Research Report

A LONGITUDINAL STUDY OF HEALTHY YOUNG MEN:

CORRELATION COEFFICIENTS

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SUMMARY PAGE

THE PROBLEM

A large body of data has been accumulated in a continuing epidemiological study of naval aviators. It was necessary to explore methods which would allow expression of important relationships which could be investigated further. An IBM 1620 computer has been used to construct a large matrix of correlation coefficients for this purpose.

FINDINGS

The relationships among data from three examinations conducted over a period of eighteen years on a group of healthy young men are presented in the form of correlation coefficients. A correlation matrix of 106 continuous variables is recorded as a reference for other investigators. Pertinent statistical considerations are outlined and briefly discussed.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the assistance of Mr. Roger Berkshire, Mrs. Margaret Duty, and LT Robert Wherry, MSC, USN, without whose help compilation of the matrix would not have been possible. Special thanks are extended to Mrs. Joyce Gill who so capably typed the many thousands of numbers in the matrix.

INTRODUCTION

A large number of epidemiologic studies are in progress oriented toward identification of factors important in the development of hypertension and arteriosclerotic disease. The majority of these studies are concerned with populations selected in middle age, and there is little information available on young adults. During the period prior to middle age, important patterns develop which influence and foreshadow the future development of vascular disease. Changes occur in various physiologic parameters and cannot be appreciated from studies of older populations. We have completed an eighteen-year follow-up in a longitudinal study of healthy young men first evaluated at 24 years of age. Follow-up examination was conducted on 96 per cent of the surviving members. The availability of a large body of unique data prompted us to investigate the relationships among the various parameters studied.

The purpose of this communication is to present the data from this study in the form of a correlation matrix of the relationships among 106 continuous variables. This matrix is presented as a source of reference for those engaged in this type of study and perhaps as a point of departure for those who find interesting relationships. Important aspects of blood pressure, electrocardiograms, and serum lipids have been presented elsewhere, and no comment will be offered on the individual correlation coefficients.

PROCEDURE

Several publications give detailed summaries of the selection, testing, and subsequent follow-up evaluations of this group (1-5). The study group is composed of 1056 healthy white males selected as physically qualified for flight training in 1940. The original studies were performed in 1940 when the mean age of the group was 23.6 years. Included in the original evaluation were height, weight, blood pressure (casual and basal), basal metabolic rate, electrocardiogram (3 standard leads plus Cf 4), somatotyping from profile nude photographs as described by Sheldon (6), Minnesota paper formboard scores, and Otis mental aptitude test scores.

In 1952, the group was re-evaluated with 88 per cent of the surviving members being examined. A history, physical examination, chest x-ray, and an electrocardiogram (12-lead) were included in this examination.

In 1958, all but three members of the original group were located, and 785 (96 per cent) of the surviving members were examined. All deaths were documented. Evaluation in 1958 included a detailed history and physical examination and the following laboratory studies: electrocardiogram (12 lead with "double" Master two-step test*), serum

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*Using standard Master steps and the table of trips (7), the subject makes double the regulation number of trips in double the usual period of time.

cholesterol and serum lipoprotein analyses. The electrocardiograms from all three examinations were measured and interpreted by two physicians independently with the final interpretation being agreed upon by both. Data from these examinations were coded and placed on IBM cards. An IBM 1620 computor was utilized to calculate Pearson Product Moment Correlations coefficients according to the formula

where *x* and *y* are the variables and *n* the number of paired observations.

Preliminary plotting of correlations between randomly selected variables indicated the relationships examined were linear.

RESULTS

The correlation coefficients are presented in the usual matrix form. The correlation coefficient is the upper number, and the lower figure is the number of observations from which the correlation is derived. A list of the variables with the mean and standard deviation of each is listed below:

