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16. Abstract

A resting "normal" ECG can coexist with known angina pectoris, positive angiocardiography and previous myocardial infarction. In contemporary exercise ECG tests, a false positive/false negative total error of 10% is not unusual.

Research aimed at improved screening detection of CHD evaluated amplitude/frequency analysis of high fidelity ECG recordings. Thirty normal males and 30 with documented CHD were selected. Analog ECGs were obtained using electromagnetic tape recording. Two bipolar leads were recorded during supine rest.

An analysis system provided for digital conversion, division of whole electrocardiac cycles into four defined segments, time-normalization of each segment, and amplitude/frequency analysis. Analyses provided a digital plot for each segment and for each 30-subject average.

The results from the CM_5 lead recorded at supine rest are presented. Comparison of the normal versus CHD groups across the 30-subject average amplitude values for each of 200 harmonics per segment revealed significant differences ($P \leq 0.05$) at most of the 200 harmonics. Two criteria, based only on the maximum and minimum amplitude values for each of the 200 harmonics, succeeded in individual screening separation of the normal versus CHD males. The results compare favorably with those of seventeen clinical studies using exercise electrocardiography.

17. Key Words	18. Distribution Statement
Coronary heart disease, Early detection, Aeromedical screening, Electrocardiography, Amplitude/frequency analysis	Availability is unlimited. Document may be released to the National Technical Information Service, Springfield, Virginia 22151, for sale to the public.

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AMPLITUDE FREQUENCY DIFFERENCES IN A SUPINE RESTING SINGLE-LEAD ELECTROCARDIOGRAM OF NORMAL VERSUS CORONARY HEART DISEASED MALES

I. Introduction

The Federal Aviation Administration (FAA) is responsible for the periodic examination of approximately 750,000 airmen and for the medical disqualification of those manifesting any of several specified disorders which are incompatible with aviation safety. In addition, FAA Order 9430.2A initiated in 1965 a specific health program designed to provide health maintenance and preventive medicine on behalf of the Air Traffic Controller Specialist (ATCS) population. One of the serious medical foci for these two responsibilities continues to be coronary heart disease (CHD).[1,2] Details concerning the high prevalence of diagnosed and silent CHD, the relationship of sudden CHD incapacitation to critical aviation activities, the relevance of early CHD detection to aviation safety and the desirability of preventive maintenance of optimum cardiovascular health in all major segments of the airman population have been presented in two previous reports.[3,4]

Medically defined, the main diagnostic criteria of CHD include: (1) angina pectoris and/or; (2) myocardial infarction and/or; (3) a positive angiocardiogram of $\geq 50\%$ luminal atherosclerotic obstruction of one or more major coronary arteries.[5,6] A resting, standard 12-lead clinical electrocardiogram (ECG) alone is not always successful in detecting CHD. In many instances, it may be normal in persons with documented medical histories of angina pectoris,[4-20] positive angiocardiography[6,7,9,11-27] and previous myocardial infarction.[21,22,28-34] Further, it may be normal closely antecedent to confirmed myocardial infarction and/or CHD death.[35-39] In general, exercise ECG tests excel the resting ECG for detection of CHD. However, even in the best contemporary exercise ECG tests, a false positive/false negative total error of at least 10% is not unusual.[6,7,15-22,25-27,40-43] Because an airman with undetected occult/covert CHD would be no less vulnerable to sudden CHD incapacitation/death than his vulnerable overt counterpart,[28-30] and because this type of sudden incapacitation/death is most susceptible to avoidance if detected and treated prior to the assault of a major cardiac crisis,[44] any advance in the technology of early detection of CHD should be highly desirable. Therefore, research was initiated to probe the possibility of using amplitude/frequency (A/F) analysis of high fidelity ECG recordings as a basis for improved screening discernment of the normal versus CHD states.

The rationale for this approach, the results of our early probing experiments and the previously published studies of other investigators in this general area have been presented and discussed in a previous report.[45] Our research in the area of A/F analysis of the ECG signal was encouraged by the fact that the serious limitations in equipment and techniques which contemporarily handicapped the earlier efforts in this area[46-50] no longer exist.[51-53]

II. Methods

A. *Selection of Normal Subjects.* Thirty normal males, free of CHD, were selected for this study. Normality was defined mainly on the basis of "coronary profile" parameters established in the Framingham Heart Study (FHS).[54] The normality parameters and their respective quantitative/qualitative criteria are shown in Table 1. Rejection of any candidate for the normal group was considered mandatory if based on any of the first 12 parameters of Table 1. Rejection on the basis of parameters 13–31 was subject to medical review by CAMI staff physicians. ATC trainees and employees of the FAA Aeronautical Center, Oklahoma City, comprised the two sources of volunteer candidates for the

TABLE 1.

SELECTION CRITERIA FOR CARDIOVASCULAR NORMALITY

PARAMETER	CRITERION	REMARKS
1) Age	20-30 years inclusive	Age on day of study entry.
2) Smoking (tobacco)	Never smoked	Teen-age smoking ($\leq$ 1 month) discounted.
3) Framingham Relative Weight Index (FRWI)	Never exceeded 110.0%	An FRWI of 100.0% indicates that the weight of the individual is equal to the median weight of the FHS males of his same height at the 1950 inception of the FHS (51). An FRWI of $\geq$ 120.0% indicates frank obesity (51).
4) Blood Pressure	$\leq$ 140/88 mm Hg (52)	Determined using standard medical sphygmomanometry (53), after a minimum of 15 minutes supine rest.
5) Heart Rate	$\leq$ 100 beats/minute (52)	Determined from a 60-second ECG recorded after a minimum of 15 minutes supine rest.
6) Vital Capacity	$\geq$ 95.0% of age/height standards (54)	Best of two trials in seated upright position.
7) Standard 12-Lead Clinical ECG	Within normal limits (55)	Data obtained in accordance with the 1967 AHA standards (56). All records were read double-blind by CAMI staff physicians.
8) Physical Exam	Standard medical criteria	Examinations conducted by CAMI staff physicians.
9) CHD Family History	No CHD present in self, and siblings and parents under 50 years of age.	Data obtained from non-medical interview.
10) Cholesterol	$\leq$ 240 mg % (63)	Fasting blood sample
11) Glucose	75-120 mg %	Fasting blood sample
12) Uric Acid	2.6-7.2 mg %	Fasting blood sample
13) Total Calcium	8.8-11.0 mg %	Fasting blood sample
14) Sodium	135-150 mEq/L	Fasting blood sample
15) Phosphorus	2.1-4.7 mg %	Fasting blood sample
16) Potassium	3.0-5.0 mEq/L	Fasting blood sample
17) Chlorides	94-100 mEq/L	Fasting blood sample
18) Alk. Phosphatase	0.6-2.5 BLU	Fasting blood sample
19) Total Bilirubin	0.1-1.2 mg %	Fasting blood sample
20) Total Protein	5.9-8.0 gm %	Fasting blood sample
21) Albumin	3.3-5.2 gm %	Fasting blood sample
22) Globulin	1.5-3.8 gm %	Fasting blood sample
23) A/G Ratio	1.1-2.5	Fasting blood sample
24) SGOT	11-52 SFU	Fasting blood sample
25) LDH	280-770 BBU	Fasting blood sample
26) Creatinine	0.3-1.8 mg %	Fasting blood sample
27) BUN	7.0-25.0 mg %	Fasting blood sample
28) Hemoglobin	12.5-17.2 gm %	Fasting blood sample
29) Hematocrit	37.0-51.0 %	Fasting blood sample
30) RBC	$4.3\text{-}5.9 \times 10^6/mm^3$	Fasting blood sample
31) WBC	$4.7\text{-}9.7 \times 10^3/mm^3$	Fasting blood sample

normal group. Details of the total multi-session screening process for the selection of the normal subjects have been reported previously.[45] Age, height and weight for each normal male are compiled in Table 2.

TABLE 2. S.E.=Standard Error

VITAL STATISTICS
NORMAL MALES

SUBJECT NUMBER	AGE (YEARS)	HEIGHT (INCHES)	WEIGHT (POUNDS)
1	29	71.5	193.75
7	29	70.5	154.25
8	30	65.0	128.0
9	27	69.5	164.0
10	29	71.75	185.0
32	29	71.5	171.0
13	30	68.75	163.0
15	22	70.75	164.0
17	24	73.0	162.0
19	30	68.25	158.25
21	29	68.25	143.75
22	27	74.0	189.0
24	25	69.0	157.5
26	25	65.25	129.0
30	30	70.5	156.0
34	28	69.25	161.0
36	26	72.5	175.0
37	22	74.0	190.0
43	25	73.0	150.0
46	27	70.25	155.5
47	26	68.5	159.0
48	28	68.5	175.0
51	26	70.0	128.5
52	29	66.0	138.0
53	26	68.75	142.0
54	24	70.75	168.5
56	23	69.75	173.0
57	26	70.25	150.0
60	26	74.5	172.0
62	29	68.75	161.0
	Mean=26.87 S.E.= 0.44	Mean=70.08 S.E.= 0.44	Mean=160.57 S.E.= 3.19

B. *Selection of CHD Subjects.* Thirty male CHD subjects were selected for this study. Employees of the FAA Aeronautical Center, Oklahoma City, comprised the sole source of volunteer candidates for the CHD group. The criteria for selection were medically documented histories of angina pectoris and/or myocardial infarction and/or positive angiocardiography. All selections for this group were critically reviewed by CAMI staff physicians. The selection criteria for each of the selected CHD subjects are compiled in Table 3. In this group, firm medical documentation existed for myocardial infarction in 23, for angina pectoris in 15, and for positive angiocardiography in 6 of these 30 CHD subjects. Angiocardiography had not been run on 24 of this group. Age, height and weight for each CHD male are compiled in Table 4.

C. *Data Acquisition and Analysis.* Table 5 presents the general data-acquisition procedures for the overall experimental protocol of this study. Both the normal and CHD groups were scheduled through this total protocol. This present report deals only with evaluation of the data obtained from a discrete unitary portion of this total protocol focused directly on the screening discernment of the normal versus CHD

TABLE 3. MI=Myocardial Infarction. AP=Angina Pectoris. PA=Positive Angiocardiogram of ≥50% luminal atherosclerotic obstruction of one or more major coronary arteries. X=Medically documented history in the specified diagnostic category.

SELECTION CRITERIA
CHD MALES

SUBJECT NUMBER	MI	AP	PA
63	x		
64		x	x
65	x	x	
67	x	x	
68	x		
69	x		
70		x	x
71	x	x	
73		x	x
74	x		
75	x	x	
76	x		
77	x		
79	x		
80		x	x
81		x	x
82	x		
83	x		
84		x	
85	x	x	
86		x	
87	x	x	
88	x		
90	x		
91	x		
93	x		
94	x		
95	x		x
96	x	x	
97	x	x	
	Sum=23	Sum=15	Sum=6

TABLE 4. S.E.=Standard Error.

VITAL STATISTICS
CHD MALES

SUBJECT NUMBER	AGE (YEARS)	HEIGHT (INCHES)	WEIGHT (POUNDS)
63	51	69.5	177.0
64	51	68.5	180.5
65	59	67.0	167.0
67	48	68.5	157.0
68	57	66.75	157.25
69	54	68.25	179.0
70	44	63.5	132.0
71	50	68.25	159.0
73	49	68.0	163.0
74	52	68.0	166.0
75	50	65.25	173.5
76	51	66.5	133.5
77	39	68.75	177.0
79	61	70.5	250.0
80	60	69.5	192.0
81	53	68.25	168.0
82	39	72.5	201.0
83	39	70.0	171.75
84	55	63.0	147.0
85	54	69.0	180.0
86	40	68.75	217.0
87	58	65.5	162.0
88	51	72.5	209.0
90	51	67.5	171.0
91	61	70.5	160.0
93	43	69.75	201.75
94	55	68.25	147.0
95	51	66.5	176.0
96	63	68.25	196.0
97	50	67.0	173.5
	Mean=51.30 S.E.= 1.23	Mean=68.13 S.E.= 0.39	Mean=174.83 S.E.= 4.49

states. Evaluation of possible inter-correlations of the remaining data with those presented here have been planned as a subsequent effort. The data evaluated in this report emanated from the segments of one whole electrocardiac cycle per subject obtained from one bipolar ECG lead (CM_5)[59] during the two-minute supine test recording of data acquisition procedure 2C (Table 5). The recording of the 2C portion of the data protocol was preceded by at least 15 minutes of supine rest. Vigorous skin preparation,[60] low-resistance ECG paste[60] and silver/silver chloride electrodes[60] were utilized exclusively for all bipolar lead recording.

Two sets of equipment were required to carry out this study. The set used for analog ECG data acquisition was located at the CAMI in Oklahoma City. The set used for A/F analysis was located at the NASA-White Sands Test Facility (WSTF) in Las Cruces, New Mexico. At task onset, the specific equipment and manpower for the A/F analysis portion of this study were not available in-house at the FAA Aeronautical Center. End-to-end calibration of both sets of equipment was a mandatory prerequisite to data acquisition and analysis. Detailed descriptions of all specific equipment and procedures for calibration, data acquisition and data analysis have been reported previously.[55]

The analog ECG recordings of the bipolar lead were obtained using a wide-band high fidelity electromagnetic tape recording system.[55] At the constant recording/playback tape speed of 15 inches per second used in this study, this system has a verified total flat frequency range of DC to 5000 cycles per second (Hz). Calibration of this system included a range of ± 5 millivolts DC and a frequency range of DC to 2000 Hz. The common-mode rejection ratio for 60 Hz noise was 120 decibels (dB). Instrumentation grade electromagnetic tape was used exclusively for the analog ECG data acquisition. All electromagnetic tape recordings were time and voice coded in parallel with a written time and event log for the purpose of facilitating subsequent identification and isolation of any specific portion to be analyzed.

