Coenzyme Q10 Supplementation and Its Effects on Heart Failure

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Introduction

- Coenzyme Q10 is a member of the electron transport chain in the mitochondria
- Antioxidant
- Rationale for Coenzyme Q10 in chronic heart failure

Outcomes

- Ejection Fraction
- New York Heart Association Classification
- Exercise Capability

No Change

Table 2. Echocardiographic and Hemodynamic Data

	Baseline	Coenzyme Q	Placebo	p <*
Left ventricular diastolic volume (ml)	220 ± 72	209 ± 75	220 ± 68	0.16
Left ventricular systolic volume (ml)	167 ± 54	149 ± 61	155 ± 58	0.26
Ejection fraction (%)	26 ± 6	31 ± 9	31 ± 9	0.98
Cardiac index	2.7 ± 0.7	2.9 ± 0.7	2.9 ± 0.7	0.46
Pulmonary wedge pressure (mm Hg)	16 ± 6	16 ± 7	16 ± 7	0.40
Systemic vascular resistance (U)	16 ± 4	15 ± 4	15 ± 5	0.24

*Multivariate analysis of variance coenzyme Q versus placebo, effect-order of treatment.

Watson et al. *J. Am. Coll. Cardiol.* 1999;33:1549-1552.

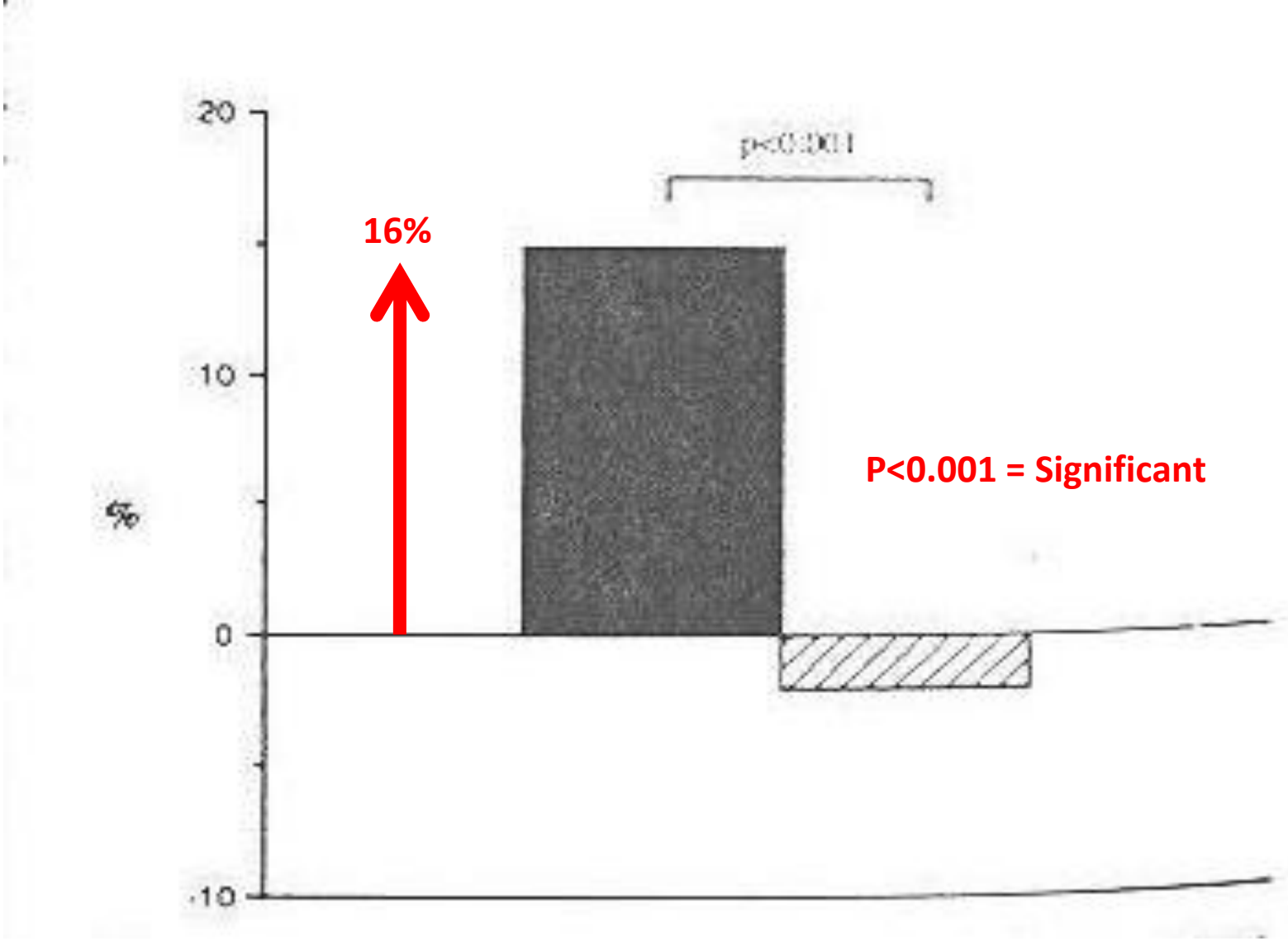


Fig. 1. Average percentage difference of ejection fraction after 7 months of ubiquinone therapy (sold bar) compared to placebo (hatched bar) in patients with heart failure.

Rengo et al. *Clin Inestig* 1993;71:S124-128.

