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Assessment of the Correlations Between Anthropometric Variables and Radiographic Cardiac Measurements in Different Body Somatotypes

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Abstract **Original Research**

Background: Medical imaging plays a central role in diagnosis; treatment planning and monitoring disease progression and understanding the intricate relationship between body somatotypes and cardiac dimensions in healthy populations offers valuable insights for developing personalized health assessments and targeted preventive strategies.

Aim: This study was designed to assess the correlations between anthropometric variables and radiographic cardiac measurements in different body somatotypes.

Materials and methods: This prospective cross-sectional study was conducted in some selected healthcare facilities that have X-rays and Echocardiography machines in Nnewi and Awka, Anambra State, Nigeria. Standard protocols for chest X-rays and echocardiography were adopted for the examinations and data such as demographic variables (age, gender), body mass index (BMI), cardiac dimensions and somatotype of the participants were recorded for analysis.

Results: BMI showed a significant positive correlation with left ventricular posterior wall thickness in systole (LVPWDs), $r = .16$, $p = .02$, indicating that higher BMI was associated with increased posterior wall thickness during systole. BMI also demonstrated a significant negative correlation with left ventricular mass index (LVMI), $r = -.33$, $p < .001$. In addition, a small but significant positive correlation was observed between BMI and cardiothoracic ratio (CTR), $r = .15$, $p = .03$. For interventricular septal thickness in diastole (IVSd) and systole (IVSs), the ICC was 0.001, with 95% confidence intervals (CIs) spanning negative to positive values (−0.134 to 0.136), suggesting no reliable agreement beyond chance. Similar findings were observed for left ventricular internal diameter in diastole (LVIDd; ICC = 0.001, 95% CI [−0.134, 0.136]) and systole (LVIDs; ICC = 0.000, 95% CI [−0.135, 0.136]), as well as left ventricular posterior wall thickness in diastole (LVPWDd; ICC = 0.004, 95% CI [−0.131, 0.139]) and systole (LVPWDs; ICC = 0.003, 95% CI [−0.132, 0.138]).

Conclusion: A small but significant positive correlation was observed between BMI and cardiothoracic ratio (CTR). All other associations with BMI were not statistically significant. Significant positive correlations were found with LVPWDs and left ventricular mass. BSA was also significantly and negatively correlated with LVMI. No significant relationships were observed between BSA and the remaining cardiac measurements.

Keywords: Body mass index, cardiac ratio, echocardiography.

INTRODUCTION

Accurate assessment of cardiac dimensions is crucial for diagnosing and managing cardiovascular diseases [1]. Chest radiography and echocardiography are widely used modalities for evaluating heart size and morphology [2]. The role of medical imaging in supporting diagnosis, treatment planning, monitoring of diseases as well as understanding the influence of body somatotypes on cardiac sizes especially in healthy populace cannot be overemphasized. A critical factor in this endeavor is the establishment of population-specific reference values for cardiac dimensions. Global normative data, predominately derived from Caucasian populations, often do not fully apply to diverse ethnic groups, including Nigerians [3-6]. Always relying on these generalized normative data can lead to inaccuracies in clinical interpretation and potentially compromise patient care. Therefore this research is focused to generate normative data and informed robust public health strategies tailored to the unique demographic characteristics of Anambra State.

MATERIALS AND METHODS

This prospective cross-sectional study design was carried out among 210 subjects who include; 70 Ectomorphs, 70 Mesomorphs and 70 Endomorphs who met the inclusion criteria, which include but not limited to; adults 18 years and above were included to avoid confounding effects of pediatric cardiac physiology, sex: both males and females were included to account for sex-based differences in cardiac dimensions, anthropometric profiles: BMI was obtained and participants grouped based on dominant body somatotypes using Heath-Carter somatotyping method, cardiac imaging data availability: participants' chest radiographs were obtained first and those with normal chest radiographs were recruited for ECHO after their dominant somatotypes were obtained in line with purposive sampling method [7], medical history: individuals without known structural heart disease and normal blood pressure were included after their blood pressures were measured and determined with digital blood pressure machine, the participants' echocardiograms were performed within a reasonable time frame, to ensure accurate comparisons, all echocardiographic measurements were indexed with BSA[8].

