Published in final edited form as:

Eur J Cardiovasc Prev Rehabil. 2010 October ; 17(5): 509–513. doi:10.1097/HJR.0b013e328337b57b.

Depressive Symptoms and Heart Rate Variability in Younger Women after an Acute Coronary Event

Frank Zimmermann-Viehoff, MD^a, Kristina Orth-Gomer, MD^{a,b}, Hui-Xin Wang, PhD^c, Hans-Christian Deter, MD^a, Melanie Merswolken, Dipl.Psych.^a, Zainab Ghadiyali^a, and Cora S. Weber, MD^a

^aDepartment of Psychosomatic Medicine and Psychotherapy, Charité Universitätsmedizin, Campus Benjamin Franklin, Berlin, Germany

^bDepartment of Public Health Science and Osher Center for Integrative Medicine, Karolinska Institutet, Stockholm, Sweden

^cAging Research Center, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Stockholm, Sweden

Abstract

Objectives—We investigated associations between depressive symptoms and reduced heart rate variability (HRV) in women aged 30–65 years after an acute coronary event.

Background—Younger women have an increased mortality after myocardial infarction compared to men of similar age. Depression was hypothesized to contribute to the poor prognosis, possibly mediated by increased susceptibility to arrhythmias.

Methods—The Stockholm Female Coronary Risk study comprised 292 women aged 30–65 years who were consecutively admitted for myocardial infarction or unstable angina pectoris during a 3-year period. Depressive symptoms were assessed by means of a 9-item questionnaire. Women with no or only one depressive symptom were classified as low depression subjects, those with two or more depressive symptoms as high depression subjects. HRV data were calculated from 24-hour ambulatory electrocardiographic recordings 3 to 6 months after the initial event.

Results—Reliable HRV data were obtained from 266 patients. 70 women were low depression subjects, and 196 women were high depression subjects. In univariate analyses, the index of standard deviations of RR-intervals, very low frequency power, low frequency power and high frequency power of HRV were lower in the high depression subjects. After controlling for potential confounders (diabetes, hypertension, systolic blood pressure, body mass index and β -blocker medication), a significant difference between low and high depression subjects was maintained for all indices except for high frequency power.

Conclusion—The presence of 2 or more depressive symptoms was associated with reduced HRV in a high-risk group of younger women after an acute coronary event.

Correspondence Address: Prof. Dr. med. Kristina Orth-Gomer, Department of Psychosomatic Medicine and Psychotherapy, Charité Universitätsmedizin Berlin, Campus Benjamin Franklin, Hindenburgdamm 30, 12200 Berlin, Tel.: +49-30-8445-3996, Fax: +49-30-8445-4590, kristina.orth-gomer@ki.se.

Potential conflicts of interest: None

Background

Depression predicts mortality after MI [1-3] and UAP [4], and is observed more frequently in women compared to men [5]. Female gender independently predicts depressive symptoms and their severity after MI or UAP [6]. Among patients hospitalized for MI, the highest prevalence of depression was found in women 60 years or younger [7]. It was hypothesized that depression contributes to the increased post-MI mortality of younger women compared to men of similar age [7].

Autonomic dysfunction is believed to be a crucial link between negative affect and cardiovascular health [8]. Measurement of heart rate variability (HRV) provides a non-invasive tool to estimate autonomic control of the heart. Reduced HRV mainly reflects decreased parasympathetic and/or increased sympathetic modulation, which in turn increases the risk for ventricular arrhythmias and sudden cardiac death [9]. A number of studies confirmed reduced HRV to be a strong independent predictor of post-MI mortality [9,10].

Depressed CHD patients displayed reduced HRV compared to non-depressed patients in some studies [11-16], while other authors did not observe significant differences [17,18]. The present study aimed to test the hypothesis that depressive symptoms are associated with reduced HRV in a high-risk group of women aged 30-65 years after an acute coronary event.