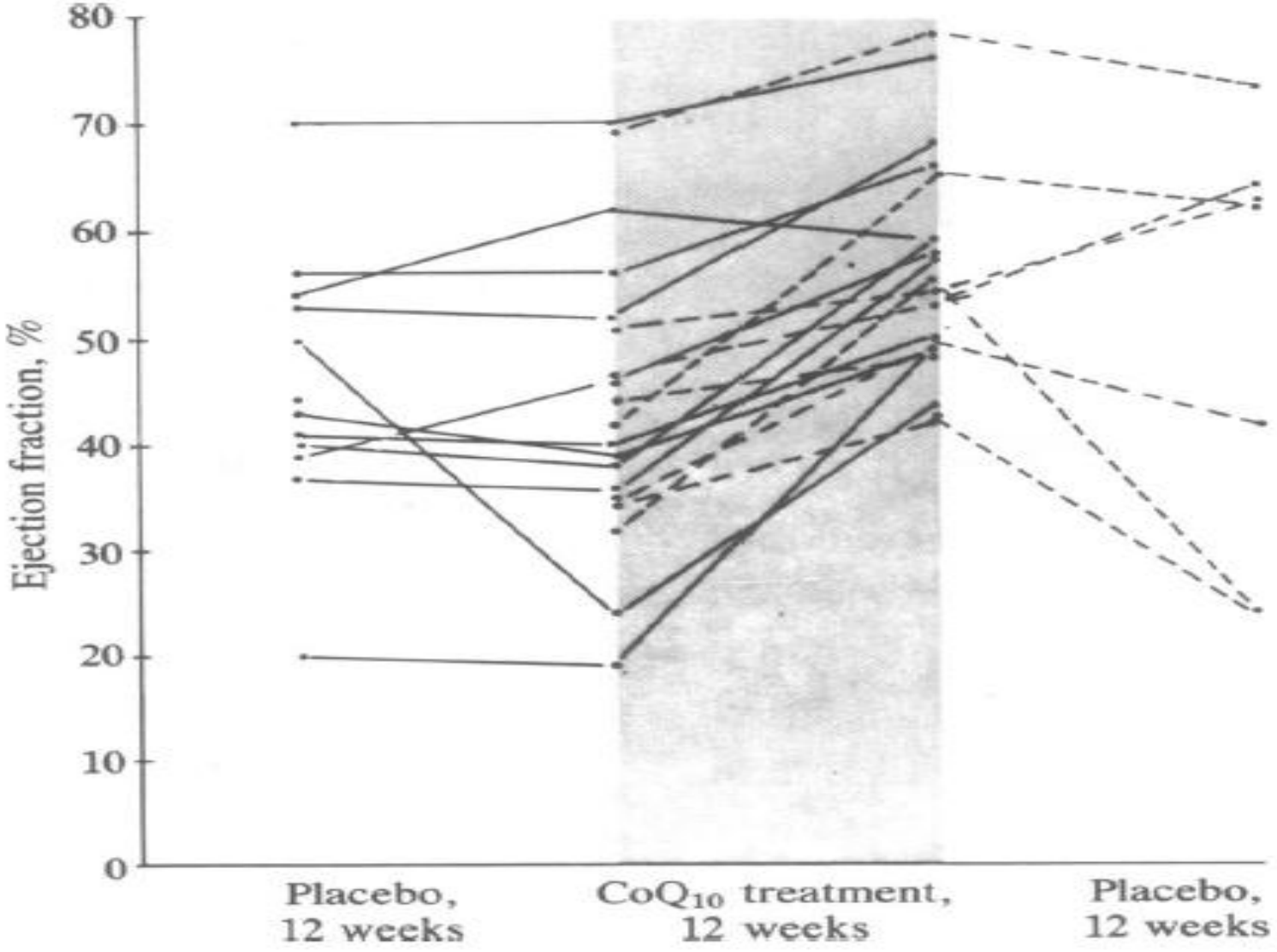


FIG. 4. Data on ejection fraction (%) for group A (----) and group B (—).