The data collection was conducted in Waves Medical Diagnostics and Research Center, Nnewi, and Evidence Based Medical Diagnostic Centre, Awka, Anambra State. Both radio-diagnostic centres provided adequate patients throughput and spread for ECHO and CXR with adequate numbers of Echocardiographers, Radiographers, Radiologists and state of art equipment in medical imaging. The equipment include: Calibrated Vivid T8 GE with probe frequency of 1.7 MHZ to 3.2 MHZ and Philip HD xe with 2.5 MHz phased array transducer both with integrated electrocardiography (ECG) recording electrodes. Calibrated Pica X-ray machine model, floor mounted, and Chest stand with floating table. The chest radiographs were post-processed with digitalizer, CR- 12 X, model and printed with Drystar 5302, HP work station and NX software[8].

Approval with reference number: MH/PRS/1244/VOL.224 was obtained from the Department of Planning, Research and Statistics, Ministry of Health, Awka, Anambra state, Nigeria. The purpose of the study was adequately explained to the participants and their consents were duly sought using written informed consent form. No identifying information about the participants were used or collected at any point during the study, and that all result remained anonymous. The participation was entirely voluntary and the participants were at liberty to withdraw from the study without being harm. The obtained information were held in strict confident.

The data were collected from chest X-ray examinations, echocardiography, and body mass index computations of height and weight of the participants. The process for the data collection was done following similar protocols described by Ogoke *et al [8]*.

The chest radiographs were obtained in a posterior-anterior projection using standard protocol of focus-to film distance (FFD) of 180 cm, full arrested inspiration, 35cm x 35cm or 35cm x 43cm cassette. The participants were positioned facing the cassette with the chin extended and the trunk adjusted so that the median sagittal plane is perpendicular to the cassette Feet parted to maintain stability. The dorsal aspects of the hands were placed behind and below the hips and the elbows were brought forward. Shoulders were relaxed and rotated forwards until they were in contact with the cassette [9]. Female subjects with large pendulous breasts were asked to pull the breasts upward and laterally (outwards), and the cassette was adjusted to keep them in position [10].

The horizontal central beam was directed at right-angles to the cassette at the level of the seventh thoracic vertebrae (i.e. spinous process of T7), which is coincident with the lung midpoint [8,9,11].

A pilot study was done to test the process for calculating the cardiothoracic ratio (CTR) and assesses inter-rater reliability between the radiologist, radiographer and the researchers. The heart size was evaluated using the maximum thoracic diameter which is the widest part of the chest cavity measured by drawing vertical line at the widest part of the cardiac silhouette and measuring the distance from the furthest point on the right border of the heart to the furthest point on the left border.

A cardiothoracic ratio (CTR) of 0.5 is generally considered the upper of the normal range for adults on a postero-anterior (PA) chest radiograph. However, Ominde *et al*[4], Ali *et al* [12] and Oladipo *et al* [13] in their studies suggested CTR of 45.62, 45.9 and 46.3 for the general populations of Nigerians and that a ratio above these CTR cut offs suggest cardiomegaly. The images were evaluated for rotation and degree of inspiration[14,15]. If the chest radiograph was taken in the supine position (AP), it could artificially enlarge the heart size therefore, PA view was adopted for all the participants because it minimizes magnification of the heart.

The heights of the participants were measured in conformity with WHO STEPS in the measurement of height [16]. The researcher instructed each of the participants at a time to remove his or her footwear, shoes, slippers, sandals and stockings, head-gear (hat, cap, hairband, comb and ribbons. Each of the participants at a time was asked to stand on the board facing the researcher. The back of the participant's head, shoulders, buttock and heels were ensured that they are in contact with the meter ruler. The feet were ensured that they are facing anteriorly and the legs separated apart (10cm) to ensure participant's stability.

The participant was asked to look ahead and not up. The researcher made sure that the eyes were on the same level. The arms were moved gently down onto the head of the participant and the participant was asked to breathe in and stand tall.

The height was read in centimeters from the eye level of the researcher at the exact point and the participant was asked to step away from the measuring board. For participants who are taller than the researcher, supporting step was used. The height was recorded in centimeters in the Excel software sheet.

The weights of the participants were measured with commercially available scale, (Hana model). The scale was placed on a firm, flat surface in conformity with WHO STEPS and adjusted to zero reading[16]. The participants were asked to remove their footwear, shoes, slippers, sandals and stockings. A participant was asked to step onto the scale at a time with one foot on each side of the scale, stand still, face forward, place arms on the side and wait until asked to step off. The weight was read from the weighing scale in kilograms and recorded in Excel data sheet.

