



EFFECTS OF MUSIC AND EXERCISE TRAINING DURING HEMODIALYSIS ON THE CARDIAC AUTONOMIC NERVOUS SYSTEM ACTIVITY

Maria Mitsiou¹, Evangelia Kouidi¹, Vassilios Liakopoulos², Asterios Deligiannis¹

Aristotle University of Thessaloniki

¹Laboratory of Sports Medicine and ²Renal Unit, 1st Department of Internal Medicine, AHEPA Hospital, Aristotle University of Thessaloniki, GREECE

Introduction

Cardiac autonomic nervous system (CANS) dysfunction is a common complication in (CKD), leading to increased cardiovascular morbidity and mortality(1).

Exercise training during hemodialysis (HD)(2).

- improves physical function and quality of life in HD patients
 - suppress the sympathetic over-excitation
 - restores the sympathetic (SNS) to parasympathetic nervous system (PNS) balance
- It was supported that musical auditory stimulation influences heart rate variability (HRV)(3). However, the effects of music on CANS in HD patients have never been studied before.

Thus, the **aim** of this study was to investigate the effectiveness of a 6-month, music and physical training combined program during HD on CANS in CKD patients.

Method

40 HD patients
50.0 ±14.7 yrs

Group A
combined music and exercise training program
n=10

Group C
sole music program
n=10

Group B
sole exercise training program
n=10

Group D
none of the above-mentioned interventions (control group)
n=10

Intervention program

Static Cycling Exercise:
3x/wk, 30'- 60', 12 -13 RPE

Music during program:
Patients' preference music: 45'- 60'
Relaxation music: pre and post monitoring



Dialysis prescription medications and level of anemia were constant during the study.

Measurements

1) Ambulatory 24-hour Holter monitoring (Gbi-3s Burdick):
Time- and frequency- domain analysis HRV calculation from Vision Series Holter System SW program

2) Polar HR monitoring during intervention (s810i):
Time- and frequency- domain analysis HRV calculation, pointcare plots from Precision Performance SW and Kubios HRV SW program

HRV indices:

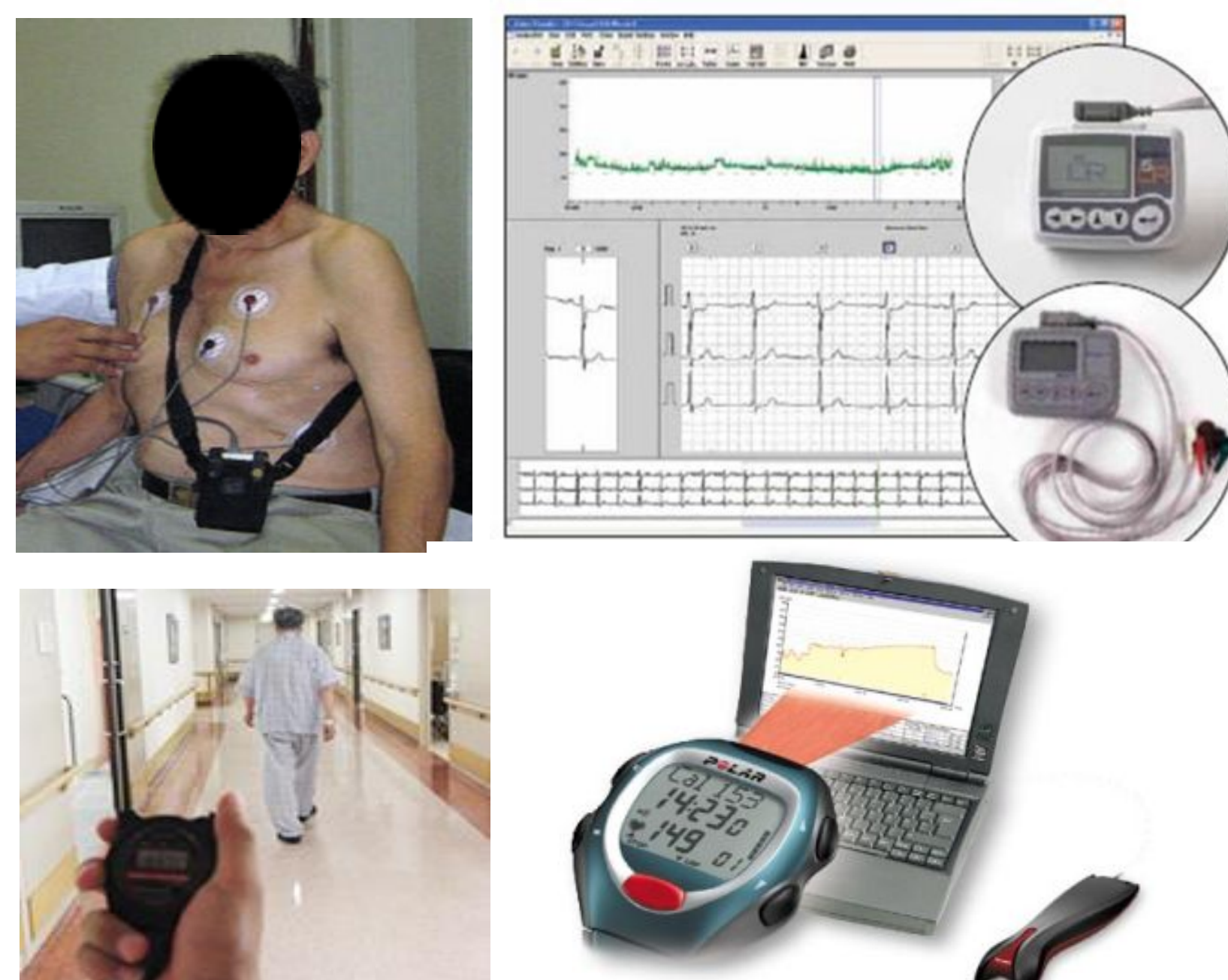
HR: mean heart rate

SDNN: standard deviation of NN intervals

RMSSD: root mean square of successive differences