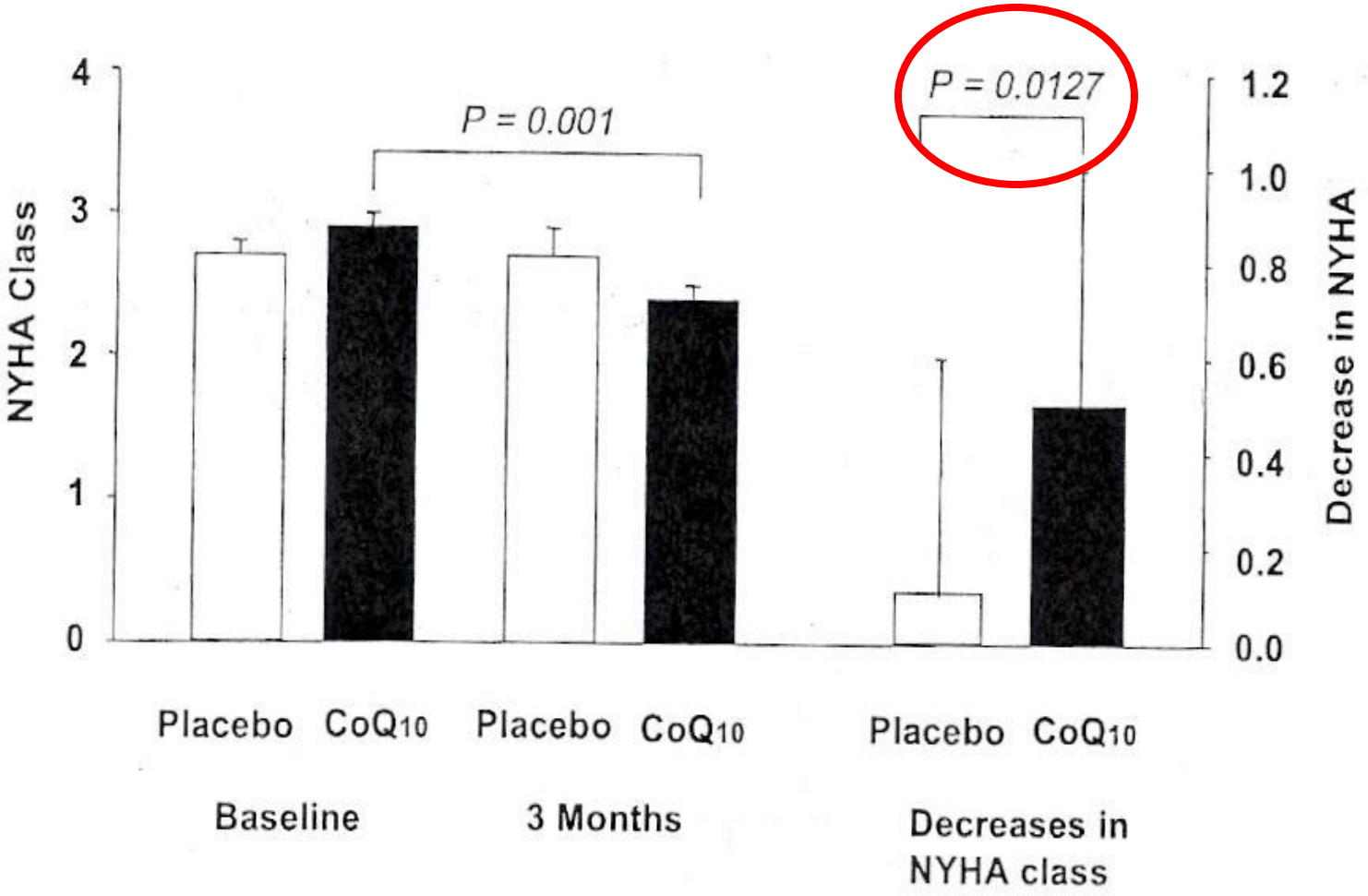
Langsjoen et al. *Proc. Natl. Acad. Sci.*1985;82:4240-4244.