Echocardiography is the most commonly used non-invasive imaging tool for the evaluation of the heart structures and functions [18]. Various measurements can be performed to determine the size, diameter, length and area of the left ventricle and these measurements are made at two different points in the cardiac cycle, namely end-diastole and end-systole. The cardiac diameter is largest at the end of diastole because the ventricles contain the greatest volume of blood [18]. The availability of Doppler facility is an added advantage because it helps in the determination of the direction of blood flow within the chambers and vessels of the heart in real time.

The participants were scanned using 2D, M-mode and Doppler measurements. Standard trans-thoracic echocardiographic studies with machine integrated ECG recording were performed using Vivid T8 machine with sector probe with frequency range from 1.7 – 3.2MHz. The choice of the probe was made to get adequate visualization of the heart structures through the intercoastal spaces. Each examination was performed with the participant observing quiet breathing while lying in the left lateral decubitus position as described by [19-21]. Ultrasound gel was applied to ensure proper coupling of the transducer and good transmission of the ultrasound beam into the participant's thoracic cavity. From the parasternal window, the parasternal long axis views were obtained by placing the transducer in the left third or fourth intercostal space adjacent to the sternum with the knob pointing towards the right shoulder. In a true long axis view which is perpendicular to the center of the true long axis of the left ventricle (LV), M-mode image was obtained between the papillary muscle and at the tip of the mitral valve [21]. Measurements were made from the leading edge of the septal endocardium to the leading edge of posterior wall endocardium [21,22]. Measurements for the interventricular septum at end diastole (IVSd), LV internal dimensions at diastole (LVIDd) and LV posterior wall thickness at end diastole (LVPWDd). Also measurements were obtained at end of systole for each of the parameters mentioned above. The measured values were divided by BSA to obtain indexed measurements as described by [6, 17, 23] and recorded in excel data sheet.

The study measured and obtained the following dimensions:

Interventricular Septum (IVSd), Interventricular Septum (IVSs), Left Ventricular Internal Diameter in diastole (LVIDd), Left Ventricular Internal Diameter in systole (LVIDs), Left Posterior Ventricular Diameter in diastole (LVPWDd), Left Posterior Ventricular Diameter in systole (LVPWDs), Right Ventricular Diameter (RVDd), Left Ventricular Mass (LVmass), Left Ventricular Mass Index (LVMI), Right Wall Thickness (RWT).

The Heath-Carter method for appraising human body somatotype was used instead of BMI because BMI does not distinguished between lean and fat mass, which is particularly relevant for mesomorphic body fat and it expresses an individual's body physique as a three-digit rating, namely: endomorph, mesomorph and ectomorph [24]. All anthropometric measurements were collected in accordance with WHO and International Standards for Anthropometry Assessment and Kinanthropometry, ISAK and each anthropometric parameter was measured three times by the researcher and the mean of the values were used for the analysis [25]. The somatotype rating was derived from a standard set of 10 essential parameters of anthropometric measurements namely; height, weight, four skinfolds, two bone breadths and two limb girths [24]. Height was measured as described earlier and recorded in centimeters. Weight was measured as described earlier and recorded in kilograms. Triceps skinfold, the vertical fold on the back of the arm was measured at the midpoint between the acromion and olecranon process and recorded in millimeters. Subscapular skinfold, a diagonal fold at the inferior angle of the scapula was measured and recorded in millimeters. Supraspinale skinfold, a diagonal fold located at a 45-degree angle above the iliac spine was measured and recorded in millimeters. Medial calf skinfold, a vertical fold on the medial side of the calf muscle at the level of its maximal girth was measured and recorded in millimeters. Humerus breadth, width between the medial and lateral epicondyles of the humerus was measured and recorded in centimeters. Femur breath, width between the medial and lateral epicondyles of the femur, was measured and recorded in centimeters. Flexed biceps girth, the circumference of the upper arm, was measured at the maximum point and recorded in centimeters. Maximal calf girth, the circumference of the calf at the level of its maximum girth was measured and recorded in centimeters.

There are many software Apps which can calculate body somatotype; however, the three somatotype components were calculated by the researcher using a series of mathematical formulas, which provided a precise, objective rating. While the original method utilized rating forms and tables, modern practice which the researcher adopted relies on explicit formulas for greater efficiency and accuracy.

Endomorph: $E = -0.7182 + 0.1451 \times \sum SF - 0.00068 \times \sum SF^2 + 0.0000014 \times \sum SF^3$

Where $\sum SF$ = (triceps + subscapula + supraspinale skinfolds) x (170.18/height in cm).