Methods

Patients and study design

The protocol of the FemCorRisk study was approved by the Ethics Committee of the Karolinska Institute, and informed consent was obtained from all subjects. The study group comprised all women below the age of 65 who were consecutively admitted for an acute coronary event (AMI or UAP) during a 3-year period in the greater Stockholm area. 335 consecutive women were identified. 43 patients (13%) could not be included in the study. Of these, 5 patients died before the examination, 13 could not come to the research center because of disease severity, 2 could not participate because of transportation difficulties, 2 took part in another study and 21 declined due to other nonmedical reasons, including inability to speak Swedish fluently.

The diagnosis of MI was made on the basis of World Health Association (WHO) criteria of typical chest pain, electrocardiographic changes and cardiac enzyme patterns. UAP was defined as new onset of severe AP or deterioration of previously known stable AP within 4 weeks before hospital admission. Severity of heart failure was estimated using the Killip classification. For our analysis, subjects were dichotomized according to presence (Killip class > 1) or absence of symptoms of heart failure. Left ventricular function was visually classified as normal or dysfunctional from left ventriculography as described elsewhere in 219 patients (75%) [19].

All patients were examined between 3 and 6 months after discharge from the hospital. A questionnaire on educational level, exercise habits, alcohol intake and smoking history was mailed to the subjects before their first visit to the research clinic. Educational level was divided into two categories: mandatory level (corresponding to 9 years of school education) or higher education (completion of high school, college or university). Exercise habits during leisure time were classified according to World Health Organization criteria and graded I to IV. I corresponded to reading, watching television, or other sedentary leisure activities, II corresponded to walking, cycling or other forms of leisure time physical activity, III corresponded to regular exercises to keep fit, and IV corresponded to hard training or participation in competitive sports, several times per week. For the analysis, exercise habits

were dichotomized into predominantly sedentary lifestyle (I) or active lifestyle (II-IV). Alcohol intake was categorized as light (≤ 5 g/day) or moderate (> 5 g/day). Smoking status was categorized as current or non- and previous smoker (stopped at least 1 year prior to the date of study recruitment). Each questionnaire was checked and clarified by the research nurse for problems and/or missing data.

The first day of the study included a detailed cardiological examination, resting ECG, and placement of a 24-hour Holter ECG monitor. Physical activity during the 24 hours of ECG monitoring was assessed using diaries. All subjects rated their activity at 5 occasions in the morning, at lunchtime, in the afternoon, at dinnertime and before going to bed, by means of a 5-point scale as follows: (0) predominantly lying, (1) predominantly sedentary, (2) light activity, (3) moderate activity, (4) physical strain. The exact time was noted in the diary and marked on the Holter tape. A sum score was built by adding the scores of each time point.

The second day included extensive interview and questionnaire assessments of lifestyle and behavioral characteristics, as well as anthropometric measures and full lipid and routine laboratory profiles. Body mass index (BMI) and blood pressure were assessed using standard methods. Menopausal status was assessed by means of a gynecological interview by the research nurse. A full history of current medication intake was abstracted from the hospital charts and verified by interviewing the patients.

Depressive symptoms were assessed by means of a short self-rating questionnaire derived from Pearlin et al. [20]. The instrument captures 9 symptoms common for depression during the past week with “yes/no” answering alternatives. “Yes” responses were scored as “1” and summed, with a high score indicating a high degree of depressive symptomatology. In detail, the symptoms comprised (1) feeling downhearted or blue, (2) feeling lonely, (3) crying easily, (4) lack of enthusiasm, (5) hopelessness about the future, (6) loss of interest, (7) loss of energy, (8) loss of appetite, (9) sleep disturbances. The scale had previously shown good internal consistency (Cronbach's $\alpha = 0.85$) and was significantly correlated ($r = 0.71$, $p < 0.0001$) with the Beck Depression Inventory [21]. For our analysis, women with no or only one depressive symptom (lowest quartile) were classified as low depression subjects, those with two or more depressive symptoms as high depression subjects. This cut-off point was chosen because women with two or more symptoms of depression were previously shown to be at increased risk for recurrent cardiovascular events in a follow-up of the FemCorRisk study [21].