Ejection Fraction Conclusion

- One study found no significant increase in ejection fraction (but did find a trend).
- Two studies found a significant increase in ejection fraction.
- Conclusion= Coenzyme Q10 supplementation improves left ventricular contractility and functional capability.

The Stages of Heart Failure – NYHA Classification

Class	Patient Symptoms
Class I (Mild)	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea (shortness of breath).
Class II (Mild)	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.
Class III (Moderate)	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.
Class IV (Severe)	Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.



l. Effect of CoQ_{10} treatment on NYHA class. Left side: NYHA class at base line and three months in placebo and CoQ_{10}
). Right side: Difference in improvement in NYHA class between the CoQ_{10} group and the placebo group.

Rosenfeldt et al. *Biofactors.* 2003;18:91-100.

Table shows the outcome variables in two treatment groups at baseline and after 3 months of CoQ10 therapy. The two far right columns show the statistical significance of the difference in response between the two groups.

	Base line			Three month value				Difference between CoQ_{10} change and placebo change	
	Placebo ($n = 18$)	CoQ_{10} ($n = 17$)	p-value	Placebo ($n = 18$)	p-value vs baseline	CoQ_{10} ($n = 17$)	p-value vs baseline	Absolute difference	p-value
NYHA	2.7 ± 0.2	2.9 ± 0.06	$p = 0.91$	2.7 ± 0.17	$p = 0.67$	2.4 ± 0.12	$p = 0.001$	−0.5	$p = 0.01$
Canadian	2.6 ± 0.1	2.7 ± 0.14	$p = 0.47$	2.4 ± 0.2	$p = 0.38$	2.3 ± 0.14	$p = 0.004$	−0.2	$p = 0.29$
SAS Naughton	533 ± 59	504 ± 53	$p = 0.89$	500 ± 61	$p = 0.22$	557 ± 50	$p = 0.14$	+103.8	$p = 0.56$

Rosenfeldt et al. *Biofactors.* 2003;18:91-100.