This sum is corrected for the subject's height by multiplying it by the ratio of a standard height (170.18 cm) to the subject's measured height. While traditional rating forms used tables to convert the height-corrected sum into a score, the modern approach uses a polynomial regression formula to derive the endomorph rating.

Mesomorph: M = 0.858(Humerus) +0.601 (Femur) + 0.188 (corrected bisceps) + 0.161 (corrected calf) – 0.131 (height) + 4.5.

Ectomorph

Height / cube root of weight = Height: Weight (HWR).

If HWR >_ 40.75: Ectomorph = 0.732 x HWR – 28.58

If HWR < 40.75 and > 38.25: Ectomorph = 0.463 x HWR - 17.63

If HWR <_ 38. 25: Ectomorph = 0.1

Individual somatotypes can be plotted as somatoplots on a 2-D somatochartbusing X, Y coordinates and component ratings.

X = Ectomorph – Endomorph

Y – 2(Mesomorph) – Endomorph + Ectomorph).

Somatotype Scales

½ - $2_{1/2}$ = Low

3- 5 = Moderate

$5_{1/2}$ - 7 = High

$7_{1/2}$ and above = extremely high[24].

Microsoft Excel data sheet was used to record the data which include the subject age, gender, weight, height, BMI, Carter and Heath 10 somatotype parameters, systolic blood pressure, diastolic blood pressure, CTR and ECHO measurements. Data were analyzed using SPSS version 20 (IBM corps, 2015). Summary of the data for cardiac size measurements included: mean, standard deviation, median and range. Participants were categorized based on dominant body somatotypes obtained using Heath and Carter [24] method of somatotyping. Inferential statistics such as Pearson correlation analyses were conducted to examine the relationships between cardiac measurements and anthropometric variables (BMI), body surface area [BSA], height and weight in a sample of 210 participants and Intraclass correlation coefficients (ICCs) were calculated to assess the level of agreement between cardiothoracic ratio and echocardiographically obtained body somatotype measures. The level of statistical significance was set at $p < 0.05$.

RESULTS:

In table 1, Pearson correlation analyses were conducted to examine the relationships between cardiac measurements and anthropometric variables (BMI), body surface area [BSA], height and weight in a sample of 210 participants.

For body mass index (BMI), most cardiac measurements were not significantly correlated. However, BMI showed a significant positive correlation with left ventricular posterior wall thickness in systole (LVPWDs), $r = .16$, $p = .02$, indicating that higher BMI was associated with increased posterior wall thickness during systole. BMI also demonstrated a significant negative correlation with left ventricular mass index (LVMI), $r = -.33$, $p < .001$. In addition, a small but significant positive correlation was observed between BMI and cardiothoracic ratio (CTR), $r = .15$, $p = .03$. All other associations with BMI were not statistically significant (Table 1).

Regarding body surface area (BSA), significant positive correlations were found with LVPWDs ($r = .18$, $p < .001$) and left ventricular mass ($r = .18$, $p = .01$). BSA was also significantly and negatively correlated with LVMI ($r = -.31$, $p < .001$). No significant relationships were observed between BSA and the remaining cardiac measurements (Table 1). Analysis of height revealed a significant positive correlation with LVPWDs ($r = .18$, $p < .001$) and LVMI ($r = .12$, $p = .03$). Height was also positively associated with CTR ($r = .22$, $p < .001$). Other cardiac parameters did not demonstrate statistically significant associations with height. For weight, no significant correlations were observed with most cardiac measurements. However, weight showed a significant negative correlation with LVMI ($r = -.32$, $p < .001$) and a significant positive correlation with CTR ($r = .14$, $p = .04$). All other correlations with weight were not statistically significant (Table 1).