TABLE 5.

DATA ACQUISITION PROTOCOL

CONDITION	PROCEDURE	REMARKS
1) Supine Rest	Standard 12-lead Clinical ECG	All ECG signals were recorded using a wide-band high fidelity electromagnetic tape recording system (57).
2) Supine Rest-CM_5 and O bipolar leads recorded simultaneously.	a) Respiratory inspiration held for 10 seconds.	ECG recording system as cited above.
	b) Respiratory end-expiration held for 10 seconds.	
	c) Sequentially: two minutes of quiet horizontal rest; two minutes of 45°, feet-down tilt; two minutes of horizontal recovery.	
3) Seated Upright	a) Blood pressure measurement after 15 minutes of rest.	Standard medical method of sphygmomanometry (53).
	b) Continuous simultaneous recording of CM_5 and O leads and oxygen uptake during: five minutes of quiet rest; three minutes of 50 RPM, 25-watt bicycle ergometry; six minutes of 50 RPM, 50-watt bicycle ergometry (blood pressure measurement at the fourth minute); and eight minutes of resting recovery.	ECG recording system as cited above. Oxygen uptake measured by a Webb Meter (58). Oxygen uptake at the 50-watt ergometry load approximates that of the Master two-step test (59).

(N)

SR-CM$_5$-PQ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	33.208	2.640	77.97	11.70	51	.654	.070	2.14	.31	101	.505	.071	2.31	.19	151	.422	.037	1.33	.25
2	13.902	1.416	36.00	4.24	52	.748	.120	3.43	.25	102	.430	.029	.81	.24	152	.388	.027	.99	.21
3	8.552	1.115	24.29	1.83	53	.776	.084	1.86	.27	103	.488	.050	1.34	.21	153	.401	.029	1.10	.25
4	7.287	.829	21.92	1.78	54	1.164	.473	14.71	.21	104	.434	.040	1.33	.25	154	.379	.029	1.04	.21
5	7.313	.919	20.62	2.27	55	.870	.145	4.35	.27	105	.429	.028	.87	.23	155	.379	.030	1.04	.19
6	6.605	.860	18.32	.70	56	1.177	.296	8.05	.21	106	.443	.035	.99	.19	156	.424	.041	1.16	.21
7	5.493	.759	17.48	.65	57	.729	.080	2.02	.29	107	.524	.075	2.06	.19	157	.392	.027	1.04	.21
8	5.459	.624	14.52	1.17	58	.801	.115	3.03	.26	108	.417	.032	1.16	.27	158	.386	.033	1.16	.15
9	4.987	.631	17.45	.44	59	.992	.274	8.08	.21	109	.416	.038	1.28	.23	159	.398	.028	1.04	.23
10	5.321	.652	13.94	.27	60	1.045	.313	9.51	.25	110	.412	.041	1.39	.19	160	.379	.026	.99	.25
11	5.763	1.392	41.67	.63	61	.725	.097	2.49	.25	111	.410	.033	1.16	.17	161	.387	.024	.93	.26
12	4.771	1.433	44.00	.32	62	.656	.080	2.14	.23	112	.430	.028	.93	.27	162	.364	.022	.81	.17
13	2.987	.367	7.94	.37	63	.626	.075	1.96	.27	113	.435	.033	1.16	.26	163	.401	.032	1.16	.21
14	2.476	.310	6.90	.35	64	.527	.051	1.57	.21	114	.447	.056	1.84	.24	164	.407	.030	1.10	.17
15	2.429	.373	9.22	.27	65	.543	.051	1.45	.25	115	.433	.041	1.39	.17	165	.410	.035	1.28	.23
16	2.264	.271	6.43	.41	66	.588	.050	1.22	.27	116	.420	.041	1.39	.23	166	.394	.026	.87	.23
17	2.005	.283	7.07	.28	67	.528	.048	1.10	.26	117	.402	.043	1.51	.17	167	.395	.030	1.16	.25
18	2.005	.260	6.03	.33	68	.527	.052	1.57	.25	118	.414	.028	.99	.23	168	.384	.026	.99	.21
19	1.693	.246	5.45	.26	69	.550	.053	1.62	.24	119	.416	.032	1.16	.25	169	.383	.023	.93	.21
20	1.695	.219	5.45	.37	70	.542	.059	1.86	.19	120	.417	.031	1.04	.23	170	.382	.034	1.16	.21
21	1.640	.232	6.03	.31	71	.536	.048	1.51	.24	121	.412	.026	.87	.21	171	.373	.026	1.04	.25
22	1.540	.184	4.06	.33	72	.635	.082	2.11	.25	122	.457	.061	1.81	.21	172	.390	.025	.99	.23
23	1.456	.171	3.56	.35	73	.643	.113	3.54	.27	123	.442	.054	1.63	.19	173	.371	.022	.87	.25
24	1.923	.438	13.56	.35	74	.593	.066	1.90	.19	124	.405	.031	1.10	.19	174	.383	.023	.93	.19
25	1.448	.157	3.12	.25	75	.753	.183	5.61	.24	125	.397	.028	.93	.23	175	.375	.018	.64	.23
26	2.062	.564	17.61	.40	76	.696	.182	5.82	.23	126	.401	.032	1.10	.17	176	.400	.035	1.22	.23
27	1.703	.381	11.54	.31	77	.613	.101	3.08	.23	127	.396	.029	1.04	.23	177	.395	.029	1.10	.25
28	1.692	.308	8.74	.21	78	.627	.077	2.10	.19	128	.387	.024	.75	.17	178	.369	.029	1.10	.21
29	1.481	.182	3.94	.37	79	.518	.038	1.16	.25	129	.425	.040	1.45	.23	179	.392	.033	1.22	.21
30	1.279	.174	3.87	.28	80	.492	.044	1.28	.25	130	.396	.029	.99	.23	180	.362	.022	.81	.23
31	1.571	.256	6.53	.29	81	.532	.057	1.74	.27	131	.438	.042	1.28	.23	181	.386	.025	.99	.25
32	2.319	.730	22.69	.26	82	.536	.067	1.87	.23	132	.403	.036	1.33	.26	182	.385	.024	.93	.23
33	2.237	.622	13.57	.28	83	.758	.220	6.86	.23	133	.398	.026	.99	.24	183	.378	.033	1.16	.15
34	1.872	.471	13.23	.28	84	.611	.113	3.66	.27	134	.393	.032	1.04	.21	184	.406	.028	1.10	.26
35	1.602	.363	10.14	.22	85	.495	.045	1.25	.23	135	.419	.039	1.23	.21	185	.380	.027	.99	.21
36	2.195	.805	22.98	.30	86	.468	.034	.87	.21	136	.423	.037	1.33	.22	186	.383	.029	1.10	.23
37	1.166	.139	3.88	.28	87	.484	.057	1.50	.21	137	.383	.026	.87	.23	187	.379	.025	.93	.21
38	.973	.100	2.61	.30	88	.479	.040	1.16	.23	138	.407	.028	.99	.23	188	.385	.025	.99	.21
39	.919	.111	2.96	.31	89	.439	.039	1.28	.19	139	.410	.034	1.22	.23	189	.362	.023	.87	.19
40	1.116	.213	6.62	.27	90	.474	.054	1.86	.28	140	.393	.030	1.10	.21	190	.408	.032	1.16	.25
41	.865	.101	2.78	.28	91	.431	.026	.81	.23	141	.411	.033	1.04	.19	191	.378	.026	.99	.21
42	.831	.100	2.61	.25	92	.430	.036	1.28	.19	142	.397	.024	.93	.24	192	.388	.032	1.22	.23
43	1.114	.252	7.53	.29	93	.466	.057	1.78	.19	143	.407	.029	.99	.24	193	.356	.019	.70	.19
44	.836	.099	2.61	.29	94	.487	.057	1.70	.25	144	.399	.031	1.10	.25	194	.377	.027	1.04	.25
45	.672	.069	1.68	.27	95	.515	.047	1.41	.17	145	.391	.028	1.04	.21	195	.376	.024	.93	.17
46	.692	.072	1.74	.25	96	.451	.037	1.04	.21	146	.389	.035	1.16	.19	196	.384	.023	.93	.25
47	.867	.140	4.09	.29	97	.518	.069	2.20	.23	147	.410	.031	1.10	.21	197	.386	.030	1.10	.19
48	.673	.068	1.62	.17	98	.479	.070	2.37	.21	148	.383	.024	.93	.23	198	.398	.027	1.04	.24
49	.730	.085	2.14	.28	99	.406	.031	.93	.23	149	.412	.039	1.45	.25	199	.371	.034	1.22	.21
50	.671	.074	1.53	.17	100	.531	.087	2.83	.25	150	.380	.025	.93	.21	200	.349	.020	.75	.21

TABLE 6. N=Normal Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

$SR\text{-}CM_5^{(N)}\text{-}QRS$ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	617.023	29.590	1091.54	302.76	51	4.419	.329	9.12	2.12	101	4.524	.370	10.26	2.11	151	4.677	.322	9.23	2.12
2	113.212	7.720	190.26	36.48	52	4.192	.332	9.12	1.72	102	4.540	.351	10.19	2.34	152	4.430	.430	10.77	2.30
3	35.322	3.049	68.23	10.77	53	4.673	.396	10.26	2.10	103	4.140	.367	9.69	1.75	153	4.696	.336	9.69	2.50
4	17.219	1.960	52.31	2.89	54	4.434	.373	10.26	1.75	104	4.448	.307	9.69	2.32	154	4.469	.336	9.69	2.32
5	13.562	1.408	30.00	2.34	55	4.840	.405	10.19	1.75	105	4.242	.297	9.69	2.30	155	4.814	.396	10.19	2.11
6	10.635	1.242	29.23	3.26	56	4.627	.337	9.69	2.33	106	4.257	.303	8.55	2.31	156	4.998	.345	10.26	2.30
7	9.318	1.123	29.56	3.26	57	4.770	.359	10.19	2.68	107	4.726	.349	10.98	1.91	157	4.475	.340	9.12	2.11
8	7.803	.931	24.32	1.17	58	4.857	.451	11.54	1.74	108	4.429	.328	9.69	2.30	158	4.575	.344	10.77	2.48
9	7.132	.731	19.47	2.69	59	4.415	.298	10.26	2.31	109	4.573	.359	10.19	2.33	159	4.235	.349	9.69	2.29
10	6.495	.519	15.07	2.53	60	4.597	.380	10.00	2.69	110	4.739	.374	10.19	2.11	160	4.457	.353	10.26	2.12
11	6.274	.473	12.14	2.69	61	4.519	.313	8.64	2.69	111	4.764	.351	9.12	2.12	161	4.429	.326	9.69	2.51
12	6.745	.870	23.23	2.31	62	4.617	.364	10.77	1.94	112	4.646	.379	10.83	1.75	162	4.797	.356	9.69	2.50
13	5.487	.448	11.49	2.52	63	4.688	.403	10.98	2.12	113	4.678	.359	10.83	2.50	163	4.736	.313	9.12	2.67
14	5.267	.371	10.77	1.16	64	4.347	.327	9.69	1.75	114	4.873	.346	10.83	2.87	164	4.724	.330	9.69	2.11
15	5.029	.318	9.20	2.30	65	4.328	.346	10.26	2.30	115	4.491	.351	9.69	2.32	165	4.703	.393	10.00	2.32
16	5.359	.369	11.40	2.72	66	4.570	.321	9.12	2.72	116	4.740	.392	10.83	2.50	166	3.816	.215	8.55	2.30
17	4.983	.396	10.00	1.75	67	4.452	.320	9.12	2.70	117	4.684	.405	11.40	2.30	167	4.679	.380	10.26	2.33
18	5.132	.360	9.69	2.31	68	4.844	.393	9.29	2.12	118	4.589	.343	10.26	1.93	168	4.074	.287	9.69	2.12
19	4.855	.338	9.69	2.30	69	4.523	.340	9.69	2.32	119	4.751	.341	10.26	2.50	169	4.765	.431	11.54	2.30
20	5.321	.432	11.61	2.69	70	4.716	.373	10.19	2.48	120	4.473	.324	9.12	2.11	170	4.995	.412	12.54	2.12
21	4.779	.330	9.69	1.16	71	4.124	.293	9.69	1.91	121	4.626	.340	9.12	2.11	171	4.409	.383	11.40	1.92
22	4.904	.356	9.69	2.11	72	4.379	.338	9.69	2.30	122	4.550	.404	11.40	1.74	172	4.744	.335	10.26	1.74
23	4.884	.285	9.12	2.34	73	4.545	.351	9.69	2.11	123	4.767	.386	10.26	2.29	173	4.652	.327	9.69	2.30
24	4.649	.361	9.41	2.30	74	4.515	.322	9.69	2.88	124	4.549	.374	11.97	2.50	174	4.268	.287	8.55	2.31
25	4.905	.357	10.26	1.74	75	4.888	.382	9.23	2.30	125	4.389	.298	9.12	1.94	175	4.590	.363	11.40	2.30
26	4.769	.342	10.26	2.34	76	4.526	.320	10.00	2.87	126	4.758	.393	9.12	1.92	176	4.583	.362	10.26	2.34
27	4.879	.442	10.83	2.32	77	4.597	.326	9.69	2.12	127	4.604	.336	10.26	2.48	177	4.423	.398	10.77	1.73
28	4.647	.340	10.26	2.12	78	4.416	.340	9.69	1.72	128	4.383	.380	12.54	1.75	178	4.783	.406	11.54	2.30
29	4.632	.352	9.12	1.91	79	4.605	.308	8.55	2.31	129	4.262	.326	9.12	1.73	179	4.370	.272	8.55	2.50
30	4.571	.269	8.55	2.69	80	4.402	.335	8.63	1.92	130	4.724	.361	9.23	2.11	180	4.555	.312	9.69	2.11
31	4.387	.308	10.83	2.49	81	4.427	.275	8.55	2.68	131	4.325	.322	10.26	1.75	181	4.566	.328	11.40	2.69
32	4.854	.382	10.45	2.11	82	4.505	.303	9.12	2.30	132	4.849	.345	8.46	2.50	182	4.269	.355	10.00	2.31
33	4.548	.327	10.26	2.33	83	4.364	.316	9.12	1.17	133	4.502	.349	9.69	2.31	183	4.744	.361	10.19	2.67
34	4.750	.296	8.55	2.31	84	4.377	.329	10.83	2.30	134	4.505	.358	9.69	1.91	184	4.531	.425	10.26	1.75
35	4.678	.418	11.40	1.75	85	4.596	.343	10.26	2.31	135	4.582	.350	10.83	2.54	185	4.178	.316	9.69	2.30
36	4.264	.397	10.83	1.17	86	4.136	.275	9.69	2.31	136	4.584	.368	9.69	2.11	186	4.642	.409	10.00	2.30
37	4.476	.341	10.26	2.11	87	4.752	.380	10.00	2.11	137	4.421	.344	10.26	2.30	187	4.637	.358	10.83	2.31
38	4.279	.276	8.55	2.31	88	4.610	.356	9.69	2.30	138	4.687	.323	9.69	2.69	188	4.658	.350	10.26	2.69
39	4.691	.375	10.77	2.69	89	4.776	.354	10.00	2.29	139	4.512	.404	10.98	1.75	189	4.574	.333	9.69	2.52
40	4.700	.360	10.00	2.10	90	4.615	.397	10.00	1.75	140	4.223	.293	9.12	2.67	190	4.419	.337	10.26	2.29
41	4.924	.402	10.77	2.32	91	4.610	.332	8.64	1.75	141	4.395	.302	9.12	2.30	191	4.389	.340	9.69	2.34
42	4.811	.348	9.12	1.74	92	4.516	.368	9.69	2.34	142	4.364	.348	10.26	2.11	192	4.350	.336	9.69	2.30
43	4.317	.344	9.69	2.31	93	4.490	.322	9.69	1.17	143	4.517	.310	8.71	2.32	193	4.170	.355	9.12	1.17
44	4.469	.320	9.69	2.30	94	4.687	.376	8.62	2.29	144	4.640	.338	10.26	2.11	194	4.241	.337	10.83	1.75
45	4.548	.346	9.12	2.31	95	4.401	.318	9.69	2.30	145	4.597	.428	10.83	1.73	195	4.403	.348	9.23	1.73
46	4.677	.304	9.69	1.75	96	4.735	.378	9.23	2.11	146	4.626	.337	9.69	1.17	196	4.272	.329	10.26	2.29
47	4.675	.357	10.26	1.74	97	4.577	.363	11.54	2.31	147	4.635	.359	10.26	2.11	197	4.138	.283	9.12	1.74
48	4.614	.348	10.00	2.51	98	4.492	.317	10.26	2.50	148	4.432	.336	8.97	1.74	198	4.435	.363	9.23	1.74
49	4.750	.329	10.26	2.30	99	4.706	.358	9.69	1.74	149	4.570	.337	8.55	1.75	199	3.841	.220	6.92	1.15
50	4.762	.379	10.83	2.67	100	4.690	.349	9.69	2.34	150	4.479	.326	10.26	2.69	200	4.159	.293	9.41	1.94