Measurement of Heart Rate Variability

HRV data were obtained from 24-hour ECG recordings between day 1 and 2 at the research clinic during normal daily activities. Medication was maintained during the recording period. Patients were hooked up with a two-channel ambulatory ECG device (Spacelab 90205, Spacelab Inc., Redmond, WA). A commercially available software (Aspect Holter Systems, Daltek, Borlänge, Sweden) identified arrhythmias and classified QRS complexes [22]. Consecutive R-R intervals were expressed in centiseconds within 5-minute epochs. At least 96% of the QRS complexes per interval had to be classified as normal to be accepted for analysis. The time series of RR-intervals were resampled with a frequency of two samples per second. Gaps in time series consequent to nonnormal R-R-intervals were filled with values calculated by linear interpolation between adjacent R-R intervals. The software also automatically checked for misclassified dropped beats deviating more than 3 standard deviations from the normal R-R interval of each epoch. The mean of all standard deviations of RR-intervals for all 5-min segments during the recording period (SDNN index) as a time-domain measure of HRV was defined as primary outcome. Impaired SDNN index was shown to be an independent predictor of mortality in the FemCorRisk study [23]. Additionally, the following frequency-domain measures of HRV were computed using spectral analysis: very low frequency (VLF) power (0.0033-0.04 Hz), low frequency (LF) power (0.04-0.15 Hz), and

high frequency (HF) power (0.15-0.40 Hz) in milliseconds squared. The LF/HF power ratio was also calculated.

Statistical Analysis

Data were analysed using SPSS 17.0 software (SPSS Inc., Chicago, IL). Due to significant nonnormal distribution of HRV parameters (all $p < 0.001$ except LF/HF ratio, $p = 0.01$, Kolmogorov-Smirnov tests), values were logarithmically transformed before the analysis. For reasons of comparability, values are presented using the original units. Continuous variables are presented as means and 95% confidence intervals, and categorical variables are presented in %.

2-tailed t-tests and Chi-square-tests were used to determine whether demographic or medical variables differed between high and low depression subjects. Variables that differed between the groups at a significance level of $p < 0.1$ were considered potential confounders. These variables were then entered as covariates in Analysis of Covariance (ANCOVA) models testing the effect of depression on HRV, with a significance level of $p < 0.05$.

Results

Reliable HRV data were available from 266 women at a mean age of 56 (range 30–65) years. The 24 women who were excluded because of missing or unreliable HRV data did not significantly differ with respect to sociodemographic, medical and behavioural variables.

MI was diagnosed in 95 patients (35.7%), and UAP was diagnosed in 171 patients (64.3%). On average, subjects reported 3.9 (3.6–4.2) depressive symptoms. 70 women were classified as low depression subjects, and 196 women were classified as high depression subjects. Sociodemographic, medical and behavioural characteristics of low and high depression subjects are shown in Table 1. High depression subjects had significantly higher systolic blood pressure and a higher prevalence of diabetes. Trends were found with respect to a higher BMI, and a higher prevalence of β -Blocker use and history of hypertension in the high depression subjects. None of the subjects took antidepressants at the time of investigation.

In univariate comparisons, all HRV indices except for the LF/HF ratio were significantly lower in the high depression subjects (Table 2). After controlling for systolic blood pressure, diabetes, hypertension, BMI, and β -blocker use, a significant difference between low and high depression subjects was maintained for SDNN index, VLF and LF. When exercise habits were additionally entered as covariate, the main outcome parameter SDNN index was still significantly lower in the high depression subjects ($p = 0.02$). Adjustment for physical activity during HRV recording did not significantly change the results.