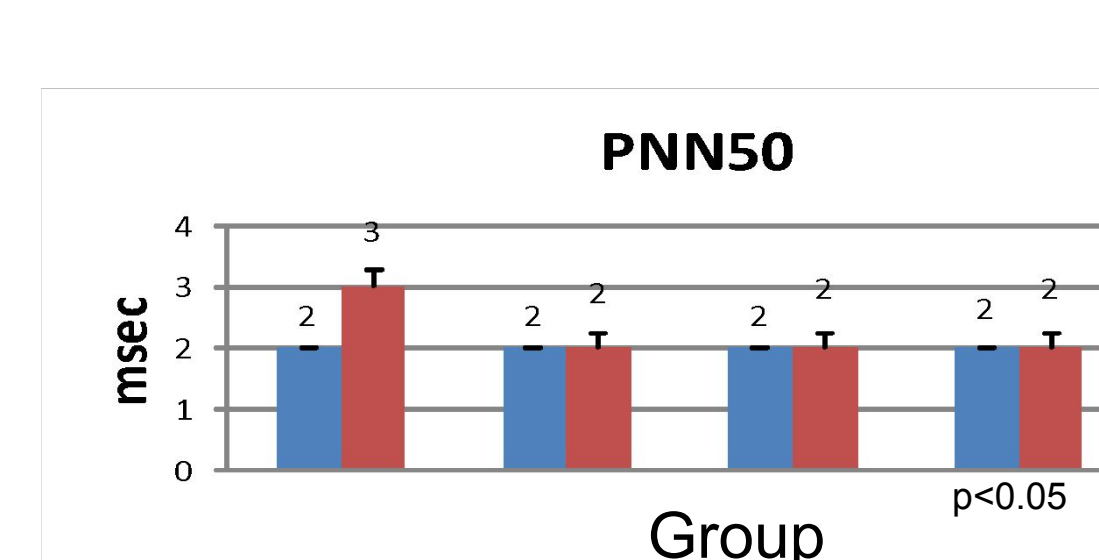
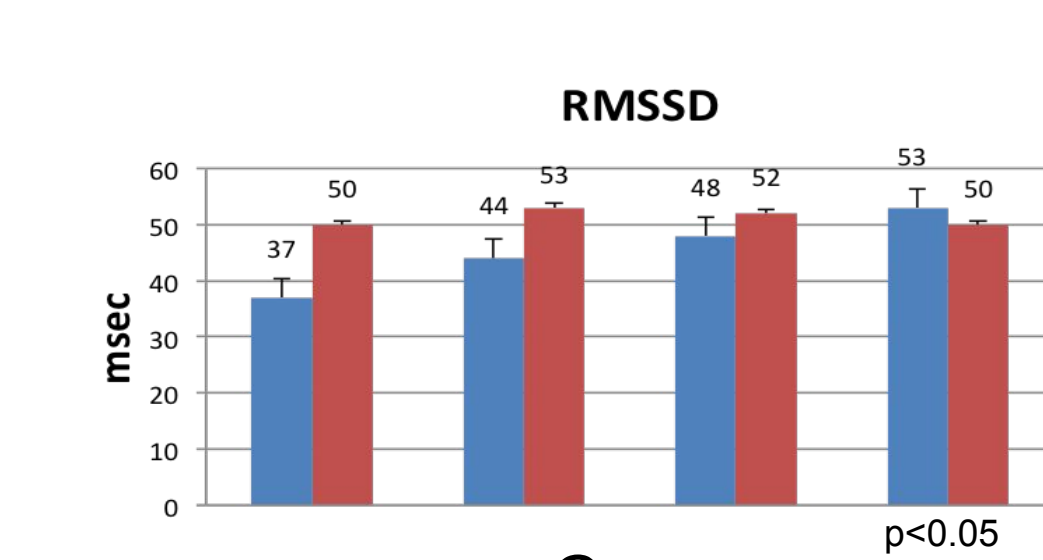
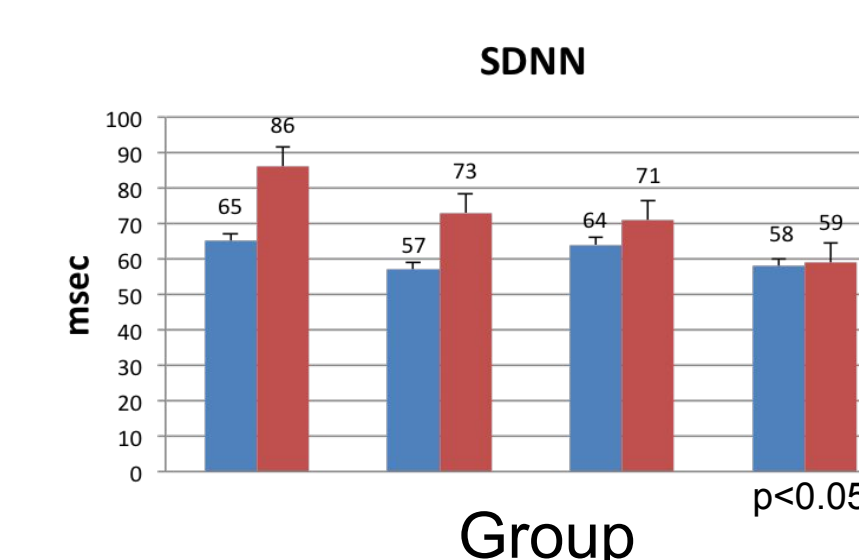
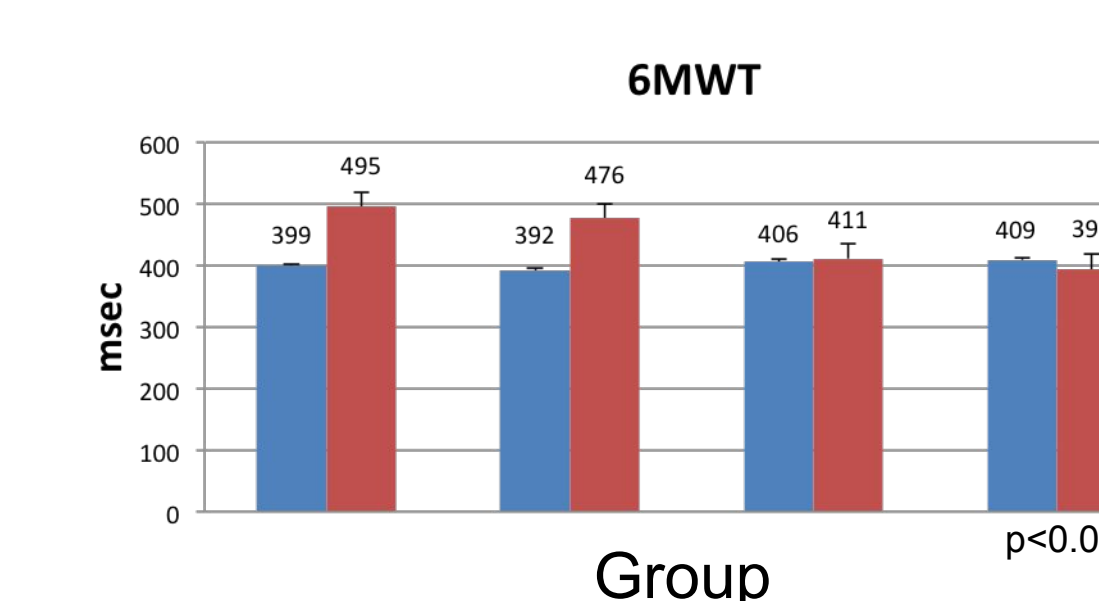