Intraclass correlation coefficients (ICCs) were calculated to assess the level of agreement between cardiothoracic ratio and echocardiographically obtained body somatotype measures (see Table 2). Across all echocardiographic variables, ICC values were extremely low, ranging from 0.000 to 0.029, indicating poor agreement between the two measurement approaches according to conventional benchmarks (ICC < .50). For interventricular septal thickness in diastole (IVSd) and systole (IVSs), the ICC was 0.001, with 95% confidence intervals (CIs) spanning negative to positive values (−0.134 to 0.136), suggesting no reliable agreement beyond chance. Similar findings were observed for left ventricular internal diameter in diastole (LVIDd; ICC = 0.001, 95% CI [−0.134, 0.136]) and systole (LVIDs; ICC = 0.000, 95% CI [−0.135, 0.136]), as well as left ventricular posterior wall thickness in diastole (LVPWDd; ICC = 0.004, 95% CI [−0.131, 0.139]) and systole (LVPWDs; ICC = 0.003, 95% CI [−0.132, 0.138]) (Table 2). Agreement for right ventricular diameter in diastole (RVDd), left ventricular mass and left ventricular mass index were also negligible (both ICCs = 0.000, 95% CI [−0.135, 0.135]). Relative wall thickness (RWT) demonstrated a slightly higher ICC (0.029), though this value still reflects poor agreement, and its confidence interval (−0.107 to 0.163) included zero. All F- tests associated with the ICC estimates were non-significant (ps = .34–.49), further indicating that the observed agreement did not differ significantly from what would be expected by chance. Collectively, these findings suggest that the cardiothoracic ratio does not demonstrate meaningful agreement with echocardiographic measures of cardiac structure or derived somatotype indices in this sample (Table 2).

DISCUSSION

With regards to the correlations between cardiac measurements and anthropometric variables (BMI), body surface area [BSA], height, and weight in a sample of 210 participants, body mass index (BMI), most cardiac measurements were not significantly correlated. However, BMI showed a significant positive correlation with left ventricular posterior wall thickness in systole (LVPWDs), indicating that higher BMI was associated with increased posterior wall thickness during systole. BMI also demonstrated a significant negative correlation with left ventricular mass index (LVMI). In addition, a small but significant positive correlation was observed between BMI and cardiothoracic ratio (CTR). All other associations with BMI were not statistically significant.

Regarding body surface area (BSA), significant positive correlations were found with LVPWDs and left ventricular mass. BSA was also significantly and negatively correlated with LVMI. No significant relationships were observed between

BSA and the remaining cardiac measurements. Analysis of height revealed a significant positive correlation with LVPWDs and LVMI. Height was also positively associated with CTR. Other cardiac parameters did not demonstrate statistically significant associations with height. For weight, no significant correlations were observed with most cardiac measurements. However, weight showed a significant negative correlation with LVMI and a significant positive correlation with CTR. All other correlations with weight were not statistically significant. These findings are consistent with similar studies conducted by Bigdelu *et al*[3], Nabeshima *et al* [26] and Moukarzel *et al* [27], which also reported a correlations between cardiac measurements and anthropometric variables (BMI), body surface area [BSA], height, and weight. In Bigdelu *et al*[3] study, which was carried out to assess the impact of obesity on echocardiographic parameters in individuals free of CVD using anthropometric measurements and aimed to understand the effects of obesity on cardiac structure and function in the absence of other confounding comorbid conditions. It is a prospective, cohort-matched, observational study with a sample size of 196 participants. The results show that in obese (endomorph) adults without cardiovascular conditions, there is significant variation in cardiac structure, diastolic and systolic functions. The anthropometric features and BMI is the most frequently correlated with abnormalities however BSA is the strongest parameter to predict abnormality. BMI >_ 25kg/m^2 was associated with enlargement in left atrial dimensions, increase in LVEDD, LVESD, LVM, Ejection mitral inflow velocity, Systolic mitral velocity and left ventricular diastolic pressures. The findings support that BMI and BSA are better than other anthropometric measurements in predicting remodeling and change of cardiac function. The main limitation of the study is the small sample size from a single institution. In Nabeshima et al (2023) study of the application of allometric methods for indexation of left ventricular end-diastolic volume to normal echocardiographic data and assessing gender and racial differences, was aimed to compare several allometric methods on gender and racial differences in left ventricular end-diastolic volume (LVEDV) measured on 3D-echocardiography using the sample size of 1,051 apparently healthy subjects from world alliance societies of echocardiography data. Normal values study were indexed to isometric BSA, BSA$^{1.5}$, BSA$^{1.8}$ to isometric height, height$^{2.3}$, height$^{2.9}$ and estimated lean body mass. The study established that the difference in LVEDV among Whites, Blacks, and Asians were smallest when BSA$^{1.5}$ or BSA$^{1.8}$ was used for indexation, followed by estimated lean body mass. The study suggests that differences in body composition and hemodynamics are more important determination of heart size than race. Moukarzel *et al*[27] in their study on echocardiographic measurements of the left heart chambers size in a large cohort of subjects: comparison of body surface area and height indexation to account for effects of obesity. It is a retrospective study with sample size of 14,007 participants, aimed to find the reference thresholds to account for the effects of obesity among a large cohort of subjects and to evaluate indexing to height as an alternative to BSA. The result of the study established that correlation between indexed and absolute values were higher for height than BSA, height; 0.80 – 0.98 and BSA; 0.44 – 0.92 and the overcorrection observed with increasing obesity class after BSA indexing was avoided after height indexing. The researchers found that for large cohorts, height-based indexation especially the allometric model with power of 1.72 provides more accurate scaling of the left heart chamber size compared to BSA indexation in obese individuals.