TABLE 7. N=Normal Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(N) SR-CM$_5$-ST$_{70}$ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	50.818	6.189	143.73	6.24	51	.932	.094	2.14	.30	101	.535	.047	1.05	.17	151	.519	.046	1.17	.22
2	32.461	3.277	78.60	7.66	52	.871	.085	1.92	.30	102	.529	.046	1.33	.27	152	.488	.041	1.16	.23
3	18.797	1.659	38.84	6.81	53	.893	.090	2.20	.27	103	.535	.048	1.40	.25	153	.478	.034	1.16	.27
4	17.018	1.789	48.87	5.64	54	.978	.102	2.15	.26	104	.550	.051	1.34	.23	154	.477	.041	1.16	.23
5	11.346	1.164	26.14	3.26	55	.842	.080	1.85	.28	105	.534	.044	1.22	.26	155	.495	.041	1.10	.25
6	8.990	.895	20.59	2.76	56	.801	.075	1.63	.25	106	.509	.044	1.10	.21	156	.482	.043	1.33	.25
7	7.300	.807	17.87	1.99	57	.853	.095	2.37	.25	107	.563	.048	1.22	.27	157	.482	.036	1.05	.21
8	6.355	.712	16.25	1.19	58	.784	.065	1.79	.30	108	.547	.052	1.34	.23	158	.477	.042	1.04	.25
9	5.525	.623	15.33	.76	59	.827	.081	1.87	.26	109	.543	.045	1.33	.25	159	.499	.039	.99	.25
10	4.807	.546	12.49	.33	60	.800	.080	1.79	.26	110	.525	.043	1.16	.19	160	.467	.040	1.16	.27
11	4.150	.492	11.74	.53	61	.732	.069	1.69	.23	111	.536	.053	1.27	.19	161	.474	.040	1.16	.19
12	5.399	.875	20.43	.46	62	.880	.090	2.39	.26	112	.572	.042	1.28	.30	162	.464	.035	1.22	.23
13	6.428	.863	18.72	1.93	63	.736	.073	1.91	.23	113	.490	.040	1.05	.21	163	.475	.035	.93	.19
14	4.272	.455	11.37	1.08	64	.724	.071	1.85	.21	114	.525	.045	1.10	.24	164	.478	.037	1.10	.15
15	3.518	.350	8.34	.86	65	.734	.068	1.57	.29	115	.484	.038	1.10	.17	165	.482	.041	1.06	.27
16	3.224	.358	8.28	.87	66	.712	.072	1.85	.25	116	.564	.052	1.46	.23	166	.494	.039	.99	.21
17	2.991	.342	8.10	.83	67	.731	.070	1.57	.25	117	.512	.037	1.22	.19	167	.458	.036	.99	.19
18	2.658	.322	8.16	.75	68	.753	.079	1.92	.21	118	.504	.045	1.22	.23	168	.454	.038	1.05	.19
19	2.504	.299	7.11	.31	69	.687	.069	1.50	.21	119	.494	.042	1.11	.23	169	.477	.039	1.10	.23
20	2.687	.322	7.93	.25	70	.688	.059	1.40	.23	120	.459	.035	1.05	.19	170	.513	.043	1.16	.24
21	3.703	.572	12.73	.69	71	.665	.058	1.50	.26	121	.520	.043	1.16	.23	171	.451	.034	.99	.25
22	2.297	.220	5.03	.45	72	.615	.054	1.40	.17	122	.512	.041	1.10	.25	172	.460	.042	1.05	.21
23	2.095	.226	5.21	.28	73	.673	.069	1.79	.24	123	.512	.051	1.27	.21	173	.488	.039	1.10	.23
24	1.903	.216	5.03	.21	74	.671	.064	1.50	.25	124	.492	.038	1.10	.22	174	.450	.038	1.10	.21
25	1.869	.189	4.28	.43	75	.607	.054	1.34	.23	125	.479	.045	1.16	.21	175	.483	.037	1.10	.29
26	1.787	.192	4.22	.23	76	.668	.060	1.34	.27	126	.507	.040	1.05	.26	176	.489	.042	1.05	.23
27	1.723	.197	4.31	.31	77	.603	.055	1.40	.15	127	.506	.042	1.11	.25	177	.448	.036	1.10	.23
28	1.647	.171	4.05	.23	78	.602	.067	2.08	.26	128	.501	.042	1.22	.21	178	.501	.042	1.16	.23
29	2.511	.396	9.36	.57	79	.716	.070	1.81	.28	129	.520	.040	1.22	.23	179	.458	.038	1.16	.26
30	1.553	.160	3.82	.46	80	.623	.060	1.68	.26	130	.487	.046	1.28	.19	180	.466	.034	1.05	.21
31	1.414	.155	3.93	.42	81	.652	.060	1.56	.23	131	.495	.042	1.16	.21	181	.462	.045	1.16	.15
32	1.468	.157	3.70	.40	82	.626	.056	1.34	.26	132	.462	.037	1.05	.25	182	.461	.032	1.05	.26
33	1.404	.145	3.30	.35	83	.585	.049	1.22	.23	133	.484	.038	1.16	.24	183	.448	.038	1.10	.19
34	1.311	.140	3.07	.36	84	.608	.052	1.34	.21	134	.503	.038	1.05	.25	184	.475	.043	1.22	.21
35	1.267	.131	3.07	.33	85	.575	.053	1.46	.25	135	.501	.043	1.10	.21	185	.476	.039	1.22	.23
36	1.268	.136	2.89	.26	86	.580	.050	1.28	.19	136	.500	.038	1.16	.17	186	.453	.036	1.05	.19
37	1.450	.143	3.03	.32	87	.671	.063	1.57	.30	137	.533	.055	1.55	.21	187	.447	.038	1.10	.17
38	1.398	.129	3.01	.44	88	.615	.067	1.85	.26	138	.460	.041	1.10	.23	188	.450	.039	1.10	.23
39	1.193	.126	2.97	.24	89	.602	.049	1.34	.31	139	.483	.036	1.05	.21	189	.449	.032	1.05	.20
40	1.204	.123	3.12	.31	90	.545	.050	1.39	.25	140	.493	.044	1.10	.23	190	.437	.034	1.05	.23
41	1.141	.118	2.68	.32	91	.583	.051	1.28	.17	141	.504	.041	1.10	.25	191	.474	.043	1.05	.25
42	1.152	.125	2.80	.26	92	.563	.049	1.40	.27	142	.500	.044	1.10	.19	192	.420	.033	1.05	.23
43	1.088	.125	2.92	.26	93	.556	.053	1.21	.19	143	.496	.043	1.17	.21	193	.457	.041	.99	.22
44	1.061	.112	2.49	.26	94	.560	.050	1.22	.25	144	.486	.036	1.05	.19	194	.454	.042	1.16	.17
45	1.024	.115	2.60	.28	95	.556	.052	1.45	.27	145	.495	.043	1.10	.24	195	.441	.033	1.10	.24
46	1.120	.109	2.42	.30	96	.564	.049	1.22	.23	146	.471	.035	1.16	.25	196	.482	.045	1.21	.23
47	.970	.091	2.15	.34	97	.546	.050	1.39	.25	147	.467	.037	1.05	.23	197	.430	.035	1.10	.22
48	.962	.098	2.14	.30	98	.527	.049	1.34	.23	148	.458	.038	1.16	.15	198	.442	.033	.93	.23
49	.926	.089	2.10	.31	99	.550	.048	1.16	.19	149	.519	.049	1.16	.21	199	.431	.031	.75	.23
50	.927	.092	2.20	.35	100	.548	.042	1.16	.27	150	.452	.033	1.05	.25	200	.401	.030	.81	0