GENERAL DATA

Sys BP 1940	Systolic blood pressure, 1940 (casual, supine)	120.7 (± 8.6) mm Hg
Dias BP 1940	Diastolic blood pressure, 1940 (casual, supine)	71.8 (± 7.7) mm Hg
Sys BP 1952	Systolic blood pressure, 1952 (casual, supine)	123.7 (± 13.4) mm Hg
Dias BP 1952	Diastolic blood pressure, 1952 (casual, supine)	76.1 (± 10.7) mm Hg
Sys BP 1958	Systolic blood pressure, 1958 (casual, supine)	123.0 (± 13.5) mm Hg
Dias BP 1958	Diastolic blood pressure, 1958 (casual, supine)	77.7 (± 9.7) mm Hg
Δ Sys 40-52	Change in systolic blood pressure 1940-1952	2.8 (± 14.8) mm Hg
Δ Dias 40-52	Change in diastolic blood pressure 1940-1952	4.3 (± 12.2) mm Hg
Δ Sys 52-58	Change in systolic blood pressure 1952-1958	-0.96 (± 13.9) mm Hg
Δ Dias 52-58	Change in diastolic blood pressure 1952-1958	1.5 (± 11.6) mm Hg
Δ Sys 40-58	Change in systolic blood pressure 1940-1958	2.3 (± 14.6) mm Hg
Δ Dias 40-58	Change in diastolic blood pressure 1940-1958	6.0 (± 11.4) mm Hg

Age 1940	Age, 1940	23.6 (± 2.3) years
Age 1952	Age, 1952	35.1 (± 2.3) years
Age 1958	Age, 1958	41.2 (± 2.3) years
Δ Age 40-52	Change in age, 1940-1952	11.5 (± 1.1) years
Δ Age 52-58	Change in age, 1952-1958	6.2 (± 1.1) years
Δ Age 40-58	Change in age, 1940-1958	17.7 (± 1.1) years
BMR	Basal metabolic rate	-1.7 (± 9.7)
OMA	Otis Mental Aptitude	35.0 (± 23.7)
MPF	Minnesota Paper Form	30.1 (± 21.0)
R 1940	Mean body radius*, 1940	133.9 (± 7.5)
R 1952	Mean body radius*, 1952	140.1 (± 7.2)
R 1958	Mean body radius*, 1958	141.3 (± 7.1)
Δ R 40-52	Change in R, 1940 to 1952	6.05 (± 5.4)
Δ R 52-58	Change in R, 1952 to 1958	1.12 (± 4.3)
Δ R 40-58	Change in R, 1940 to 1958	7.20 (± 5.7)
Ht/Wt 1940	Height/weight, 1940	0.443 (± 0.038) in./lbs
Ht/Wt 1952	Height/weight, 1952	0.408 (± 0.042) in./lbs.
Ht/Wt 1958	Height/weight, 1958	0.401 (± 0.039) in./lbs.
Δ Ht/wt 40-52	Change in ht/wt, 1940-1952	0.036 (± 0.032) in./lbs.
Δ Ht/wt 52-58	Change in ht/wt, 1952-1958	0.007 (± 0.025) in./lbs.
Δ Ht/wt 40-58	Change in ht/wt, 1940-1958	0.043 (± 0.034) in./lbs.
Ht 1940	Height, 1940	70.3 (± 2.15) inches

*As described by Behnke (8).

Wt 1940	Weight, 1940	159.8 (± 15.6) lbs.
Wt 1952	Weight, 1952	174.2 (± 19.8) lbs.
Wt 1958	Weight, 1958	177.2 (± 19.8) lbs.
△ Wt 40-52	Change in weight, 1940-1952	14.56 (± 13.2) lbs.
△ Wt 52-58	Change in weight, 1952-1958	2.74 (± 10.4) lbs.
△ Wt 40-58	Change in weight, 1940-1958	17.48 (± 14.2) lbs.
% Dev. 1940	Percent deviation from average weight (Metropolitan tables), 1940	-1.10 (± 8.35)%
% Dev. 1952	Percent deviation from average weight (Metropolitan tables), 1952	+1.41 (± 10.00)%
% Dev. 1958	Percent deviation from average weight (Metropolitan tables), 1958	+1.37(± 9.72)%
△ %Dev.40-52	Change in % deviation from average weight 1940-1952	+2.62 (± 8.34)%
△ %Dev.52-58	Change in % deviation from average weight 1952-1958	-0.14 (± 6.29)%
△ %Dev.40-58	Change in % deviation from average weight 1940-1958	+ 2.48 (± 8.76)%
Endo	Endomorphy (score on each individual's endomorphic components x 2 to eliminate fractions, 1940)	6.31 (± 1.84)
Meso	Mesomorphy (score on each individual's mesomorphic components x 2 to eliminate fractions, 1940)	8.83 (± 1.69)
Ecto	Ectomorphy (score on each individual's ectomorphy components x 2 to eliminate fractions, 1940)	6.26 (± 2.14)
Endo-Meso	Endomorphy plus mesomorphy, 1940 (addition of these two components for each individual)	15.14 (± 2.22)