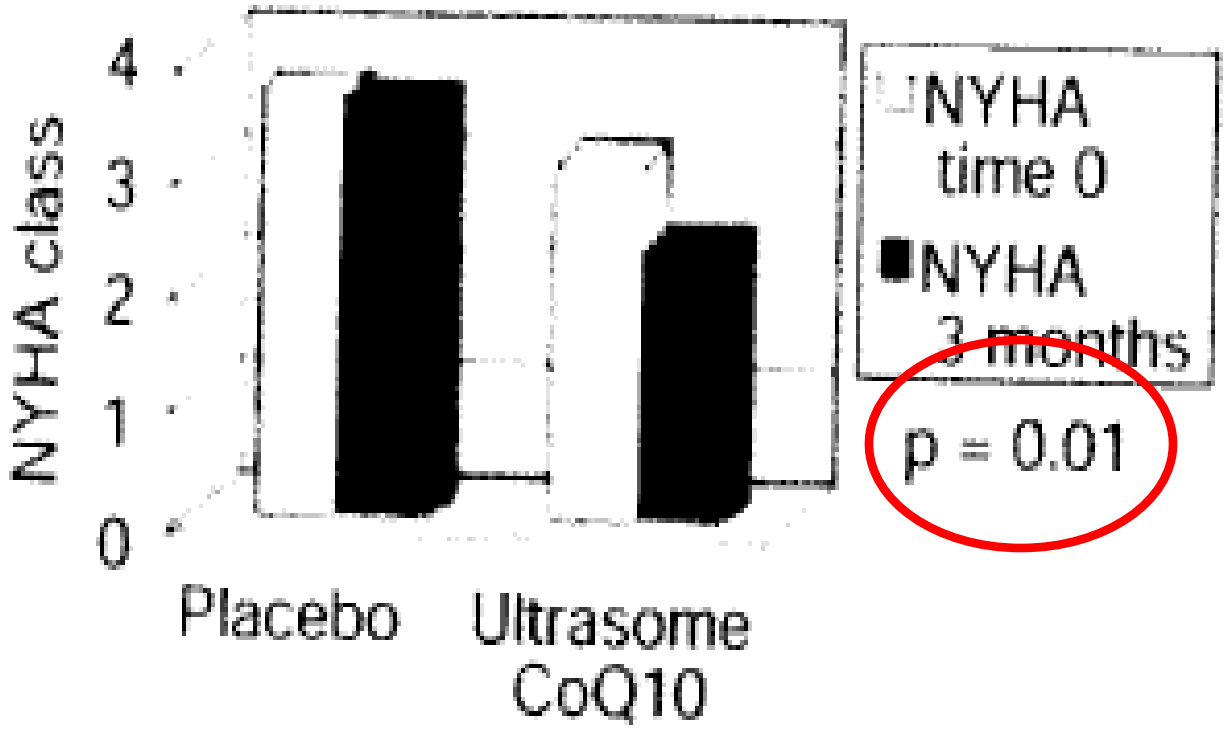


FIG. 4 New York Heart Association (NYHA) class at entry and 3 months later in the placebo and Ultrasome coenzyme Q10 groups ($p = 0.01$).

Berman et al. *Clin Cardiol.*2004;27:295-299.

Table 3

Noninvasive parameters

	Q_{10} baseline	Q_{10} 12 weeks	Stat.	Placebo baseline	Placebo 12 weeks	Stat.
LVEF	26 ± 8	26 ± 11	ns	32 ± 9	35 ± 8	ns
NYHA	3A	2B	ns	2B	2B	ns
BP mean rest	93 ± 11	91 ± 13	ns	90 ± 7	94 ± 9	ns
BP mean work	118 ± 15	113 ± 13	ns	109 ± 7	112 ± 9	ns
HR rest	75 ± 9	71 ± 11	ns	65 ± 10	66 ± 11	ns
HR work	109 ± 12	104 ± 12	ns	97 ± 14	94 ± 15	ns

Table 3. New York Association classification

No Significant change

Munkholm et al. *BioFactors*. 1999;9:285-289.

NYHA Conclusion

- One study found no significant change in class.
- Two studies found a significant decrease in NYHA class with supplementation of CoQ10.
- Conclusion: CoQ10 may decrease NYHA classification in patients with chronic heart failure.