TABLE 8. N=Normal Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(N) SR-CM$_5$-ST$_W$ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	107.744	7.072	215.32	18.58	51	1.355	.381	11.96	.37	101	.898	.108	3.08	.35	151	.767	.099	2.70	.27
2	50.483	3.263	85.57	11.20	52	1.079	.112	3.07	.35	102	.835	.090	2.84	.38	152	.794	.105	3.27	.29
3	19.623	1.545	35.84	3.89	53	1.373	.314	9.94	.27	103	1.007	.199	5.95	.30	153	.877	.096	2.70	.25
4	9.824	1.147	28.33	1.73	54	1.331	.188	4.27	.29	104	.875	.109	2.95	.35	154	.770	.084	2.32	.29
5	8.617	1.119	30.76	.87	55	1.725	.540	16.98	.33	105	.896	.100	2.72	.31	155	.778	.085	2.43	.35
6	8.524	.998	25.72	1.27	56	1.802	.582	16.58	.40	106	.801	.091	2.43	.23	156	.753	.093	2.72	.33
7	7.893	.817	21.55	1.91	57	2.752	.902	24.76	.38	107	.748	.073	2.03	.27	157	.772	.099	2.89	.31
8	6.835	.701	17.67	1.67	58	1.496	.270	6.38	.34	108	.812	.094	2.70	.35	158	.769	.087	2.50	.25
9	6.060	.607	13.73	1.57	59	1.691	.597	18.19	.27	109	.780	.087	2.67	.37	159	.825	.099	2.89	.31
10	5.482	.533	12.86	1.29	60	1.630	.537	16.58	.27	110	.791	.087	2.49	.35	160	.758	.079	2.26	.25
11	4.865	.463	9.94	1.12	61	1.068	.129	3.19	.23	111	.781	.099	2.70	.31	161	.816	.093	2.70	.40
12	4.465	.401	9.36	.87	62	1.531	.431	13.69	.48	112	.876	.098	2.70	.31	162	.767	.075	2.38	.35
13	3.862	.385	8.00	.83	63	1.141	.161	3.56	.29	113	.842	.092	2.70	.29	163	.726	.084	2.38	.29
14	3.443	.327	7.16	.63	64	.965	.093	2.84	.33	114	.795	.098	2.67	.35	164	.782	.087	2.70	.35
15	3.242	.347	7.36	.46	65	.862	.097	2.72	.29	115	.757	.078	2.43	.23	165	.752	.079	2.43	.29
16	3.132	.307	7.24	.77	66	.911	.082	2.67	.29	116	.754	.098	2.70	.23	166	.816	.110	3.47	.25
17	3.564	.557	15.39	.60	67	.870	.085	2.67	.33	117	.769	.090	2.67	.29	167	.832	.112	3.47	.25
18	3.993	.973	29.57	.65	68	.941	.102	2.89	.21	118	.827	.094	2.61	.35	168	.746	.093	2.50	.30
19	5.905	1.676	46.56	.42	69	.899	.070	2.38	.38	119	.865	.114	3.08	.25	169	.777	.096	2.50	.31
20	2.856	.430	10.59	.56	70	.823	.096	2.72	.27	120	.807	.093	2.61	.29	170	.808	.082	2.38	.29
21	2.699	.369	10.51	.41	71	.906	.101	2.72	.31	121	.794	.101	2.89	.37	171	.826	.095	2.43	.29
22	1.947	.184	4.16	.46	72	.822	.085	2.67	.31	122	.790	.082	2.55	.33	172	.791	.091	2.89	.35
23	2.007	.166	3.65	.58	73	.961	.097	2.84	.33	123	.729	.082	2.38	.34	173	.747	.078	2.38	.29
24	1.951	.187	4.52	.56	74	.835	.098	2.78	.21	124	.848	.110	3.08	.21	174	.775	.095	2.89	.29
25	1.847	.168	4.06	.52	75	.860	.083	2.55	.29	125	.861	.123	3.58	.33	175	.801	.088	2.89	.35
26	1.808	.158	3.77	.54	76	.839	.107	2.89	.27	126	.783	.103	2.70	.21	176	.751	.096	2.55	.29
27	1.628	.144	3.71	.37	77	.880	.097	2.89	.31	127	.832	.111	2.95	.29	177	.828	.112	3.01	.35
28	1.585	.150	4.11	.48	78	.802	.084	2.55	.29	128	.790	.099	2.32	.29	178	.724	.064	2.09	.35
29	1.533	.156	3.82	.42	79	.864	.095	2.70	.25	129	.915	.166	4.79	.35	179	.821	.122	3.08	.29
30	1.486	.133	3.36	.42	80	.860	.099	2.89	.33	130	.921	.180	5.58	.23	180	.770	.090	2.55	.33
31	1.475	.140	4.11	.35	81	.877	.090	2.95	.25	131	.851	.093	2.43	.29	181	.713	.084	2.26	.21
32	1.449	.131	3.36	.31	82	.832	.091	2.50	.35	132	1.014	.215	6.24	.25	182	.747	.100	2.89	.23
33	1.316	.132	3.48	.35	83	.834	.087	2.61	.35	133	.928	.149	4.16	.27	183	.769	.068	2.09	.31
34	1.327	.123	3.08	.29	84	.845	.093	2.61	.29	134	.897	.118	3.08	.25	184	.721	.081	2.50	.29
35	1.273	.104	2.84	.40	85	.961	.144	4.14	.31	135	.857	.119	3.08	.29	185	.791	.073	2.12	.40
36	1.319	.138	4.00	.33	86	.801	.088	2.61	.31	136	.861	.093	2.49	.29	186	.771	.071	1.93	.33
37	1.225	.123	3.08	.33	87	.785	.089	2.43	.27	137	.850	.098	2.89	.23	187	.780	.119	3.47	.31
38	1.183	.100	3.13	.46	88	.991	.125	3.08	.23	138	.808	.088	2.50	.29	188	.736	.083	2.61	.21
39	1.234	.123	3.13	.31	89	.962	.112	2.60	.33	139	.791	.088	2.67	.23	189	.715	.086	2.31	.29
40	1.253	.123	3.66	.35	90	.850	.093	2.55	.31	140	.823	.098	2.89	.29	190	.819	.106	3.08	.29
41	1.152	.117	3.30	.25	91	.969	.114	2.73	.38	141	.762	.089	2.72	.35	191	.767	.081	2.31	.29
42	1.194	.108	2.72	.29	92	1.022	.245	7.75	.19	142	.785	.103	2.72	.29	192	.801	.077	2.20	.35
43	1.115	.098	2.72	.25	93	1.118	.282	8.60	.25	143	.783	.103	2.72	.35	193	.796	.103	2.89	.25
44	1.115	.105	3.07	.35	94	1.167	.265	7.80	.25	144	.816	.105	2.89	.29	194	.782	.078	2.55	.31
45	1.154	.107	2.89	.40	95	1.451	.363	9.69	.35	145	.879	.111	2.72	.31	195	.718	.082	2.38	.23
46	1.047	.108	3.07	.29	96	1.041	.141	3.33	.29	146	.890	.112	3.27	.19	196	.770	.120	3.47	.31
47	1.090	.110	3.27	.33	97	.980	.119	2.83	.40	147	.808	.102	2.43	.29	197	.760	.078	2.38	.29
48	1.079	.129	3.53	.25	98	1.019	.203	6.26	.35	148	.816	.085	2.78	.31	198	.758	.111	3.27	.31
49	.997	.101	3.07	.35	99	.885	.116	2.94	.23	149	.752	.112	2.89	.35	199	.675	.086	2.32	.35
50	1.097	.110	2.89	.31	100	.947	.182	5.70	.25	150	.762	.089	2.61	.23	200	.717	.083	2.38	.27

TABLE 9. N=Normal Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(CHD)
SR-CM$_5$-PQ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	32.237	1.396	49.71	19.73	51	.548	.041	1.10	.29	101	.361	.017	.62	.19	151	.343	.021	.76	.21
2	8.097	.780	20.49	3.18	52	.514	.043	1.16	.23	102	.343	.016	.58	.15	152	.357	.018	.68	.19
3	5.932	.826	18.47	.23	53	.483	.042	1.18	.21	103	.365	.017	.58	.19	153	.334	.016	.54	.17
4	4.840	.718	15.16	.95	54	.586	.091	2.92	.23	104	.372	.020	.60	.21	154	.328	.015	.46	.21
5	4.956	.745	20.81	.60	55	.530	.050	1.37	.25	105	.382	.027	.97	.25	155	.350	.019	.66	.21
6	4.057	.606	15.35	.62	56	.448	.035	.95	.23	106	.349	.018	.60	.19	156	.324	.013	.48	.21
7	2.869	.475	11.38	.35	57	.521	.051	1.53	.19	107	.336	.017	.62	.19	157	.346	.013	.48	.21
8	3.437	.462	11.07	.89	58	.526	.042	1.04	.21	108	.352	.017	.60	.15	158	.354	.019	.72	.21
9	2.807	.359	8.91	.29	59	.457	.040	1.18	.23	109	.346	.018	.56	.21	159	.332	.014	.50	.15
10	2.529	.279	6.51	.35	60	.500	.039	.97	.19	110	.339	.015	.54	.21	160	.341	.012	.48	.19
11	2.498	.416	11.69	.27	61	.470	.039	1.30	.17	111	.359	.020	.72	.19	161	.325	.014	.58	.17
12	1.888	.229	5.67	.39	62	.586	.133	4.36	.17	112	.347	.014	.50	.19	162	.341	.021	.75	.21
13	1.708	.197	4.59	.23	63	.492	.046	1.43	.27	113	.345	.013	.52	.23	163	.345	.018	.68	.21
14	2.160	.673	20.77	.31	64	.461	.032	.85	.23	114	.351	.015	.58	.19	164	.340	.014	.46	.19
15	1.436	.175	3.52	.29	65	.452	.025	.89	.29	115	.330	.017	.58	.17	165	.352	.015	.50	.19
16	1.289	.171	3.58	.29	66	.467	.034	1.16	.21	116	.383	.034	1.20	.21	166	.332	.018	.62	.21
17	1.277	.158	3.37	.23	67	.423	.031	.85	.15	117	.336	.017	.54	.15	167	.343	.017	.54	.15
18	1.273	.151	3.47	.39	68	.501	.045	1.10	.19	118	.358	.019	.62	.21	168	.328	.012	.43	.17
19	1.133	.120	2.71	.27	69	.419	.024	.72	.21	119	.391	.020	.72	.23	169	.361	.016	.64	.23
20	1.048	.123	2.96	.21	70	.468	.040	1.20	.19	120	.326	.014	.52	.21	170	.334	.013	.52	.19
21	.910	.126	3.18	.25	71	.490	.047	1.37	.23	121	.385	.018	.72	.29	171	.337	.015	.54	.17
22	.875	.092	2.03	.19	72	.468	.047	1.51	.23	122	.334	.014	.60	.21	172	.342	.017	.60	.19
23	.935	.103	2.86	.27	73	.484	.047	1.59	.21	123	.354	.016	.54	.19	173	.312	.012	.52	.19
24	.912	.130	3.18	.23	74	.417	.027	.91	.19	124	.335	.020	.62	.14	174	.377	.024	.89	.23
25	.839	.099	2.40	.19	75	.431	.025	.76	.27	125	.332	.015	.56	.17	175	.341	.017	.56	.19
26	.887	.104	2.25	.31	76	.422	.036	.93	.17	126	.368	.019	.60	.23	176	.322	.012	.50	.23
27	.930	.140	3.91	.21	77	.396	.028	.97	.21	127	.340	.016	.62	.21	177	.333	.013	.50	.21
28	.723	.083	1.99	.25	78	.437	.028	.81	.21	128	.352	.014	.60	.21	178	.345	.016	.56	.21
29	.767	.083	1.72	.27	79	.392	.026	.76	21	129	.328	.016	.52	.19	179	.335	.014	.52	.19
30	.808	.088	2.17	.23	80	.478	.084	2.79	.19	130	.370	.025	.85	.19	180	.351	.024	.91	.17
31	.747	.095	2.13	.21	81	.430	.036	1.08	.23	131	.359	.022	.70	.15	181	.374	.034	1.24	.21
32	.794	.168	4.98	.19	82	.397	.024	.79	.19	132	.337	.015	.52	.21	182	.354	.024	.93	.21
33	.841	.144	4.18	.23	83	.413	.029	.83	.23	133	.358	.017	.54	.21	183	.338	.016	.62	.19
34	.721	.072	1.80	.17	84	.374	.025	.79	.15	134	.350	.016	.60	.21	184	.352	.018	.62	.19
35	.699	.092	2.23	.23	85	.394	.026	.76	.21	135	.351	.016	.52	.17	185	.326	.012	.46	.21
36	.630	.061	1.43	.17	86	.352	.018	.68	.21	136	.351	.019	.64	.17	186	.325	.015	.50	.19
37	.648	.063	1.43	.27	87	.392	.026	.74	.23	137	.346	.016	.60	.19	187	.359	.013	.52	.19
38	.546	.060	1.65	.23	88	.394	.021	.62	.17	138	.335	.016	.52	.21	188	.336	.015	.50	.17
39	.587	.066	1.99	.19	89	.394	.026	.83	.19	139	.335	.014	.48	.21	189	.352	.021	.85	.23
40	.537	.056	1.49	.23	90	.376	.022	.74	.23	140	.343	.014	.56	.21	190	.337	.014	.48	.17
41	.588	.057	1.36	.21	91	.352	.020	.64	.17	141	.342	.015	.52	.19	191	.310	.014	.45	.14
42	.593	.053	1.36	.23	92	.377	.024	.74	.21	142	.364	.015	.56	.23	192	.361	.014	.58	.19
43	.693	.117	3.74	.29	93	.357	.021	.66	.19	143	.336	.012	.46	.19	193	.364	.033	1.12	.19
44	.735	.120	3.62	.23	94	.386	.020	.68	.23	144	.342	.015	.50	.21	194	.349	.020	.77	.17
45	.642	.110	3.35	.15	95	.359	.019	.64	.21	145	.332	.016	.52	.21	195	.330	.016	.52	.17
46	.541	.053	1.53	.19	96	.367	.018	.64	.19	146	.355	.014	.50	.19	196	.319	.013	.54	.21
47	.546	.051	1.28	.21	97	.420	.031	1.12	.23	147	.344	.015	.58	.21	197	.358	.015	.58	.23
48	.487	.046	1.22	.19	98	.430	.056	1.90	.21	148	.412	.065	2.25	.21	198	.319	.013	.46	.19
49	.558	.053	1.39	.21	99	.373	.022	.66	.19	149	.360	.020	.85	.25	199	.330	.011	.46	.21
50	.552	.052	1.57	.25	100	.366	.022	.70	.19	150	.348	.020	.72	.19	200	.321	.016	.64	.21