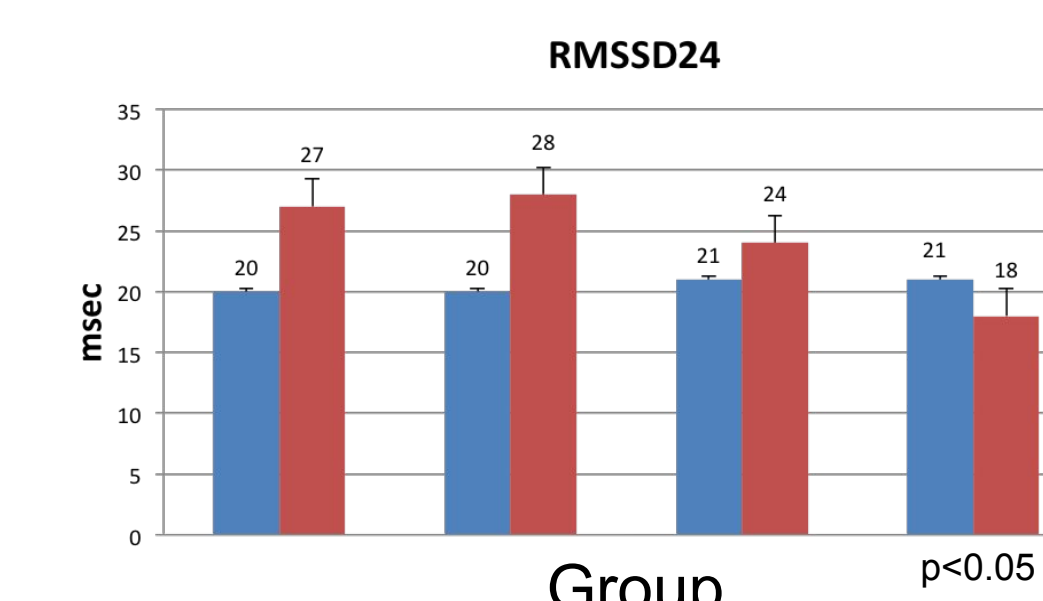
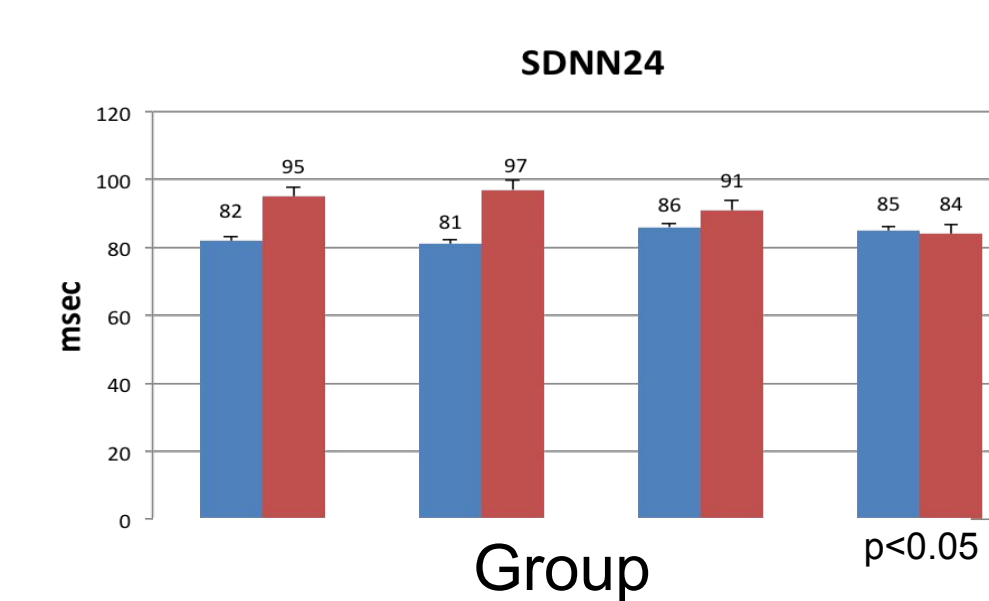
pNN50: proportion of NN50 divided by total number of NNs

