breathing – repeat polysomnogram**
- **Mood, quality of life, symptoms**
- **Cardiovascular risk – 24 hour blood pressure, lipid profile, glucose metabolism, repeat cardiopulmonary exercise test**



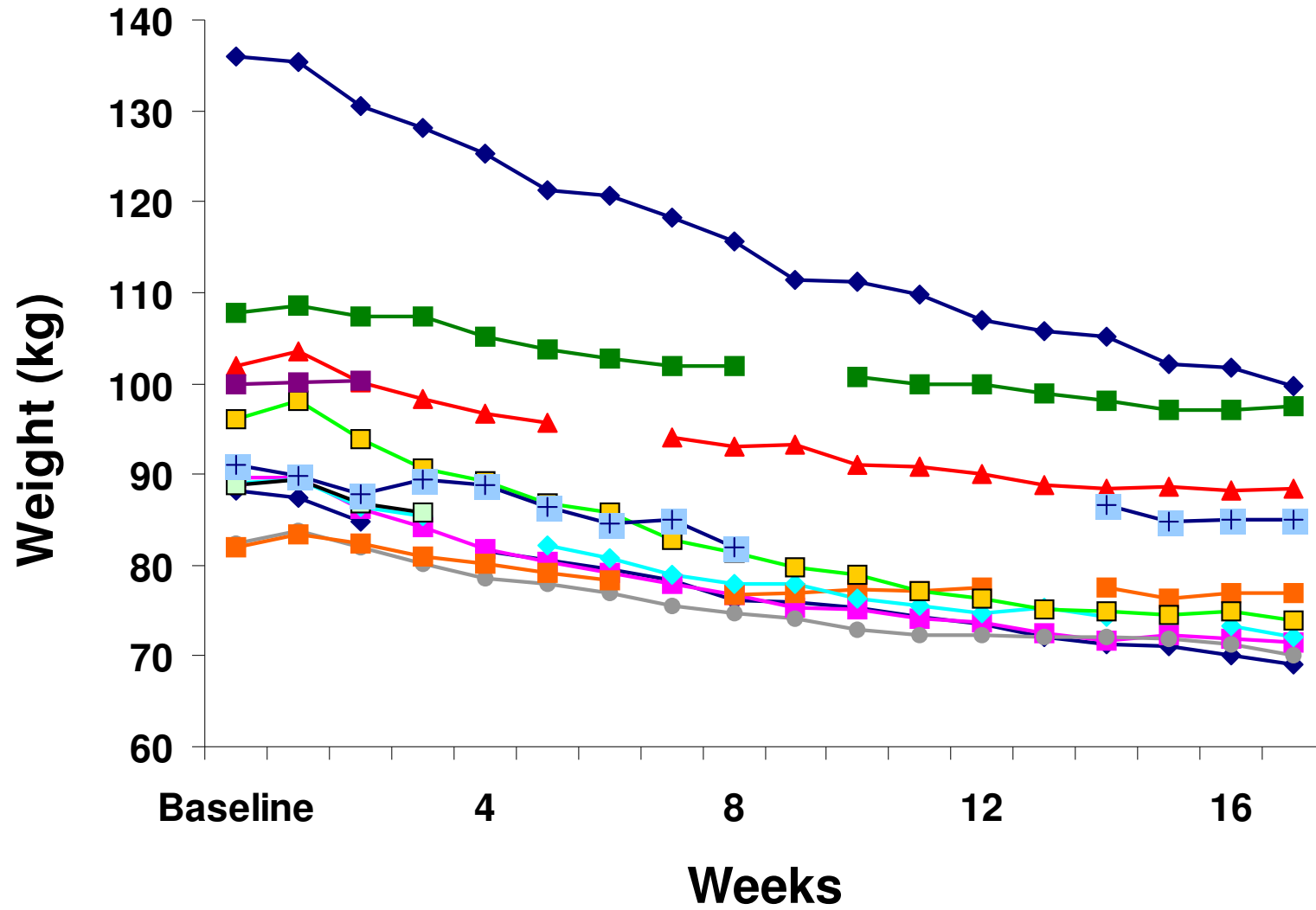
# Results

- n = 12, 42.5 (2.0) years
- Adherence – 2 drop outs, at 2 and 3 weeks
- Anthropometry

	pre	post	p
Weight (kg)	96.4 (5.1)	80.4 (3.6)	< 0.001
BMI (kg/m <sup>2</sup> )	35.8 (1.3)	30.0 (1.3)	< 0.001
% fat mass	42.4 (3.2)	35.0 (3.2)	0.011
Waist circumference (cm)	117.3 (3.3)	97.7 (2.8)	< 0.001