TABLE 10. CHD=Coronary Heart Disease Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(CHD)
$SR\text{-}CM_5\text{-}QRS$ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	391.817	27.551	679.65	15.76	51	3.326	.320	8.14	.35	101	3.403	.316	8.72	.27	151	3.197	.298	8.72	.35
2	79.525	6.287	149.42	4.38	52	3.735	.413	11.05	.23	102	3.355	.346	8.72	.29	152	3.217	.279	8.72	.45
3	23.816	2.977	72.95	.62	53	3.444	.349	9.30	.46	103	3.228	.324	8.14	.29	153	3.310	.312	8.14	.48
4	14.061	1.618	40.12	.81	54	3.601	.410	11.05	.39	104	3.394	.340	9.88	.31	154	3.434	.394	9.88	.37
5	9.872	1.016	27.86	.39	55	3.225	.283	7.56	.29	105	3.137	.265	6.98	.35	155	3.355	.332	9.88	.25
6	6.594	.650	16.46	.41	56	3.315	.267	6.98	.29	106	3.303	.338	10.47	.35	156	3.468	.326	9.30	.33
7	6.029	.594	11.63	.54	57	3.495	.357	10.47	.41	107	3.251	.288	8.14	.43	157	3.313	.273	8.14	.35
8	5.203	.535	12.38	.97	58	3.441	.319	8.72	.37	108	3.260	.303	9.30	.41	158	3.150	.311	8.72	.43
9	4.778	.446	13.17	.64	59	3.426	.285	8.14	.41	109	3.476	.349	8.72	.37	159	3.411	.286	6.98	.52
10	4.242	.406	9.88	.46	60	3.498	.385	9.30	.23	110	3.465	.308	8.14	.23	160	3.275	.337	8.72	.29
11	4.375	.380	9.10	.46	61	3.254	.288	8.14	.48	111	3.392	.315	9.30	.35	161	3.438	.369	10.47	.45
12	3.733	.326	8.14	.45	62	3.359	.320	8.14	.43	112	3.443	.324	8.14	.27	162	3.280	.288	8.72	.48
13	3.848	.371	9.30	.27	63	3.341	.334	8.72	.50	113	3.022	.294	8.72	.35	163	3.371	.319	8.72	.31
14	3.735	.321	8.14	.37	64	3.180	.272	8.72	.33	114	3.404	.277	8.14	.50	164	3.427	.287	6.98	.37
15	3.665	.313	7.56	.35	65	3.408	.297	9.30	.35	115	3.138	.325	10.47	.41	165	3.386	.342	9.88	.29
16	3.643	.337	9.88	.33	66	3.459	.328	8.14	.35	116	3.413	.367	10.47	.39	166	3.440	.317	7.56	.35
17	3.527	.355	8.72	.35	67	3.307	.328	8.14	.37	117	3.728	.383	9.88	.37	167	3.078	.280	8.14	.46
18	3.748	.334	8.14	.45	68	3.297	.306	8.14	.35	118	3.170	.270	6.98	.33	168	3.368	.322	6.98	.29
19	3.373	.261	8.14	.43	69	3.378	.311	8.14	.58	119	3.312	.329	9.30	.27	169	3.375	.325	9.30	.35
20	3.536	.357	9.88	.37	70	3.334	.388	11.63	.29	120	3.346	.343	8.72	.17	170	3.096	.257	7.56	.46
21	3.470	.355	10.47	.23	71	3.622	.363	9.88	.41	121	3.441	.405	11.05	.31	171	3.426	.287	7.56	.35
22	3.259	.302	8.14	.54	72	3.459	.300	8.14	.46	122	3.403	.283	7.56	.46	172	3.235	.258	6.98	.35
23	3.243	.302	9.30	.45	73	3.110	.268	8.14	.39	123	3.568	.327	8.14	.23	173	3.228	.316	9.30	.29
24	3.340	.276	8.72	.37	74	3.405	.382	10.47	.37	124	3.505	.353	9.88	.48	174	3.459	.333	8.72	.27
25	3.245	.327	8.14	.39	75	3.176	.341	10.47	.35	125	3.515	.340	8.14	.48	175	3.186	.306	8.14	.39
26	3.277	.287	8.72	.29	76	3.305	.317	8.14	.29	126	3.533	.427	9.88	.41	176	3.411	.346	8.72	.52
27	3.373	.301	8.14	.37	77	3.440	.361	9.88	.39	127	3.111	.265	7.56	.27	177	3.392	.281	7.56	.37
28	3.334	.328	7.56	.37	78	3.149	.332	10.47	.35	128	3.331	.378	9.88	.29	178	3.353	.284	8.14	.35
29	3.289	.270	8.14	.23	79	3.408	.279	8.14	.52	129	3.255	.317	8.72	.29	179	3.357	.316	8.14	.54
30	3.371	.278	6.98	.45	80	3.369	.316	9.30	.46	130	3.438	.326	10.47	.31	180	3.052	.245	7.56	.33
31	3.244	.302	7.56	.37	81	3.587	.338	9.30	.23	131	3.450	.324	8.72	.41	181	3.118	.290	8.14	.31
32	3.223	.264	8.14	.43	82	3.433	.363	9.30	.27	132	3.422	.342	9.30	.43	182	3.123	.327	9.88	.35
33	3.374	.337	8.14	.43	83	3.359	.336	8.72	.29	133	3.403	.357	9.30	.45	183	3.210	.259	8.14	.43
34	3.118	.254	6.98	.27	84	3.399	.387	10.47	.29	134	3.412	.337	9.30	.33	184	3.308	.341	9.88	.60
35	3.243	.267	6.98	.33	85	3.395	.376	9.88	.41	135	3.182	.292	9.30	.35	185	3.092	.263	8.72	.41
36	3.205	.293	7.56	.17	86	3.553	.309	8.14	.47	136	3.640	.426	10.47	.23	186	3.392	.300	7.56	.48
37	3.069	.288	8.72	.29	87	3.305	.324	8.72	.58	137	3.215	.297	9.30	.29	187	3.426	.342	8.14	.46
38	3.211	.283	8.72	.47	88	3.211	.302	9.30	.48	138	3.445	.395	10.47	.35	188	3.169	.257	8.14	.23
39	3.474	.363	8.14	.54	89	3.211	.293	6.98	.50	139	3.230	.287	7.56	.27	189	3.375	.333	9.30	.50
40	3.261	.328	9.30	.43	90	3.352	.359	9.88	.45	140	3.465	.340	9.30	.35	190	3.233	.321	8.14	.41
41	3.296	.298	8.14	.35	91	3.174	.252	6.98	.31	141	3.439	.341	8.72	.62	191	3.081	.237	8.14	.43
42	3.363	.304	8.14	.41	92	3.244	.297	8.72	.37	142	3.208	.268	8.14	.35	192	3.159	.298	8.72	.62
43	3.458	.343	8.72	.45	93	3.254	.358	9.88	.29	143	3.504	.363	9.30	.35	193	3.295	.293	8.72	.46
44	3.474	.359	9.30	.17	94	3.633	.418	11.05	.39	144	3.445	.337	9.30	.35	194	3.243	.276	7.56	.46
45	3.259	.251	6.98	.37	95	3.460	.362	8.14	.45	145	3.392	.340	9.88	.19	195	3.293	.363	9.30	.17
46	3.320	.365	9.88	.29	96	3.646	.406	9.88	.47	146	3.323	.339	9.30	.37	196	3.358	.317	9.30	.31
47	3.305	.282	8.72	.48	97	3.186	.297	8.14	.43	147	3.134	.251	6.98	.46	197	3.037	.290	7.56	.46
48	3.218	.275	8.14	.37	98	3.640	.375	10.47	.23	148	3.166	.310	8.14	.35	198	3.303	.335	8.14	.41
49	3.442	.330	8.14	.35	99	3.360	.367	10.47	.48	149	3.124	.275	8.72	.39	199	3.165	.257	8.14	.58
50	3.299	.277	8.72	.52	100	3.306	.300	8.14	.31	150	3.364	.300	9.88	.29	200	3.105	.280	8.14	.41

TABLE 11. CHD=Coronary Heart Disease Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(CHD)
$SR\text{-}CM_5\text{-}ST_{70}$ (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	27.876	4.642	100.81	1.10	51	.537	.067	1.63	.22	101	.368	.026	.81	.22	151	.330	.033	1.10	.17
2	15.628	2.255	46.40	1.38	52	.474	.052	1.34	.17	102	.382	.034	1.05	.19	152	.362	.028	.81	.19
3	9.708	1.464	31.10	1.23	53	.546	.059	1.39	.26	103	.382	.036	1.05	.22	153	.359	.025	.87	.18
4	7.485	1.105	23.42	.57	54	.554	.053	1.34	.25	104	.387	.031	.99	.22	154	.363	.023	.70	.19
5	5.625	.880	19.07	.23	55	.527	.055	1.51	.21	105	.372	.036	1.16	.20	155	.360	.029	.87	.15
6	4.260	.703	14.13	.27	56	.506	.056	1.34	.23	106	.380	.033	1.10	.19	156	.318	.020	.76	.21
7	3.944	.571	12.33	.31	57	.470	.043	1.16	.23	107	.388	.032	.93	.20	157	.381	.038	1.05	.16
8	3.250	.520	12.26	.28	58	.494	.055	1.34	.20	108	.359	.027	.87	.21	158	.363	.037	1.22	.22
9	2.834	.430	9.65	.26	59	.479	.049	1.34	.24	109	.377	.033	.93	.21	159	.339	.027	.87	.17
10	2.519	.394	8.26	.22	60	.465	.049	1.16	.19	110	.353	.035	1.16	.19	160	.354	.026	.81	.19
11	2.126	.346	7.62	.31	61	.499	.056	1.40	.23	111	.398	.039	1.16	.17	161	.353	.026	.81	.22
12	2.687	.364	8.49	.45	62	.526	.051	1.12	.21	112	.375	.031	.87	.19	162	.342	.028	.87	.17
13	2.325	.296	5.93	.33	63	.447	.047	1.22	.19	113	.374	.031	.99	.21	163	.336	.025	.87	.18
14	1.928	.274	6.16	.23	64	.466	.044	1.28	.21	114	.394	.039	1.10	.17	164	.345	.034	1.10	.19
15	1.710	.250	5.17	.24	65	.464	.037	.99	.24	115	.352	.034	1.16	.19	165	.352	.033	.93	.12
16	1.571	.225	5.23	.26	66	.493	.049	1.39	.22	116	.389	.038	.93	.19	166	.353	.026	.87	.22
17	1.381	.197	4.01	.22	67	.428	.035	1.05	.23	117	.333	.033	1.16	.17	167	.358	.030	.93	.22
18	1.361	.204	4.53	.23	68	.546	.046	1.05	.21	118	.354	.031	.93	.19	168	.361	.029	.87	.22
19	1.299	.182	4.59	.22	69	.957	.156	4.01	.27	119	.350	.031	.87	.17	169	.335	.025	.93	.19
20	1.415	.187	4.65	.22	70	.554	.059	1.36	.19	120	.342	.021	.64	.21	170	.341	.021	.70	.21
21	1.679	.244	5.47	.30	71	.414	.034	.93	.22	121	.382	.033	1.05	.22	171	.334	.034	1.10	.17
22	1.211	.178	3.78	.25	72	.452	.044	1.16	.22	122	.349	.024	.81	.19	172	.348	.025	.76	.18
23	1.062	.150	3.72	.26	73	.455	.041	1.16	.23	123	.391	.033	1.05	.24	173	.367	.032	1.05	.20
24	1.081	.143	2.79	.26	74	.435	.041	1.10	.22	124	.343	.028	.93	.17	174	.356	.026	.87	.22
25	1.092	.124	2.85	.24	75	.465	.048	1.22	.22	125	.365	.029	.76	.15	175	.353	.027	.81	.19
26	1.088	.131	2.73	.22	76	.464	.040	1.16	.25	126	.359	.032	.93	.21	176	.331	.027	.93	.14
27	1.224	.137	2.91	.27	77	.452	.047	1.39	.23	127	.337	.023	.70	.17	177	.353	.032	1.10	.18
28	.900	.128	3.02	.24	78	.447	.040	1.16	.19	128	.400	.033	.99	.22	178	.343	.028	1.05	.22
29	1.174	.165	3.95	.18	79	.407	.042	1.16	.22	129	.376	.026	.81	.20	179	.351	.028	.76	.17
30	.878	.123	2.56	.20	80	.408	.038	1.10	.19	130	.381	.030	.99	.20	180	.364	.028	.93	.18
31	.844	.127	2.97	.22	81	.396	.033	.93	.19	131	.348	.030	.93	.15	181	.340	.027	.81	.19
32	.824	.111	2.56	.26	82	.426	.047	1.45	.25	132	.345	.024	.70	.16	182	.364	.030	.87	.22
33	.735	.102	2.15	.23	83	.449	.044	1.22	.21	133	.359	.029	1.05	.21	183	.332	.024	.87	.17
34	.795	.108	2.27	.23	84	.395	.040	1.10	.20	134	.352	.032	.87	.19	184	.327	.022	.70	.17
35	.742	.097	2.27	.24	85	.426	.042	1.28	.24	135	.355	.027	.93	.21	185	.346	.027	.99	.21
36	.731	.099	2.27	.20	86	.375	.036	1.05	.21	136	.385	.035	1.05	.16	186	.339	.029	.99	.17
37	.903	.125	2.62	.19	87	.441	.039	1.05	.22	137	.355	.032	1.10	.17	187	.347	.028	.87	.19
38	.701	.092	2.27	.22	88	.389	.034	.93	.17	138	.373	.027	.93	.19	188	.350	.028	.93	.20
39	.597	.079	1.69	.23	89	.407	.045	1.10	.12	139	.349	.024	.64	.21	189	.340	.025	.76	.19
40	.642	.081	1.92	.21	90	.406	.038	1.05	.22	140	.353	.028	.99	.17	190	.376	.030	.99	.24
41	.604	.075	1.69	.22	91	.388	.038	1.10	.17	141	.367	.031	.87	.15	191	.347	.033	1.10	.14
42	.604	.064	1.63	.21	92	.412	.041	1.10	.20	142	.345	.022	.81	.23	192	.380	.032	.93	.20
43	.599	.075	1.57	.22	93	.384	.042	1.34	.20	143	.357	.028	.87	.19	193	.352	.034	1.16	.17
44	.588	.070	1.57	.21	94	.388	.033	.93	.17	144	.361	.038	1.05	.16	194	.341	.027	.93	.19
45	.684	.089	1.74	.24	95	.404	.035	1.10	.22	145	.346	.027	.81	.19	195	.367	.037	1.05	.20
46	.637	.068	1.57	.24	96	.365	.030	.93	.19	146	.354	.029	.81	.21	196	.332	.020	.76	.19
47	.571	.068	1.74	.19	97	.382	.032	.93	.19	147	.329	.027	.93	.12	197	.348	.031	.93	.21
48	.574	.058	1.34	.21	98	.385	.038	.93	.19	148	.349	.023	.64	.17	198	.359	.031	.93	.19
49	.533	.058	1.57	.22	99	.380	.031	.93	.21	149	.359	.032	.99	.20	199	.343	.027	.93	.20
50	.496	.052	1.22	.21	100	.407	.042	1.16	.21	150	.352	.026	.87	.17	200	.343	.030	.99	.17

TABLE 12. CHD=Coronary Heart Disease Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

(CHD)
SR-CM5-STW (abs.)