3) Six minute walk test:
Estimation of functional capacity

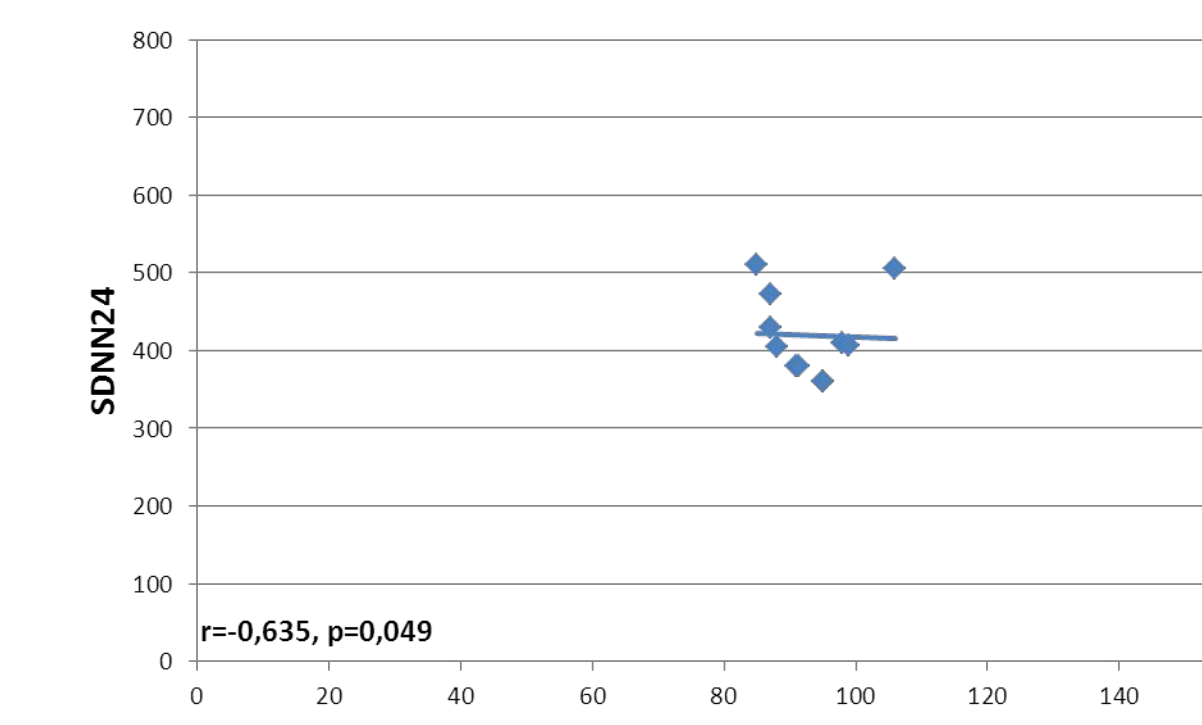
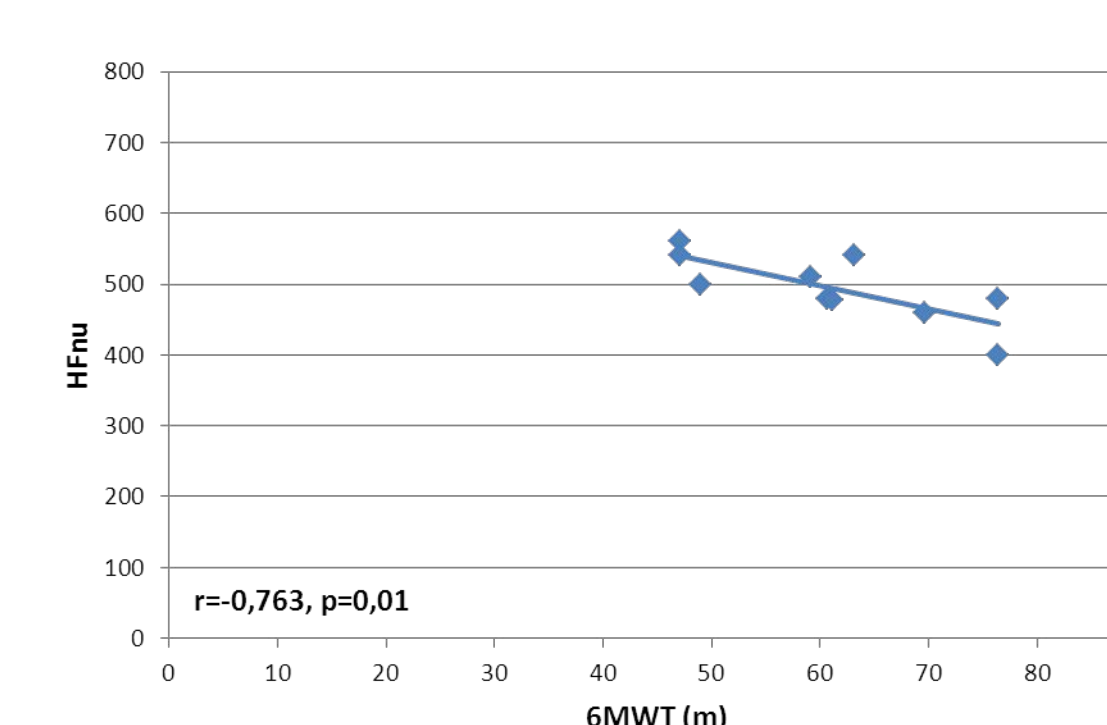