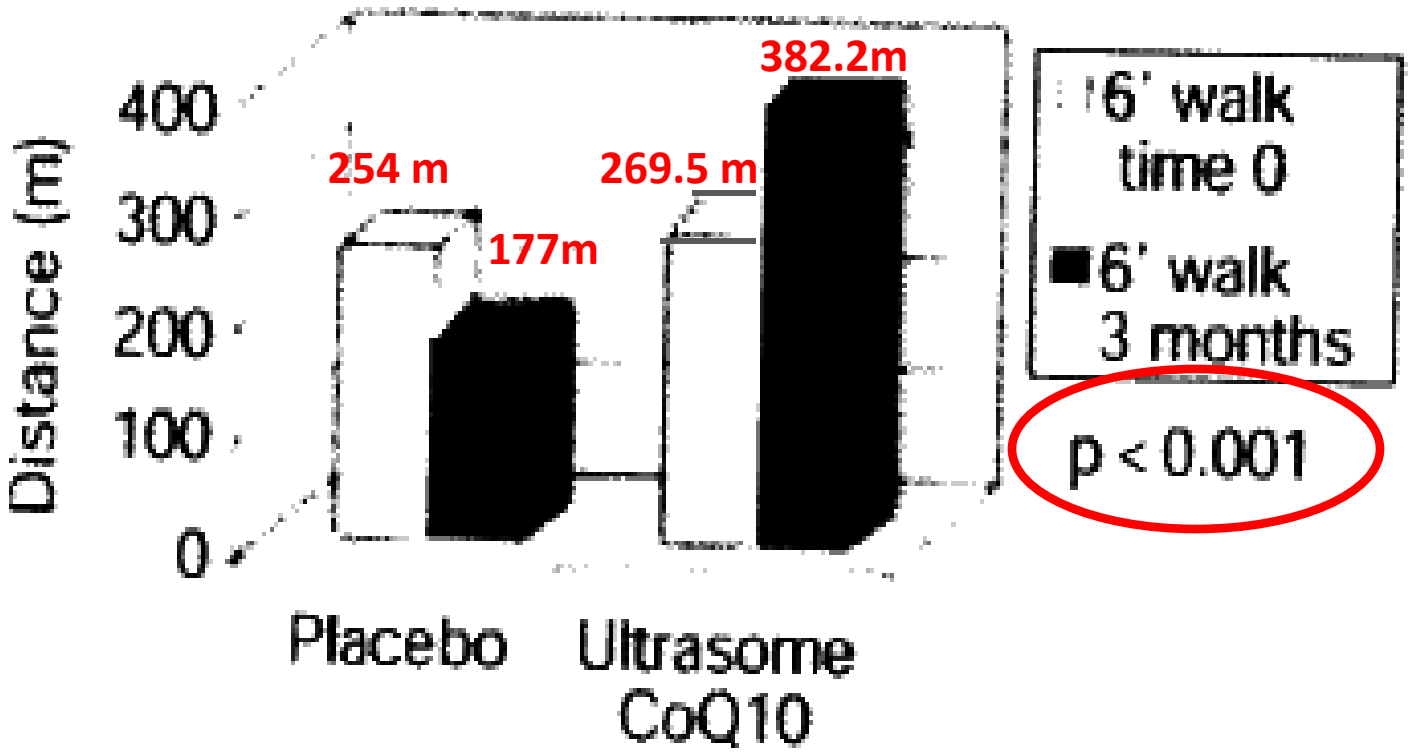


FIG. 5 Six-minute walk test at entry and 3 months later in the placebo and Ultrasome coenzyme Q10 groups ($p < 0.0001$).

Berman et al. *Clin Cardiol.*2004;27:295-299.

	Base line			Three month value				Difference between CoQ_{10} change and placebo change	
	Placebo ($n = 18$)	CoQ_{10} ($n = 17$)	p-value	Placebo ($n = 18$)	p-value vs baseline	CoQ_{10} ($n = 17$)	p-value vs baseline	Absolute difference	p-value
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Canadian SAS	2.6 ± 0.1	2.7 ± 0.14	$p = 0.47$	2.4 ± 0.2	$p = 0.38$	2.3 ± 0.14	$p = 0.004$	-0.2	$p = 0.29$
Naughton exercise time (sec)	533 ± 59	504 ± 53	$p = 0.89$	500 ± 61	$p = 0.22$	557 ± 50	$p = 0.14$	$+103.8$	$p = 0.56$
6 min walk distance	345 ± 33	351 ± 25	$p = 0.72$	328 ± 31	$p = 0.62$	372 ± 23	$p = 0.046$	$+37.7$	$p = 0.29$