H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.	H	Av.	S.E.	Max.	Min.
f 1	48.237	4.568	106.10	8.52	51	.734	.091	2.46	.27	101	.498	.052	1.63	.21	151	.447	.031	.99	.20
2	22.870	2.161	49.66	5.09	52	.690	.080	1.86	.27	102	.512	.041	1.28	.27	152	.440	.032	.99	.19
3	10.500	1.378	33.59	1.53	53	.709	.080	1.94	.21	103	.485	.040	1.10	.21	153	.485	.036	.99	.23
4	6.837	1.186	27.05	.56	54	.882	.117	3.00	.22	104	.551	.045	1.22	.12	154	.418	.026	.76	.19
5	5.615	.978	22.44	1.05	55	1.094	.213	5.23	.24	105	.518	.038	.93	.25	155	.466	.036	1.05	.21
6	5.035	.795	19.46	.72	56	.728	.073	1.69	.23	106	.503	.038	1.10	.27	156	.430	.036	.99	.14
7	4.278	.654	15.97	.58	57	.698	.079	2.09	.24	107	.500	.042	1.10	.19	157	.455	.038	1.05	.17
8	3.616	.585	13.63	.58	58	.643	.066	1.55	.23	108	.527	.042	1.10	.27	158	.482	.038	1.10	.23
9	3.525	.506	11.13	.60	59	.734	.127	4.05	.25	109	.511	.041	1.16	.27	159	.458	.033	.93	.17
10	3.050	.487	11.29	.34	60	.822	.219	6.97	.26	110	.520	.043	1.16	.21	160	.456	.038	1.16	.23
11	2.842	.446	10.18	.45	61	.670	.074	1.76	.23	111	.552	.046	1.22	.21	161	.447	.032	.93	.23
12	2.674	.404	9.16	.57	62	.671	.076	1.84	.23	112	.494	.033	.87	.17	162	.436	.029	.87	.21
13	2.446	.384	9.12	.37	63	.656	.059	1.28	.22	113	.515	.035	1.01	.24	163	.464	.034	.99	.21
14	2.187	.352	8.54	.41	64	.656	.065	1.57	.21	114	.514	.037	.99	.14	164	.484	.065	2.09	.17
15	2.017	.329	7.82	.33	65	.669	.069	1.55	.29	115	.502	.042	1.22	.21	165	.503	.044	1.18	.23
16	2.093	.319	7.72	.41	66	.624	.052	1.18	.23	116	.521	.039	1.05	.28	166	.547	.074	2.27	.17
17	1.905	.298	7.28	.33	67	.624	.063	1.51	.23	117	.484	.035	.93	.23	167	.458	.036	.93	.23
18	2.451	.381	9.13	.32	68	.551	.050	1.34	.23	118	.529	.041	1.18	.24	168	.455	.034	1.05	.23
19	2.013	.365	10.49	.28	69	.593	.062	1.57	.23	119	.518	.041	1.20	.21	169	.414	.035	1.05	.17
20	2.392	.690	18.20	.28	70	.602	.052	1.32	.21	120	.478	.036	.99	.23	170	.440	.036	1.10	.23
21	1.538	.270	5.71	.31	71	.598	.054	1.40	.23	121	.487	.039	1.05	.23	171	.411	.028	.81	.21
22	1.550	.229	4.80	.26	72	.562	.053	1.28	.25	122	.476	.031	.93	.22	172	.431	.032	.93	.23
23	1.264	.208	4.59	.25	73	.565	.048	1.30	.17	123	.479	.038	1.10	.22	173	.449	.032	.81	.19
24	1.220	.189	3.89	.23	74	.538	.045	1.06	.23	124	.486	.035	1.08	.21	174	.488	.041	1.16	.22
25	1.183	.180	4.12	.27	75	.599	.054	1.45	.23	125	.485	.038	1.10	.17	175	.482	.043	1.28	.24
26	1.115	.172	3.76	.19	76	.594	.052	1.22	.24	126	.456	.032	.93	.25	176	.461	.039	1.28	.21
27	1.128	.159	3.37	.27	77	.574	.048	1.28	.23	127	.526	.040	1.22	.26	177	.435	.036	1.05	.12
28	1.024	.158	3.35	.27	78	.564	.055	1.28	.20	128	.494	.040	1.16	.19	178	.450	.040	1.16	.14
29	1.009	.146	3.06	.23	79	.503	.040	.99	.19	129	.645	.133	4.36	.21	179	.419	.031	.99	.23
30	1.059	.142	3.00	.23	80	.574	.048	1.16	.15	130	.513	.042	1.28	.23	180	.435	.036	1.05	.19
31	1.009	.136	3.14	.26	81	.551	.046	1.06	.23	131	.484	.031	.81	.26	181	.476	.036	.95	.20
32	.973	.140	2.92	.25	82	.542	.046	1.34	.19	132	.497	.036	1.05	.21	182	.442	.037	.99	.23
33	.886	.122	2.87	.23	83	.528	.043	1.10	.22	133	.471	.032	.87	.23	183	.439	.030	.93	.23
34	.899	.124	2.79	.19	84	.546	.047	1.10	.24	134	.437	.035	.87	.23	184	.446	.035	1.10	.17
35	.923	.119	2.71	.20	85	.530	.040	1.12	.27	135	.483	.033	.87	.21	185	.409	.029	.81	.14
36	.854	.108	2.75	.24	86	.489	.038	1.05	.17	136	.479	.029	.87	.17	186	.467	.038	1.10	.23
37	.834	.111	2.44	.20	87	.560	.042	1.10	.23	137	.494	.044	1.16	.22	187	.445	.036	.99	.23
38	.839	.098	2.23	.25	88	.567	.056	1.34	.21	138	.450	.035	1.16	.24	188	.430	.035	1.05	.22
39	.825	.102	2.44	.23	89	.541	.049	1.34	.21	139	.477	.046	1.40	.23	189	.451	.029	.81	.23
40	.836	.108	2.30	.21	90	.541	.043	1.05	.23	140	.458	.043	1.16	.23	190	.422	.031	.99	.17
41	.806	.107	2.34	.23	91	.613	.081	2.56	.19	141	.491	.041	1.16	.19	191	.442	.030	.81	.23
42	.809	.104	2.23	.17	92	.676	.174	5.61	.23	142	.455	.027	.81	.23	192	.468	.036	1.05	.19
43	.817	.089	1.80	.23	93	.485	.040	1.22	.17	143	.451	.034	.87	.12	193	.430	.031	.99	.23
44	.713	.081	1.92	.21	94	.542	.039	1.12	.23	144	.458	.033	.99	.21	194	.447	.035	1.10	.19
45	.773	.099	2.32	.23	95	.497	.050	1.34	.23	145	.466	.042	1.22	.19	195	.405	.022	.76	.22
46	.748	.092	2.50	.27	96	.538	.043	1.03	.17	146	.435	.034	1.10	.23	196	.411	.029	.99	.22
47	.753	.086	2.03	.23	97	.502	.043	1.16	.19	147	.460	.036	1.03	.21	197	.457	.031	.81	.25
48	.695	.080	1.74	.22	98	.510	.044	1.28	.21	148	.441	.033	1.05	.23	198	.428	.031	.93	.21
49	.740	.083	1.92	.21	99	.622	.068	2.17	.23	149	.421	.026	.76	.21	199	.442	.034	.93	.26
50	.657	.075	2.05	.27	100	.581	.089	2.90	.21	150	.480	.039	1.05	.17	200	.413	.030	.99	.23

TABLE 13. CHD=Coronary Heart Disease Group. H=Harmonic. Av.=Mean Amplitude. S.E.=Standard Error. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. abs.=Absolute Amplitude Values.

TABLE 14. N=Normal Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(N)

SR-CM$_5$-PQ (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	26.411	5.961	51	.399	.150	101	1.181	.079	151	.308	.109
2	9.076	2.329	52	1.681	.098	102	.292	.079	152	.295	.079
3	5.549	1.008	53	.866	.109	103	.728	.098	153	.317	.089
4	5.936	1.044	54	5.010	.147	104	.306	.094	154	.295	.081
5	4.767	1.295	55	1.753	.147	105	.292	.078	155	.304	.071
6	4.564	.705	56	4.117	.147	106	.399	.098	156	.563	.072
7	4.234	.393	57	.815	.169	107	.669	.065	157	.292	.089
8	8.725	.684	58	.776	.169	108	.292	.104	158	.283	.085
9	4.992	.350	59	2.071	.159	109	.294	.064	159	.327	.100
10	4.749	.139	60	2.437	.122	110	.298	.079	160	.292	.085
11	14.196	.348	61	.898	.137	111	.283	.059	161	.283	.089
12	11.281	.278	62	.716	.143	112	.462	.089	162	.323	.085
13	2.016	.233	63	.892	.139	113	.283	.098	163	.294	.079
14	1.931	.260	64	.340	.104	114	.901	.094	164	.308	.104
15	1.690	.149	65	.347	.099	115	.315	.094	165	.283	.103
16	1.422	.267	66	.669	.128	116	.270	.084	166	.326	.099
17	1.218	.174	67	.325	.094	117	.304	.079	167	.295	.100
18	1.398	.196	68	.362	.128	118	.261	.113	168	.298	.099
19	1.263	.245	69	.315	.119	119	.273	.089	169	.305	.072
20	1.217	.220	70	.316	.094	120	.292	.104	170	.308	.084
21	1.082	.208	71	.563	.124	121	.267	.111	171	.292	.074
22	1.040	.191	72	1.033	.104	122	.729	.074	172	.292	.095
23	1.096	.190	73	1.737	.109	123	.833	.091	173	.283	.088
24	8.206	.260	74	.646	.126	124	.298	.065	174	.298	.103
25	1.974	.174	75	1.912	.135	125	.280	.091	175	.286	.088
26	11.139	.243	76	1.983	.143	126	.308	.059	176	.394	.099
27	1.963	.185	77	1.050	.129	127	.280	.089	177	.283	.098
28	4.757	.138	78	1.331	.134	128	.286	.095	178	.292	.098
29	1.774	.216	79	.372	.129	129	.305	.069	179	.270	.099
30	1.318	.175	80	.494	.122	130	.283	.076	180	.292	.099
31	2.329	.208	81	.323	.118	131	.406	.085	181	.298	.103
32	7.731	.214	82	.479	.113	132	.295	.084	182	.350	.089
33	5.477	.174	83	1.760	.143	133	.283	.094	183	.292	.085
34	6.765	.202	84	.939	.124	134	.292	.079	184	.273	.109
35	2.600	.142	85	.359	.098	135	.601	.088	185	.304	.094
36	5.893	.185	86	.280	.085	136	.308	.105	186	.304	.089
37	1.093	.168	87	.622	.094	137	.295	.078	187	.320	.081
38	.870	.214	88	.375	.078	138	.295	.109	188	.295	.089
39	1.264	.157	89	.270	.109	139	.314	.069	189	.295	.083
40	3.976	.193	90	.316	.098	140	.283	.098	190	.327	.099
41	.549	.168	91	.314	.098	141	.295	.095	191	.308	.099
42	.528	.153	92	.295	.065	142	.286	.100	192	.298	.103
43	4.764	.163	93	.873	.084	143	.333	.098	193	.298	.089
44	1.058	.173	94	.836	.074	144	.283	.098	194	.295	.084
45	.486	.118	95	.895	.104	145	.278	.084	195	.323	.076
46	.443	.143	96	.472	.098	146	.427	.089	196	.308	.084
47	2.226	.149	97	.750	.099	147	.329	.074	197	.310	.079
48	.521	.104	98	.809	.126	148	.311	.098	198	.335	.098
49	.574	.175	99	.283	.078	149	.283	.085	199	.280	.085
50	.454	.121	100	1.140	.089	150	.292	.072	200	.280	.081

TABLE 15. N=Normal Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(N)

SR-CM$_5$-QRS (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	48.559	25.680	51	.445	.164	101	.441	.151	151	.419	.151
2	14.720	1.808	52	.376	.088	102	.392	.152	152	.445	.115
3	3.896	.390	53	.412	.133	103	.365	.114	153	.385	.183
4	2.352	.166	54	.409	.114	104	.385	.140	154	.362	.140
5	1.766	.152	55	.421	.114	105	.359	.179	155	.445	.150
6	1.998	.248	56	.380	.174	106	.385	.115	156	.450	.165
7	1.949	.235	57	.431	.138	107	.422	.130	157	.359	.133
8	1.748	.076	58	.470	.105	108	.359	.165	158	.390	.170
9	1.405	.144	59	.421	.133	109	.445	.155	159	.390	.157
10	.994	.199	60	.441	.150	110	.392	.133	160	.456	.127
11	.800	.175	61	.449	.166	111	.431	.157	161	.355	.166
12	1.227	.133	62	.412	.145	112	.431	.114	162	.387	.180
13	.826	.172	63	.449	.153	113	.412	.191	163	.382	.183
14	.487	.070	64	.386	.114	114	.398	.176	164	.380	.157
15	.719	.165	65	.415	.118	115	.359	.140	165	.496	.140
16	.598	.206	66	.419	.180	116	.456	.147	166	.343	.147
17	.476	.114	67	.414	.172	117	.417	.115	167	.390	.152
18	.564	.133	68	.459	.127	118	.421	.130	168	.355	.120
19	.447	.138	69	.420	.140	119	.390	.172	169	.418	.133
20	.553	.193	70	.392	.166	120	.387	.172	170	.459	.189
21	.581	.066	71	.355	.130	121	.456	.151	171	.417	.140
22	.570	.166	72	.356	.170	122	.417	.125	172	.419	.086
23	.379	.152	73	.390	.152	123	.420	.157	173	.412	.152
24	.412	.165	74	.355	.121	124	.438	.172	174	.385	.172
25	.435	.105	75	.414	.165	125	.412	.145	175	.360	.120
26	.456	.152	76	.362	.176	126	.419	.115	176	.387	.152
27	.414	.140	77	.379	.164	127	.421	.139	177	.390	.095
28	.437	.164	78	.381	.088	128	.459	.114	178	.418	.172
29	.441	.138	79	.385	.139	129	.359	.095	179	.365	.133
30	.389	.172	80	.365	.152	130	.449	.151	180	.441	.151
31	.396	.146	81	.382	.151	131	.375	.114	181	.417	.142
32	.497	.118	82	.356	.165	132	.456	.194	182	.421	.090
33	.380	.152	83	.344	.076	133	.415	.115	183	.412	.133
34	.379	.170	84	.396	.140	134	.387	.138	184	.442	.114
35	.417	.114	85	.387	.195	135	.396	.147	185	.355	.144
36	.470	.076	86	.361	.133	136	.412	.120	186	.414	.118
37	.385	.147	87	.362	.172	137	.392	.127	187	.408	.179
38	.444	.139	88	.457	.179	138	.398	.180	188	.379	.161
39	.390	.172	89	.390	.157	139	.422	.114	189	.441	.175
40	.362	.138	90	.442	.114	140	.356	.166	190	.380	.114
41	.419	.115	91	.449	.130	141	.412	.175	191	.412	.152
42	.385	.105	92	.382	.144	142	.392	.147	192	.386	.144
43	.362	.133	93	.420	.076	143	.353	.140	193	.380	.076
44	.387	.127	94	.441	.157	144	.456	.172	194	.396	.114
45	.408	.133	95	.355	.188	145	.495	.095	195	.398	.095
46	.395	.114	96	.445	.172	146	.379	.076	196	.375	.114
47	.375	.105	97	.418	.174	147	.379	.151	197	.338	.104
48	.362	.181	98	.420	.151	148	.445	.105	198	.390	.086
49	.375	.165	99	.385	.086	149	.456	.114	199	.343	.059
50	.414	.178	100	.456	.152	150	.390	.172	200	.362	.145