Among the covariates, history of diabetes was significantly related to SDNN index ($p = 0.05$), VLF ($p = 0.03$) and LF ($p = 0.01$). Exercise habits were significantly related to SDNN index ($p = 0.004$), VLF ($p < 0.001$), LF ($p = 0.001$), HF ($p = 0.05$) and LF/HF ratio ($p = 0.008$). β -blocker use was significantly related to LF/HF ratio ($p = 0.02$).

Discussion

The data confirmed our hypothesis of reduced HRV in women with symptoms of depression after MI or UAP, even after adjustment for potential confounders. To our knowledge, this is the first population-based study focusing on autonomic dysfunction and depression in a group of women aged 30–65. At that age, gender differences with regard to prognosis after a coronary event are most evident [24]. However, most comparable studies included considerably fewer and relatively older women [12–16].

Depression is observed in up to 40% of women 60 years or younger hospitalized for MI [7], and is thus believed to account at least partially for the poor prognosis within this group. Clinical depression is diagnosed by means of a psychiatric interview, while depressive symptoms mostly refer to self-assessment instruments. The cut-off point of 2 or more depressive symptoms for our classification as high depression subjects was comparatively low. However, studies suggest that already minimal symptoms of depression are associated with increased risk after MI or UAP [2,21,25].

In female CHD patients, autonomic dysfunction was proposed to mediate between depression and mortality via increased susceptibility to arrhythmias and sudden cardiac death [26]. This pathway may be particularly relevant in younger women, as they were shown to have lower HRV compared to men of the same age [27]. We found robust differences between high and low depression subjects with respect to SDNN index and VLF. Both HRV indices were independently related to arrhythmic events and mortality in CHD patients in a number of studies [10,23].

As far as we know, only few studies failed to detect a difference in HRV between depressed and non-depressed CHD patients. Gehi et al. hypothesized that the participants of the Heart and Soul study were sicker than participants of other studies, and therefore might have had a priori autonomic dysfunction [17]. A reanalysis of their data showed however that the somatic symptoms of depression were very well related to autonomic dysfunction [28]. Martens et al. [18] observed no differences in HRV between depressed and non-depressed CHD patients after adjustment for confounders, but acknowledged that this finding was possibly due to the small sample size compared to the study of Carney et al. [11].

Thayer et al. [29] argued that HRV parameters in the time domain or the lower frequency spectra might rather be related to the range of physical activity engaged in by the patients, and therefore might reflect functional capacity rather than altered autonomic tone. In our study, neither controlling for exercise habits nor physical activity during ECG recording changed our main outcome.

Licht et al. [30] found that differences in HRV in non-cardiological patients with and without major depression were mainly driven by antidepressant use. Such confounding can be excluded in our analysis, as none of the study subjects used antidepressant medication at the time of HRV recording.

Due to the composition of our study group, generalization to males, older women or patients from different countries is limited. Depression following myocardial infarction was shown to be of higher prognostic relevance than depression preceding the event [31]. Because we did not determine the exact time of onset of depressive symptoms, it is possible that some women were characterized by more chronic depressive symptoms, while some women might have developed depressive symptoms in response to the coronary event. However, depressive symptoms were robustly associated with increased mortality independently of time of onset [1].

Conclusions

In summary, our study contributes evidence to the hypothesis that depressive symptoms are associated with reduced HRV in patients after an acute coronary event. We demonstrated that this association is present in a high-risk group of younger women aged 30-65 years, and that reduced HRV is already present in women with minimal depressive symptoms.

Acknowledgments

Grants: This work was supported by grant HL-45785 from the US NIH (Bethesda, MD), grant B93-19X-10407 from the Swedish Medical Research Council, a grant from the Swedish Labour Market Insurance Company and a grant from the Osher Center for Integrative Medicine