Rosenfeldt et al. *Biofactors.* 2003;18:91-100

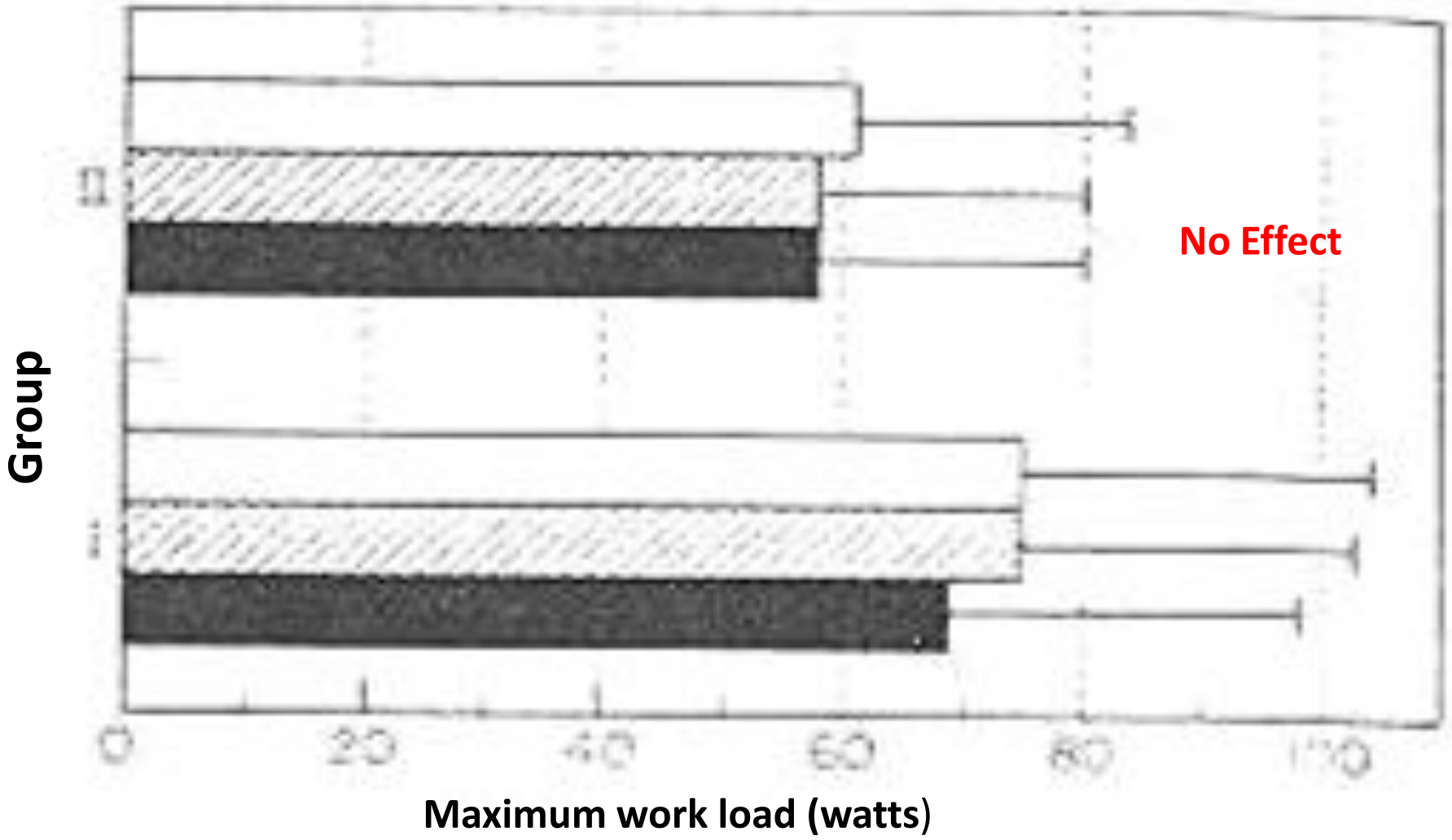

Figure 2. Maximum exercise capacity under control conditions (black bar) under placebo conditions (shaded bar) and during treatment with CoQ10 (white bar). Exercise test were preformed using a bicycle ergometer.

Permanetter et al. *Eur. Heart J.*1992;13:1528-1533.

Exercise Capacity Conclusion

- Two out of three studies presented found improvement in 6 min walk distance with a significant improvement on exercise capacity after supplementation of CoQ10
- Conclusion= Patients who received CoQ10 were able to walk a greater distance in 6 minutes which shows that CoQ10 may improve exercise capacity.

Overall Conclusion of Outcomes

- Overall Conclusion: Supplementation of CoQ10 of at lest 100 mg/d improves ejection fraction, decrease NYHA class and improve exercise capacity in patients with chronic heart failure.
- ADA Evidence Based Library
  - For patient with heart failure, is there evidence to suggest that Coenzyme Q10 provides beneficial outcomes?
  - Grade II (good)

Implications for Practice

- Recommended does for CoQ10 is 30-200mg/d.
- Is safe and has no significant side effects.
- The safety of CoQ10 during pregnancy and breastfeeding is not know and should not be used during these periods.
- Supplement should be taken with meals for better absorption.
- Easily available and inexpensive.
- Natural food sources
  - Salmon and tuna
  - Liver
  - Whole grains

Questions?????