TABLE 16. N=Normal Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(N)

SR-CM$_5$-ST$_{70}$ (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	27.376	5.134	51	.385	.103	101	.250	.049	151	.316	.097
2	12.550	5.562	52	.356	.087	102	.261	.087	152	.331	.065
3	8.442	3.392	53	.385	.092	103	.267	.078	153	.442	.080
4	10.891	2.748	54	.951	.117	104	.265	.077	154	.427	.070
5	5.810	1.547	55	.498	.081	105	.271	.076	155	.472	.083
6	3.878	1.613	56	.361	.070	106	.349	.060	156	.331	.070
7	3.093	.998	57	.366	.070	107	.498	.092	157	.349	.060
8	2.697	.536	58	.391	.087	108	.487	.057	158	.490	.092
9	2.525	.348	59	.385	.076	109	.353	.076	159	.342	.076
10	2.017	.151	60	.324	.113	110	.312	.087	160	.353	.091
11	1.993	.216	61	.431	.065	111	.254	.076	161	.513	.076
12	5.866	.209	62	.568	.129	112	.341	.086	162	.409	.083
13	5.694	.787	63	.321	.065	113	.261	.060	163	.302	.076
14	2.420	.579	64	.345	.060	114	.510	.076	164	.383	.043
15	1.652	.465	65	.302	.092	115	.372	.049	165	.673	.057
16	1.415	.453	66	.338	.070	116	.427	.076	166	.342	.060
17	1.316	.350	67	.334	.103	117	.372	.091	167	.308	.076
18	1.203	.259	68	.359	.060	118	.282	.052	168	.584	.076
19	1.171	.138	69	.333	.076	119	.255	.081	169	.309	.069
20	1.461	.135	70	.333	.065	120	.320	.054	170	.483	.085
21	3.741	.318	71	.434	.076	121	.450	.069	171	.461	.070
22	1.305	.372	72	.338	.039	122	.294	.081	172	.261	.060
23	.856	.081	73	.278	.076	123	.770	.065	173	.301	.091
24	.769	.060	74	.327	.087	124	.394	.087	174	.454	.076
25	.837	.125	75	.269	.076	125	.309	.052	175	.297	.068
26	.772	.065	76	.327	.081	126	.290	.076	176	.391	.076
27	.829	.103	77	.334	.043	127	.435	.091	177	.327	.052
28	.725	.149	78	.289	.097	128	.316	.060	178	.357	.076
29	2.649	.219	79	.403	.091	129	.372	.092	179	.346	.081
30	.691	.200	80	.398	.078	130	.349	.054	180	.454	.092
31	.706	.119	81	.341	.087	131	.294	.070	181	.346	.076
32	.633	.113	82	.309	.076	132	.271	.087	182	.387	.092
33	.608	.173	83	.284	.087	133	.275	.081	183	.342	.070
34	.549	.108	84	.275	.060	134	.278	.080	184	.265	.087
35	.560	.146	85	.282	.087	135	.361	.060	185	.383	.065
36	.851	.108	86	.305	.054	136	.323	.081	186	.427	.077
37	1.114	.201	87	.455	.092	137	.989	.060	187	.331	.049
38	.868	.174	88	.480	.065	138	.267	.065	188	.327	.057
39	.511	.130	89	.361	.092	139	.287	.081	189	.297	.078
40	.844	.103	90	.282	.070	140	.409	.065	190	.353	.076
41	.488	.092	91	.282	.049	141	.576	.081	191	.331	.076
42	.473	.076	92	.287	.092	142	.335	.060	192	.282	.065
43	.484	.076	93	.323	.065	143	.387	.087	193	.361	.057
44	.421	.076	94	.255	.070	144	.261	.070	194	.268	.072
45	.464	.081	95	.282	.091	145	.352	.076	195	.276	.057
46	.858	.139	96	.293	.065	146	.282	.078	196	.324	.065
47	.445	.130	97	.346	.070	147	.282	.065	197	.265	.074
48	.487	.087	98	.265	.065	148	.320	.078	198	.282	.059
49	.394	.130	99	.298	.054	149	.427	.060	199	.649	.059
50	.353	.108	100	.261	.087	150	.265	.069	200	.379	.062

TABLE 17. N=Normal Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(N)

SR-CM5-STW (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	39.132	11.418	51	4.153	.092	101	.369	.075	151	.322	.092
2	17.265	5.786	52	.534	.110	102	.340	.096	152	.392	.062
3	8.464	1.490	53	2.005	.140	103	1.093	.098	153	.534	.082
4	5.189	.507	54	1.207	.094	104	.346	.106	154	.288	.085
5	3.343	.290	55	2.742	.098	105	.613	.086	155	.305	.087
6	3.130	.405	56	2.678	.110	106	.288	.061	156	.288	.079
7	2.979	.553	57	4.630	.118	107	.270	.075	157	.346	.074
8	2.719	.576	58	1.193	.092	108	.323	.096	158	.299	.069
9	2.508	.369	59	1.863	.075	109	.323	.096	159	.346	.083
10	2.222	.438	60	3.780	.110	110	.305	.087	160	.305	.096
11	2.073	.432	61	.722	.119	111	.322	.082	161	.544	.076
12	2.011	.438	62	2.516	.129	112	.323	.083	162	.305	.076
13	1.663	.329	63	.951	.100	113	.322	.094	163	.340	.072
14	1.527	.322	64	.323	.118	114	.305	.092	164	.323	.074
15	1.428	.105	65	.288	.072	115	.305	.061	165	.261	.082
16	1.241	.262	66	.287	.110	116	.356	.057	166	.415	.075
17	5.346	.200	67	.288	.101	117	.288	.082	167	.415	.090
18	4.776	.171	68	.346	.112	118	.305	.082	168	.323	.082
19	8.705	.184	69	.340	.094	119	.452	.085	169	.341	.085
20	2.415	.200	70	.279	.114	120	.341	.085	170	.295	.077
21	1.932	.096	71	.322	.100	121	.346	.096	171	.546	.062
22	.855	.105	72	.288	.089	122	.288	.066	172	.346	.074
23	.871	.131	73	.313	.096	123	.340	.071	173	.305	.062
24	.775	.158	74	.305	.084	124	.426	.106	174	.346	.074
25	.751	.184	75	.304	.092	125	1.054	.083	175	.407	.076
26	.914	.147	76	.346	.096	126	.340	.086	176	.305	.075
27	.631	.197	77	.346	.087	127	.346	.076	177	.356	.087
28	.628	.158	78	.323	.092	128	.380	.059	178	.323	.082
29	.557	.110	79	.322	.086	129	.773	.070	179	.538	.064
30	.743	.129	80	.346	.082	130	.902	.057	180	.305	.093
31	.501	.187	81	.350	.106	131	.313	.082	181	.305	.062
32	.600	.119	82	.305	.083	132	1.167	.082	182	.346	.075
33	.600	.086	83	.329	.075	133	.778	.074	183	.323	.083
34	.429	.085	84	.720	.083	134	.378	.071	184	.299	.082
35	.426	.131	85	1.439	.102	135	.481	.066	185	.356	.074
36	.425	.131	86	.432	.074	136	.385	.092	186	.308	.096
37	.420	.101	87	.276	.086	137	.359	.086	187	.415	.072
38	.457	.120	88	.566	.083	138	.299	.076	188	.305	.082
39	.422	.101	89	.765	.096	139	.288	.071	189	.323	.082
40	.438	.129	90	.374	.087	140	.346	.082	190	.369	.075
41	.385	.119	91	.510	.114	141	.340	.075	191	.288	.086
42	.424	.085	92	1.251	.089	142	.322	.077	192	.305	.074
43	.400	.092	93	1.389	.059	143	.356	.086	193	.346	.076
44	.372	.079	94	1.459	.072	144	.346	.069	194	.288	.086
45	.457	.123	95	1.812	.094	145	.499	.082	195	.288	.079
46	.372	.101	96	.623	.077	146	.392	.082	196	.415	.086
47	.392	.110	97	.608	.098	147	.598	.085	197	.391	.086
48	.392	.114	98	.641	.076	148	.285	.108	198	.392	.083
49	.373	.102	99	.669	.047	149	.346	.079	199	.323	.067
50	.781	.118	100	1.299	.072	150	.288	.075	200	.253	.000

TABLE 20. CHD=Coronary Heart Disease Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(CHD)
SR-CM$_5$-ST$_{70}$ (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	29.298	1.448	51	.441	.185	101	.400	.096	151	.397	.075
2	11.922	2.266	52	.451	.126	102	.461	.100	152	.405	.092
3	8.059	1.289	53	.530	.177	103	.397	.126	153	.442	.071
4	9.657	.614	54	.945	.143	104	.426	.095	154	.442	.099
5	4.843	.377	55	.623	.158	105	.396	.134	155	.451	.113
6	3.533	.277	56	.452	.163	106	.433	.107	156	.441	.048
7	4.008	.404	57	.474	.119	107	.414	.130	157	.433	.111
8	2.767	.442	58	.442	.195	108	.423	.100	158	.374	.100
9	2.100	.328	59	.431	.170	109	.509	.092	159	.434	.095
10	2.092	.330	60	.419	.101	110	.452	.095	160	.404	.100
11	1.821	.252	61	.487	.190	111	.569	.100	161	.469	.106
12	5.490	.312	62	.750	.151	112	.409	.111	162	.423	.088
13	2.856	.451	63	.423	.149	113	.390	.088	163	.459	.090
14	1.411	.370	64	.517	.126	114	.377	.099	164	.421	.071
15	1.386	.276	65	.701	.163	115	.457	.083	165	.397	.050
16	1.420	.256	66	.629	.168	116	.521	.117	166	.405	.095
17	1.107	.191	67	.415	.126	117	.433	.075	167	.418	.088
18	1.325	.210	68	.754	.179	118	.421	.074	168	.451	.106
19	1.052	.267	69	2.780	.177	119	.397	.117	169	.418	.088
20	1.751	.330	70	.740	.143	120	.418	.088	170	.423	.075
21	3.553	.277	71	.469	.150	121	.434	.100	171	.496	.059
22	1.020	.269	72	.421	.146	122	.459	.083	172	.434	.111
23	.823	.284	73	.528	.137	123	.441	.099	173	.419	.113
24	.885	.264	74	.488	.101	124	.433	.101	174	.393	.100
25	1.828	.234	75	.537	.113	125	.423	.092	175	.433	.099
26	1.273	.204	76	.487	.154	126	.418	.088	176	.483	.088
27	1.882	.265	77	.487	.163	127	.418	.081	177	.434	.105
28	.720	.219	78	.469	.119	128	.461	.113	178	.433	.071
29	3.166	.199	79	.446	.150	129	.451	.130	179	.442	.105
30	.635	.201	80	.495	.148	130	.433	.119	180	.414	.131
31	.736	.101	81	.397	.143	131	.414	.113	181	.434	.075
32	.807	.199	82	.471	.113	132	.459	.089	182	.404	.113
33	.611	.202	83	.500	.122	133	.452	.075	183	.414	.071
34	.680	.191	84	.459	.133	134	.403	.111	184	.442	.075
35	.776	.191	85	.556	.137	135	.442	.111	185	.423	.095
36	.606	.177	86	.423	.113	136	.442	.100	186	.478	.113
37	2.095	.167	87	.489	.127	137	.423	.095	187	.433	.088
38	.883	.151	88	.424	.142	138	.468	.101	188	.405	.083
39	.444	.200	89	.403	.050	139	.419	.114	189	.503	.075
40	.675	.151	90	.443	.107	140	.411	.063	190	.442	.127
41	.459	.210	91	.393	.108	141	.433	.108	191	.442	.099
42	.572	.209	92	.466	.134	142	.455	.071	192	.431	.105
43	.498	.184	93	.397	.099	143	.496	.100	193	.433	.095
44	.539	.185	94	.435	.142	144	.414	.075	194	.408	.075
45	1.137	.177	95	.443	.131	145	.418	.059	195	.423	.133
46	.857	.236	96	.434	.095	146	.496	.106	196	.383	.075
47	.621	.151	97	.459	.120	147	.444	.075	197	.465	.099
48	.533	.156	98	.405	.114	148	.424	.095	198	.451	.107
49	.586	.190	99	.565	.143	149	.459	.100	199	.408	.083
50	.423	.161	100	.435	.126	150	.414	.107	200	.414	.075

TABLE 21. CHD=Coronary Heart Disease Group. H=Harmonic. Max.=Maximum Amplitude Value. Min.=Minimum Amplitude Value. f=Fundamental of 10 Hz for harmonic #1. %=Per Cent Amplitude Values.