References

1. Frasure-Smith N, Lespérance F, Talajic M. Depression and 18 month prognosis after myocardial infarction. *Circulation* 1995;91:999–1005. [PubMed: 7531624]
2. Bush DE, Ziegelstein RC, Tayback M, Richter D, Stevens S, Zahalsky H, Fauerbach JA. Even minimal symptoms of depression increase mortality risk after acute myocardial infarction. *Am J Cardiol* 2001;88(4):337–41. [PubMed: 11545750]
3. Shiotani I, Sato H, Kinjo K, Nakatani D, Mizuno H, Ohnishi Y, Hishida E, Kijima Y, Hori M, Sato H. Osaka Acute Coronary Insufficiency Study (OACIS) Group. Depressive symptoms predict 12-month prognosis in elderly patients with acute myocardial infarction. *J Cardiovasc Risk* 2002;9(3):153–60. [PubMed: 12202838]
4. Lespérance F, Frasure-Smith N, Juneau M, Thérioux P. Depression and 1-year prognosis in unstable angina. *Arch Intern Med* 2000;160:1354–60. [PubMed: 10809041]
5. Weissman MM, Bland R, Joyce PR, Newman S, Wells JE, Wittchen HU. Sex differences in rates of depression: cross-national perspectives. *J Affect Disord* 1993;29:77–84. [PubMed: 8300980]
6. Naqvi TZ, Rafique AM, Andreas V, Rahban M, Mirocha J, Naqvi SS. Predictors of depressive symptoms post-acute coronary syndrome. *Gend Med* 2007;4(4):339–51. [PubMed: 18215725]
7. Mallik S, Spertus JA, Reid KJ, Krumholz HM, Rumsfeld JS, Weintraub WS, Agarwal P, Santra M, Bidyasar S, Lichtman JH, Wenger NK, Vaccarino V. Depressive symptoms after acute myocardial infarction: evidence for highest rates in younger women. *Arch Intern Med* 2006;166(8):876–83. [PubMed: 16636213]
8. Carney RM, Freedland KE. Depression and heart rate variability in patients with coronary heart disease. *Cleve Clin J Med* 2009;76 2:S13–7. [PubMed: 19376975]
9. Odemuyiwa O, Malik M, Farrell T, Bashir Y, Poloniecki J, Camm J. Comparison of the predictive characteristics of heart rate variability index and left ventricular ejection fraction for all-cause mortality, arrhythmic events and sudden death after acute myocardial infarction. *Am J Cardiol* 1991;68(5):434–9. [PubMed: 1872267]
10. Bigger JT Jr, Fleiss JL, Steinman RC, Rolnitzky LM, Kleiger RE, Rottman JN. Frequency domain measures of heart period variability and mortality after myocardial infarction. *Circulation* 1992;85:164–71. [PubMed: 1728446]
11. Carney RM, Blumenthal JA, Stein PK, Watkins L, Catellier D, Berkman LF, Czajkowski SM, O'Connor C, Stone PH, Freedland KE. Depression, heart rate variability, and acute myocardial infarction. *Circulation* 2001;104:2024–8. [PubMed: 11673340]
12. Guinjoan SM, de Guevara MS, Correa C, Schaufele SI, Nicola-Siri L, Fahrer RD, Ortiz-Fragola E, Martinez-Martinez JA, Cardinali DP. Cardiac parasympathetic dysfunction related to depression in older adults with acute coronary syndromes. *J Psychosom Res* 2004;56:83–8. [PubMed: 14987968]
13. Krittayaphong R, Cascio WE, Light KC, Sheffield D, Golden RN, Finkel JB, Glekas G, Koch GG, Sheps DS. Heart rate variability in patients with coronary artery disease: differences in patients with higher and lower depression scores. *Psychosom Med* 1997;59:231–5. [PubMed: 9178333]
14. Drago S, Bergerone S, Anselmino M, Varalda PG, Cascio B, Palumbo L, Angelini G, Trevi PG. Depression in patients with acute myocardial infarction: influence on autonomic nervous system and prognostic role Results of a five-year follow-up study. *Int J Cardiol* 2007;115:46–51. [PubMed: 16797746]
15. Carney RM, Saunders RD, Freedland KE, Stein P, Rich MW, Jaffe AS. Association of depression with reduced heart rate variability in coronary artery disease. *Am J Cardiol* 1995;76:562–4. [PubMed: 7677077]
16. Stein PK, Carney RM, Freedland KE, Skala JA, Jaffe AS, Kleiger RE, Rottman JN. Severe depression is associated with markedly reduced heart rate variability in patients with stable coronary heart disease. *J Psychosom Res* 2000;48(4-5):493–500. [PubMed: 10880671]