Results

The functional ability of HD patients increased in the combined music-exercise group [F(3,36)=13.095, p=0.000]. Similar results were observed for the HR[F(3,36)= 1.910, p= 0.145]; the SDNN [F (3,36)=11.671, p=0.000]; the RMSSD [F (3,36)=12.395, p=0,000]; and the pNN50 [F (3,36)=45.752, p=0.000] respectively.



GROUPS	MHR (b/min)	SDNN (msec)	RMSSD (msec)	PNN50 (msec)	6mwt (m)
A (pre)	79±10	65±7	37±4	2±0,2	399±42
A (post)	73±13*	86±9*	50±5*	3±0,3*	495±46*
B (pre)	85±11	57±4#	44±3 #	2±0,2	392±41
B (post)	81±13*	73±4*	53±2*	2±0,3*	476±33*
C (pre)	88 ±11	64±7	48±2 ⁺	2±0,2	406 ± 52
C (post)	84±12*	71±7* ⁺	52±2*	2±0,1* ⁺	411 ±48* [‡]
D (pre)	82±5	58 ±5	53±3 ^{≠\$§}	2±0,2	409 ± 40
D (post)	82±5	59 ±48 ^{≠\$§}	50±4	2±0,2* ^{≠\$}	393 ± 42* ^{≠\$}



:p<0.05 pre versus post,
#:p<0.05 between groups A and B
+:p<0.05 between groups A and C
≠:p<0.05 between groups A and D
‡:p<0.05 between groups B and C
\$:p<0.05 between groups B and D
§:p<0.05 between groups C and D

Conclusion

- Combined musical auditory stimulation with exercise training during HD:
- influences on the balance of SNS and PNS beneficially
 - improves the functional capacity

References

1. Deligiannis *et al.*, 1999. Effects of physical training on heart rate variability in Patients on hemodialysis. *Am J Cardiol*, 84:197-202.
2. Kouidi *et al.*, 2010. Depression, heart rate variability, and exercise training in dialysis patients. *Eur J Cardiovasc Prev Rehabil*, 17: 160–167.
3. Valenti *et al.*, 2012. Auditory stimulation and cardiac autonomic regulation. *Clinics*, 2012; 67(8):955-958.