**Total % weight loss = 16.1 (2.3)%**



## ➤ Polysomnography

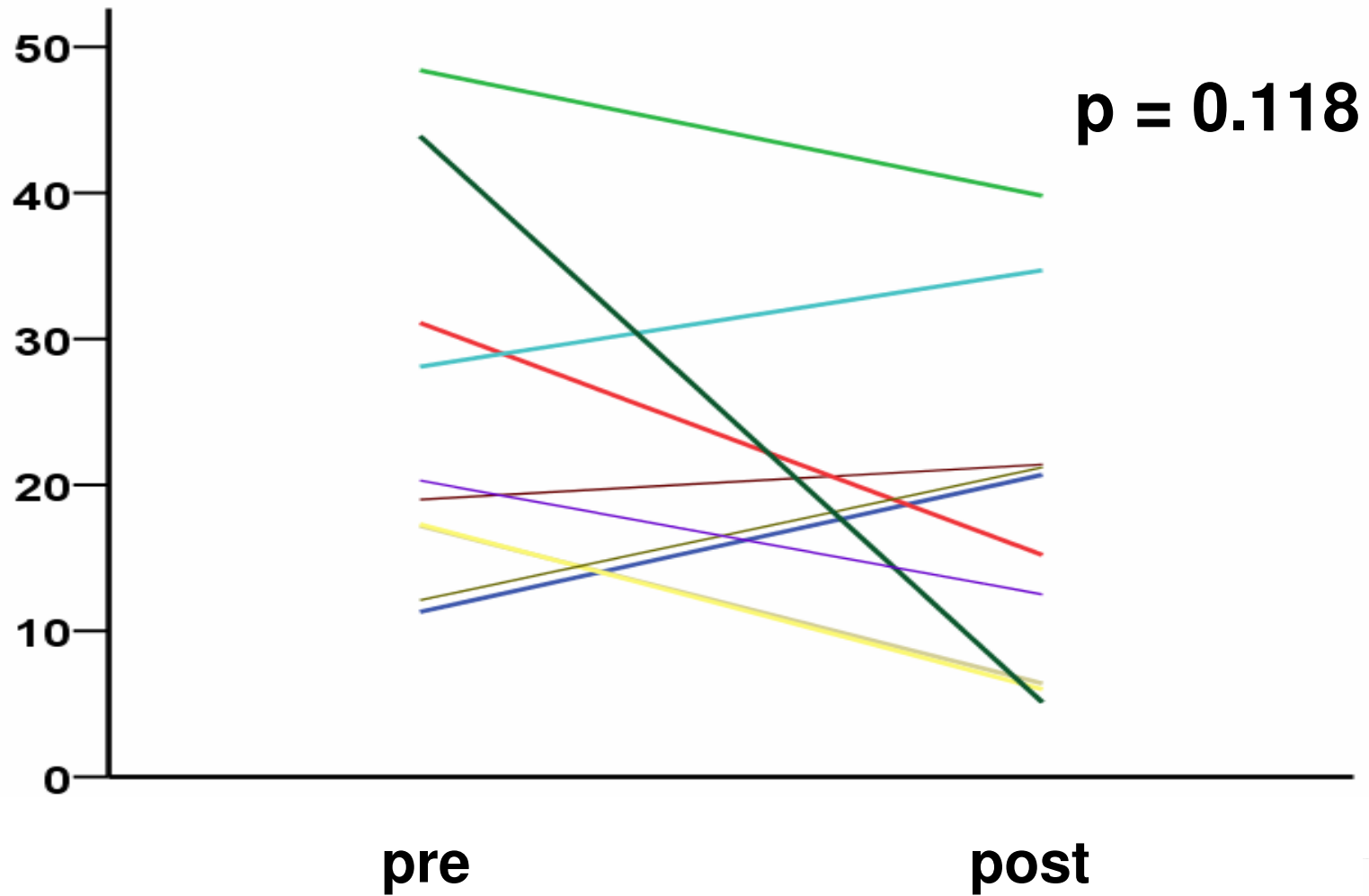
	pre	post	p
AHI (events/hour of sleep)	27.8 (5.4)	18.3 (3.7)	0.118
Total sleep time (min)	312.5 (32.2)	356.1 (18.2)	ns

## ➤ Sleepiness, quality of life, symptoms

	pre	post	p
Epworth sleepiness scale	8.7 (1.5)	6.0 (1.3)	0.043
Functional outcomes of sleep questionnaire	3.0 (0.2)	3.5 (1.5)	0.068
Symptom questionnaire	65.7 (5.1)	44.9 (8.6)	0.084



# Apnoea Hypopnoea Index



## ➤ Polysomnography

	pre	post	p
AHI (events/hour of sleep)	27.1 (4.5)	18.3 (3.7)	0.118
Total sleep time (min)	332.4 (34.0)	356.1 (18.2)	ns

## ➤ Sleepiness, quality of life, symptoms

	pre	post	p
Epworth sleepiness scale	8.7 (1.5)	6.0 (1.3)	0.043
Functional outcomes of sleep questionnaire	3.0 (0.2)	3.5 (0.2)	0.068
Symptom questionnaire	63.6 (6.5)	44.9 (8.6)	0.084



## ➤ Blood pressure

	pre	post	p
24 hour Systolic (mmHg)	127.6 (4.3)	120.5 (3.1)	0.015
24 hour Diastolic (mmHg)	77.5 (3.3)	73.3 (2.0)	0.097
24 hour MAP (mmHg)	95.0 (3.4)	89.3 (2.2)	0.035

## ➤ Cardiopulmonary exercise test

	pre	post	p
VO <sub>2</sub> peak (ml/min/kg)	17.1 (0.9)	22.4 (1.6)	0.001
Work max (Watts)	117.8 (12.6)	131.7 (13.6)	0.001
HR isowork (bpm)	156.1 (4.9)	145.9 (3.8)	0.014



## ➤ Metabolic outcomes

	pre	post	p
Total Cholesterol (mmol/L)	5.2 (0.4)	4.4 (0.3)	0.006
LDL-Cholesterol (mmol/L)	3.5 (0.3)	2.9 (0.3)	0.037
Triglycerides (mmol/L)	1.6 (0.3)	1.0 (0.2)	0.031
Glucose (mmol/L)	6.3 (0.8)	5.8 (0.5)	ns
Insulin (mIU/L)	16.4 (2.0)	10.9 (1.6)	< 0.001
C Reactive Protein (mg/L)	7.1 (0.9)	4.2 (0.7)	0.012
Gamma GT (mIU/L)	30.1 (4.4)	20.8 (2.9)	0.004



# Conclusions

- **Successful weight loss**
- **85% completion rate**
- **Clinically significant improvement in SDB**
- **Improvement in symptoms**
- **Improvement in cardiovascular risk**
- **Need controlled trial v current interventions & long term follow up**



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