17. Gehi A, Mangano D, Pipkin S, Browner WS, Whooley MA. Depression and heart rate variability in patients with stable coronary heart disease: findings from the Heart and Soul Study. *Arch Gen Psychiatry* 2005;62(6):661–6. [PubMed: 15939843]
18. Martens EJ, Nyklicek I, Szabo BM, Kupper N. Depression and anxiety as predictors of heart rate variability after myocardial infarction. *Psychol Med* 2008;2007;38(3):375–83. 1–9. [PubMed: 17988419]
19. Al-Khalili F, Svane B, Wamala SP, Orth-Gomér K, Rydén L, Schenck-Gustafsson K. Clinical importance of risk factors and exercise testing for prediction of significant coronary artery stenosis in women recovering from unstable coronary artery disease: the Stockholm Female Coronary Risk Study. *Am Heart J* 2000;139(6):971–8. [PubMed: 10827376]
20. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. *J Health Soc Behav* 1981;22(4):337–56. [PubMed: 7320473]
21. Horsten M, Mittleman MA, Wamala SP, Schenck-Gustafsson K, Orth-Gomér K. Depressive symptoms and lack of social integration in relation to prognosis of CHD in middle-aged women. The Stockholm Female Coronary Risk Study *Eur Heart J* 2000;21(13):1072–80.
22. Nygård ME, Hulting J. An automated system for ECG monitoring. *Comput Biomed Res* 1979;12(2):181–202. [PubMed: 371910]
23. Janszky I, Ericson M, Mittleman MA, Wamala S, Al-Khalili F, Schenck-Gustafsson K, Orth-Gomer K. Heart rate variability in long-term risk assessment in middle-aged women with coronary heart disease: The Stockholm Female Coronary Risk Study. *J Intern Med* 2004;255(1):13–21. [PubMed: 14687234]
24. Vaccarino V, Parsons L, Every NR, Barron HV, Krumholz HM. Sex-based differences in early mortality after myocardial infarction. *N Engl J Med* 1999;341(4):217–25. [PubMed: 10413733]
25. Kamphuis MH, Geerlings MI, Dekker JM, Giampaoli S, Nissinen A, Grobbee DE, Kromhout D. Autonomic dysfunction: a link between depression and cardiovascular mortality? The FINE Study. *Eur J Cardiovasc Prev Rehabil* 2007;14(6):796–802. [PubMed: 18043302]
26. Whang W, Kubzansky LD, Kawachi I, Rexrode KM, Kroenke CH, Glynn RJ, Garan H, Albert CM. Depression and risk of sudden cardiac death and coronary heart disease in women: results from the Nurses' Health Study. *J Am Coll Cardiol* 2009;53(11):950–8. [PubMed: 19281925]
27. Umetani K, Singer DH, McCraty R, Atkinson M. Twenty-four hour time domain heart rate variability and heart rate: relations to age and gender over nine decades. *J Am Coll Cardiol* 1998;31(3):593–601. [PubMed: 9502641]
28. de Jonge P, Mangano D, Whooley MA. Differential association of cognitive and somatic depressive symptoms with heart rate variability in patients with stable coronary heart disease: findings from the Heart and Soul Study. *Psychosom Med* 2007;69(8):735–9. [PubMed: 17942844]
29. Thayer JF, Wang X, Snieder H. Ethnic differences in heart rate variability: does ultralow-frequency heart rate variability really measure autonomic tone? *Am Heart J* 2006;152(3):e27. [PubMed: 16923401]
30. Licht CM, de Geus EJ, Zitman FG, Hoogendijk WJ, van Dyck R, Penninx BW. Association between major depressive disorder and heart rate variability in the Netherlands Study of Depression and Anxiety (NESDA). *Arch Gen Psychiatry* 2008;65(12):1358–67. [PubMed: 19047522]
31. de Jonge P, van den Brink RH, Spijkerman TA, Ormel J. Only incident depressive episodes after myocardial infarction are associated with new cardiovascular events. *J Am Coll Cardiol* 2006;48(11):2204–8. [PubMed: 17161246]