CONCLUSION

A small but significant positive correlation was observed between BMI and cardiothoracic ratio (CTR). All other associations with BMI were not statistically significant. Significant positive correlations were found with LVPWDs and left ventricular mass. BSA was also significantly and negatively correlated with LVMI. No significant relationships were observed between BSA and the remaining cardiac measurements. Analysis of height revealed a significant positive correlation with LVPWDs and LVM.

Conflict of interest: There is none declared among the authors.

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Table 1: Correlation table showing influence of anthropometric variables on cardiac measurements

Cardiac measurements	Anthropometric variables	N	R	p-value	Remark
IVSd (mm)			0.12	0.07	N/S
IVSs (mm)			0.09	0.21	N/S
LVIDd (mm)			0.06	0.42	N/S
LVIDs (mm)			0.02	0.75	N/S
LVPWDd (mm)			0.05	0.43	N/S
LVPWDs (mm)	BMI	210	0.16	0.02	Sig
RVDd (mm)			0.08	0.23	N/S
LVMass (g)			0.11	0.11	N/S
LVMI(g/m^2)			-0.33	<0.001	Sig
RWT			0.03	0.68	N/S
CTR			0.15	0.03	Sig

IVSd (mm)			0.11	0.10	N/S
IVSs (mm)			0.06	0.41	N/S
LVIDd (mm)			0.11	0.09	N/S
LVIDs (mm)			0.04	0.57	N/S
LVPWDd (mm)			0.12	0.08	N/S
LVPWDs (mm)	BSA	210	0.18	<0.001	Sig
RVDd (mm)			0.04	0.54	N/S
LVMass (g)			0.18	0.01	Sig
LVMI(g/m^2)			-0.31	<0.001	Sig
RWT			0.04	0.53	N/S
CTR			0.26	<0.001	N/S
IVSd (mm)			0.12	0.89	N/S
IVSs (mm)			0.07	0.32	N/S
LVIDd (mm)			0.09	0.16	N/S
LVIDs (mm)			0.03	0.65	N/S
LVPWDd (mm)			0.09	0.15	N/S
LVPWDs (mm)	Height	210	0.18	<0.001	Sig
RVDd (mm)			0.06	0.37	N/S
LVMass (g)			0.16	0.23	N/S
LVMI(g/m^2)			0.12	0.03	Sig
RWT			0.04	0.57	N/S
CTR			0.22	<0.001	Sig
IVSd (mm)			-0.06	0.38	N/S
IVSs (mm)			-0.09	0.19	N/S
LVIDd (mm)			0.08	0.24	N/S
LVIDs (mm)			0.03	0.69	N/S
LVPWDd (mm)			0.11	0.18	N/S
LVPWDs (mm)	Weight	210	-0.03	0.71	N/S
RVDd (mm)			-0.07	0.32	N/S
LVMass (g)			0.08	0.23	N/S
LVMI(g/m^2)			-0.32	<0.001	Sig

RWT	0.02	0.73	N/S
CTR	0.14	0.04	Sig

Table 2: Intraclass Correlation Coefficient for Agreement between cardiothoracic ratio and echocardiographic obtained Cardiac dimensions across the dominant body somatotype

Variables	ICC	95% Confidence Interval		F(209)	P
		Lower Bound	Upper Bound		
IVSd (mm)	0.001	-0.134	0.136	1.003	0.49
IVSs (mm)	0.001	-0.134	0.136	1.003	0.49
LVIDd (mm)	0.001	-0.134	0.136	1.001	0.49
LVIDs (mm)	0.000	-0.135	0.136	1.001	0.49
LVPWDd (mm)	0.004	-0.131	0.139	1.008	0.48
LVPWDs (mm)	0.003	-0.132	0.138	1.006	0.48
RVDd (mm)	0.000	-0.135	0.135	1.000	0.49
LVMass (g)	0.000	-0.135	0.135	1.000	0.49
LVMI(g/m^2)	0.000	-0.135	0.135	1.000	0.49
RWT	0.029	-0.107	0.163	1.059	0.34