(CHD)

SR-CM5-STW (%)

H	Max.	Min.	H	Max.	Min.	H	Max.	Min.	H	Max.	Min.
f 1	35.157	8.816	51	.853	.126	101	.527	.105	151	.330	.092
2	13.695	3.128	52	.500	.136	102	.391	.115	152	.339	.082
3	7.051	1.010	53	.517	.113	103	.441	.109	153	.367	.107
4	5.088	.427	54	.987	.149	104	.377	.056	154	.367	.088
5	4.577	.359	55	3.329	.181	105	.381	.082	155	.341	.092
6	4.590	.587	56	.620	.143	106	.380	.113	156	.358	.080
7	3.772	.583	57	1.002	.178	107	.386	.084	157	.352	.084
8	2.941	.207	58	.420	.113	108	.442	.102	158	.352	.109
9	2.873	.482	59	.711	.108	109	.657	.108	159	.345	.113
10	2.634	.377	60	2.430	.129	110	.605	.115	160	.348	.084
11	2.274	.267	61	1.215	.113	111	.484	.117	161	.380	.100
12	2.099	.317	62	.500	.151	112	.442	.084	162	.337	.113
13	2.051	.255	63	.617	.143	113	.337	.075	163	.337	.095
14	1.883	.222	64	.632	.136	114	.560	.112	164	.755	.096
15	1.805	.170	65	.711	.147	115	.376	.131	165	.822	.095
16	1.618	.282	66	.671	.113	116	.358	.113	166	1.577	.095
17	2.357	.149	67	.626	.121	117	.521	.126	167	.472	.095
18	3.293	.159	68	.337	.126	118	.722	.110	168	.330	.085
19	1.844	.209	69	.466	.095	119	.391	.119	169	.372	.063
20	4.488	.227	70	.400	.142	120	.442	.092	170	.328	.084
21	1.406	.168	71	.414	.126	121	.337	.068	171	.358	.084
22	1.394	.132	72	.400	.138	122	.360	.126	172	.315	.102
23	1.072	.169	73	.334	.063	123	.401	.103	173	.337	.088
24	1.032	.126	74	.369	.113	124	.541	.120	174	.345	.099
25	.968	.176	75	.381	.091	125	.360	.084	175	.379	.100
26	.878	.113	76	.448	.105	126	.360	.090	176	.379	.078
27	1.001	.113	77	.422	.148	127	.362	.133	177	.323	.056
28	.890	.138	78	.417	.084	128	.526	.102	178	.360	.089
29	.812	.162	79	.365	.113	129	3.032	.131	179	.360	.072
30	.836	.076	80	.405	.106	130	.362	.105	180	.364	.095
31	.788	.169	81	.372	.113	131	.358	.103	181	.376	.080
32	.740	.151	82	.372	.119	132	.360	.073	182	.356	.078
33	.722	.084	83	.345	.128	133	.430	.082	183	.365	.101
34	.728	.135	84	.373	.105	134	.345	.087	184	.358	.078
35	1.109	.126	85	.338	.126	135	.403	.110	185	.323	.084
36	.571	.190	86	.541	.084	136	.360	.095	186	.365	.088
37	.638	.113	87	.358	.147	137	.382	.093	187	.376	.075
38	.739	.113	88	.585	.094	138	.358	.092	188	.352	.093
39	.608	.167	89	.397	.129	139	.414	.080	189	.360	.082
40	.626	.136	90	.360	.135	140	.398	.080	190	.352	.076
41	.637	.136	91	.923	.107	141	.352	.095	191	.358	.079
42	.589	.084	92	3.908	.126	142	.358	.117	192	.330	.095
43	.763	.175	93	.445	.106	143	.358	.056	193	.352	.084
44	.457	.126	94	.481	.143	144	.323	.100	194	.315	.082
45	.631	.135	95	.397	.084	145	.365	.100	195	.352	.092
46	.453	.095	96	.365	.084	146	.352	.099	196	.352	.084
47	.516	.113	97	.330	.128	147	.352	.073	197	.345	.113
48	.555	.091	98	.345	.133	148	.376	.095	198	.345	.065
49	.476	.147	99	.417	.132	149	.315	.082	199	.315	.068
50	.397	.149	100	1.012	.126	150	.430	.084	200	.376	.068

AUTHORS	Year	No. Of Subjects CAD	No. Of Subjects Normal	Exercise ECG: Degree Of Exercise	Exercise ECG: ST Segment Depression Criterion(mm)	Se	Sp	IM
LIKOFF ET AL [18]	1966	24	50	GXT-Bike	≥1.0	0.58	0.68	0.26
HULTGREN ET AL[26]	1967	32	23	GXT (90% HR) Treadmill	≥1.0	0.60	1.00	0.60
DEMANY ET AL[41]	1967	42	33	DM	≥1.0	0.43	.070	0.13
MASON ET AL [40]	1967	49	35	GXT (90% HR) Bike or Escalator	≥1.0	0.78	0.89	0.67
KASSEBAUM ET AL [25]	1968	34	33	GXT (85% HR) Bike	≥1.0	0.62	0.97	0.59
DWYER ET AL [7]	1969	11	9	GXT-Bike	≥0.5	0.91	0.70	0.61
ROITMAN ET AL [20]	1970	30	16	GXT (90% HR) Treadmill	≥1.0	0.80	0.88	0.68
SALTUPS ET AL [16]	1971	43	19	DM	≥0.5	0.47	1.00	0.47
FITZGIBBON ET AL [22]	1971	113	37	DM	≥0.5	0.39	0.68	0.07
LEWIS ET AL [43]	1971	26	12	DM	≥1.0	0.62	0.92	0.54
	1971	26	12	GXT (90% HR) Treadmill	≥1.0	0.81	1.00	0.81
COHN ET AL [42]	1971	77	33	DM (HR>110/min.)	≥0.5	0.86	0.73	0.59
McCONAHAY ET AL [17]	1971	65	35	DM	≥0.5	0.63	0.83	0.46
	1971	65	35	DM	≥1.0	0.35	1.00	0.35
ASCOOP ET AL [15]	1971	44	52	GXT (HR>170/min.) Bike	≥1.0	0.59	0.94	0.53
	1971	39	52	DM	≥1.0	0.33	0.93	0.26
COHN ET AL [27]	1972	143	101	DM	≥1.0	0.71	0.84	0.55
COHN ET AL [21]	1972	62	38	DM (HR>110/min.) or GXT (85% HR) Bike	≥0.5	0.60	0.79	0.39
MARTIN ET AL [6]	1972	63	37	GXT (90% HR) Treadmill	≥1.0	0.62	0.90	0.52
McHENRY ET AL [19]	1972	86	80	GXT (90% HR) Treadmill	≥1.0	0.81	0.95	0.76

TABLE 22. Clinical Studies of Exercise Electrocardiography Versus Coronary Artery Disease (Separation criterion for CAD subjects was ≥50% luminal atherosclerotic obstruction of one or more major coronary arteries). CAD=Coronary Artery Disease. mm=millimeters. Se=Sensitivity of separation. Sp=Specificity of separation. IM=Index of Merit Rating. GXT=Graded Exercise Test. DM=Double Master Test. (90% HR)=90% of age-rated maximum heart rate.

SEPARATION CRITERIA		ECG SEGMENTS				SEGMENT COMBINATIONS										
		PQ	QRS	ST_{70}	ST_W	PQ+ QRS	PQ+ ST_{70}	PQ+ ST_W	QRS+ ST_{70}	QRS+ ST_W	ST_{70}+ ST_W	PQ+ ST_{70}+ ST_W	PQ+ ST_{70}+ QRS	PQ+ ST_W+ QRS	ST_{70}+ ST_W+ QRS	ALL
I(abs)	Se	0.93	0.90	0.83	0.90	0.97	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
	Sp	0.93	0.70	0.63	0.93	0.97	0.97	1.00	0.80	1.00	0.97	1.00	0.97	1.00	1.00	1.00
	IM	(0.86)	(0.60)	(0.46)	(0.83)	(0.94)	(0.97)	(1.00)	(0.80)	(1.00)	(0.94)	(1.00)	(0.97)	(1.00)	(1.00)	(1.00)
II(%)	Se	1.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sp	0.93	0.87	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	IM	(0.93)	(0.80)	(1.00)	(1.00)	(0.97)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
I+II	Se	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sp	1.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	IM	(1.00)	(0.90)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)

TABLE 23. Compilation of Se, Sp and IM ratings for all possible combinations of the four ECG segments with separation Criteria I and II. Se=Sensitivity of separation. Sp=Specificity of separation. IM=Index of Merit Rating. I(abs.)=Separation Criterion I based on absolute amplitude values. II(%)=Separation Criterion II based on % amplitude values.

normal subjects was a positive angiocardiogram of $\geq 50\%$ luminal atherosclerotic obstruction of one or more major coronary arteries. All degrees of positive ST segment depression listed in Table 22 include a minimum duration of 0.08 seconds. The IM values ranged from 0.07 to 0.81.

Table 23 presents the Se, Sp and IM ratings for all possible combinations of the four ECG segments with separation Criteria I and II as utilized in our present study. In each cell of this Table, the upper number represents the Se, the middle number the Sp and the lower number (in parentheses) the IM ratings respectively for that particular cell. A total of 45 IM ratings are compiled in Table 23. Of these ratings, the ST_{70}/I combination provided the lowest value of 0.46. The average IM rating of the seventeen clinical studies presented in Table 22 was 0.49. The highest IM rating of the seventeen clinical studies in Table 22 was 0.81. In Table 23, only 4 of the IM values are less than 0.81; 9 of them have values from 0.83 to 0.97; and the remaining 32 have a common value of 1.00.

IV. Discussion

The IM ratings in Table 23 are based on A/F data from a maximum of one whole electrocardiac cycle per person recorded from one ECG lead at supine rest. Since these ratings compare quite well with those of contemporary exercise ECG tests, as shown in Table 22, the former appear to reflect a potential capability for improved screening detection of CHD. However promising, these initial results must be considered as tentative because of the retrospective design of this study. The separation Criteria (I and II) utilized in this study were chosen arbitrarily and tested for their potential capabilities of screening discernment of two different but known population segments. As is the case for results from any initial retrospective study, such results are considered to be scientifically validated only if corroborated by a prospective double-blind test. In the context of this study, this would simply consist of applying our screening procedure to a suitable number of male test subjects whos enormal or CHD status is unknown to us. Our data-based selection of the normal or CHD status of each subject would be compared subsequently to that determined by a concensus board of cardiologists. For the purpose of calculating the appropriate IM for this double-blind validation procedure, the cardiological diagnosis (normal or CHD) will be considered as the definitive standard against which the correct-incorrect selection by the A/F method will be judged.

Because of the initial, retrospective nature of the present study, it would appear quite unreasonable to expect that the IM rating obtained from the double-blind procedure would closely approximate the major trend of the 45 IM values in Table 23. However, it is quite reasonable to expect that, in order for the A/F method to be considered as a useful improvement for screening detection of CHD, its double-blind IM rating should again compare favorably with those of accepted clinical methods as exemplified in Table 22. Preliminary plans for a double-blind validation test have been formulated and are tentatively projected for activation in the near future.

For an initial, retrospective type study, the strong showing of the IM values in Table 23 exceeded conservative expectations by some degree. This initial strength of discernment based on a supine rest, single-lead ECG recording was surprising when considered in the light of a coincidental observation. A resting, standard 12-lead clinical ECG was recorded on all normal and CHD subjects as an integral part of the overall screening procedure. Using accepted medical standards as the basis of judgment,[60] the 12-lead clinical ECGs of 17 of the 30 CHD subjects were interpreted by CAMI staff physicians as falling "within normal limits." This would seem to provide evidence in addition to our preliminary observations concerning the possibility of masking and/or absence of useful A/F information within the integral ECG signal.[45]

The initial degree of discernment shown in Table 23 is additionally remarkable in view of the frequency resolution of only 10 Hz used in this study. Taking into account the approximate shift in real-time frequencies which resulted from the segment time-normalization process, a maximum of about 40 harmonics for the ST_w and a minimum of about 5 for the QRS segments respectively represent the real-time frequency band of about DC to 100 Hz. A previous study has estimated that approximately 95% of the real-time A/F power spectrum lies below 100 Hz.[46] The discernment reflected in Table 23 is

based therefore on a very small portion of the total potential information available in real-time A/F analyses using finer frequency resolution. Evidence exists in the A/F data of this present study as well as previous preliminary probes[45] for the possible presence of distinct normal and CHD "frequency signatures" which may be vulnerable to on-line band pass techniques.

On contingency of successful validation of the present results by a double-blind test, long range parallel efforts have been tentatively planned for pursuit of the "frequency signature" concept and for the conversion of hardware facets of the prototype A/F method to validated software computer equivalents. Software analyses using modern computer techniques would be more universally applicable and amenable to mass data processing should the use of this method ever be called upon for the screening detection of CHD in the airman population. The useful degree, if any, to which the A/F and/or on-line band pass methods succeed should be reflected in a commensurate enhancement of aviation safety and cardiovascular health maintenance.

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