Abbreviations

CHD	coronary heart disease
ECG	electrocardiogram
HRV	heart rate variability
MI	myocardial infarction
UAP	unstable angina pectoris

Table 1**Characteristics of Subjects with Low and High Depression**

	Low Depression (n=70)	High Depression (n=196)	p
Sociodemographic factors			
Age (years)	56.1 (54.4-57.8)	56.17 (55.21-57.13)	0.94
Education (% college/university degree)	17.1	16.8	0.95
Marital status (% married)	68.6	62.8	0.38
Medical factors			
Index Event (% AMI)	40.0	34.2	0.39
Killip Class > 1 (%)	5.7	9.2	0.37
Left ventricular dysfunction* (%)	14.0	12.8	0.86
Systolic Blood Pressure (mm Hg)	117.67 (113.56-121.78)	122.46 (120.10-124.82)	0.04
Diastolic Blood Pressure (mm Hg)	75.69 (73.03-78.34)	76.80 (75.28-78.32)	0.46
History of Hypertension (%)	40.0	52.0	0.08
History of Diabetes (%)	4.3	17.9	0.005
Body Mass Index (kg/m ²)	26.26 (25.40 – 27.12)	27.31 (26.64-27.98)	0.06
Total cholesterol (mmol/l)	6.46 (6.15-6.78)	6.54 (6.37-6.71)	0.68
LDL cholesterol (mmol/l)	4.15 (3.84-4.46)	4.05 (3.86-4.23)	0.57
HDL cholesterol (mmol/l)	1.52 (1.41-1.62)	1.48 (1.42-1.53)	0.46
Triglycerides (mmol/l)	1.51 (1.29-1.73)	1.87 (1.57-2.17)	0.17
Post Menopause (without HRT, %)	68.6	67.3	0.85
Medication use			
β-Blocker (%)	52.9	65.8	0.06
ACE inhibitor (%)	11.4	9.7	0.68
Aspirin (%)	68.6	68.9	0.96
Statin (%)	5.7	8.2	0.51
Behavioral factors			
Smoking (% current smokers)	20.0	18.4	0.76
Exercise Habits (% sedentary lifestyle)	17.1	26.5	0.12
Physical activity during ECG recording	7.79 (7.25-8.33)	7.72 (7.43-8.01)	0.67
Alcohol intake (% moderate consumers)	64.3	71.4	0.27

HRT: hormone replacement therapy;

* total n=219, missing data for n=20 in the low depression and n=47 in the high depression group.

Table 2

HRV in Subjects with Low and High Depression

HRV parameters	Low Depression (n=70)	High Depression (n=196)	p [*]	p ^{**}
SDNN index (ms)	52.09 (46.49-57.68)	44.77 (42.21-47.33)	0.005	0.01
VLF power (ms ²)	759.64 (616.16-903.13)	609.94 (551.85-668.04)	0.02	0.04
LF power (ms ²)	678.21 (397.72-958.71)	464.42 (367.31-561.54)	0.01	0.04
HF power (ms ²)	698.49 (241.38-1155.59)	387.40 (234.75-540.06)	0.05	0.07
LF/HF ratio	2.29 (2.05-2.52)	2.07 (1.95-2.19)	0.21	0.52

*
2-tailed t-test;

**
ANCOVA (adjusted for systolic blood pressure, diabetes, hypertension, BMI and β -blocker use)