Chol.	Cholesterol, Abell method (9) 1958	226.6 ($\pm$ 45.81)mg%
A.I.	Atherogenic Index (derived from lipoprotein analysis performed at Institute of Medical Physics: AI = 0.1 (Sf 0-12) + 0.175 (Sf 12-400) Sf in mg/100 ml 1958 (10)	84.71 ($\pm$ 28.77)
Sf 12-20	Sf 12-20 Lipoprotein fraction, 1958	41.67 ($\pm$ 10.67)

Electrocardiographic Data

Rate 1940	Rate, 1940	63.35 ($\pm$ 10.60)per min.
Rate 1952	Rate, 1952	74.48 ($\pm$ 11.47)per min.
Rate 1958	Rate, 1958	71.02 ($\pm$ 10.87)per min.
Δ Rate 40-52	Change in rate, 1940-1952	11.20 ($\pm$ 13.75)per min.
Δ Rate 52-58	Change in rate, 1952-1958	3.97 ($\pm$ 12.00)per min.
Δ Rate 40-58	Change in rate, 1940-1958	7.51 ($\pm$ 12.63)per min.
PR 1940	PR interval, 1940	0.154 ($\pm$ 0.02) mm
PR 1952	PR interval, 1952	0.160 ($\pm$ 0.02) mm
PR 1958	PR interval, 1958	0.167 ($\pm$ 0.04) mm
Δ PR 40-52	Change in PR, 1940-1952	0.004 ($\pm$ 0.02) mm
Δ PR 52-58	Change in PR, 1952-1958	0.006 ($\pm$ 0.02) mm
Δ PR 40-58	Change in PR, 1940-1958	0.011 ($\pm$ 0.02) mm
QRS 1940	QRS duration, 1940	0.088 ($\pm$ 0.02) mm
QRS 1952	QRS duration, 1952	0.086 ($\pm$ 0.01) mm
QRS 1958	QRS duration, 1958	0.087 ($\pm$ 0.01) mm
QT 1940	QT interval, 1940	0.385 ($\pm$ 0.036) mm
QT 1952	QT interval, 1952	0.360 ($\pm$ 0.029) mm

QT 1958	QT interval, 1958	0.365 (± 0.033) mm
Δ QT 40-52	Change in QT, 1940-1952	0.024 (± 0.040) mm
Δ QT 52-58	Change in QT, 1952-1958	0.006 (± 0.035) mm
Δ QT 40-58	Change in QT, 1940-1958	0.017 (± 0.038) mm
QRS Vec. 1940	QRS frontal vector, 1940	60.76 (± 26.87)°
QRS Vec. 1952	QRS frontal vector, 1952	47.90 (± 29.07)°
QRS Vec. 1958	QRS frontal vector, 1958	41.66 (± 34.52)°
Δ QRS Vec.40-52	Change QRS frontal vector, 1940-1952	12.81(± 17.37)°
Δ QRS Vec.52-58	Change QRS frontal vector, 1952-1958	6.59 (± 18.80)°
Δ QRS Vec.40-58	Change QRS frontal vector, 1940-1958	19.63 (± 24.59)°
Master rate	Maximum rate achieved after double Master two-step test, 1958	86.45 (± 17.45)per min.
Master rate	Increase in rate with double Master two-step test, 1958	16.16 (± 12.68)per min.
T Vec.1940	T frontal vector, 1940	43.08 (± 18.29)°
T Vec. 1952	T frontal vector, 1952	41.13 (± 18.41)°
T Vec. 1958	T frontal vector, 1958	39.13 (± 19.24)°
Δ T Vec.40-52	Change in T vector, 1940-1952	3.23 (± 18.04)°
Δ T Vec.52-58	Change in T vector, 1952-1958	2.70 (± 16.32)°
Δ T Vec.40-58	Change in T vector, 1940-1958	4.86 (± 19.03)°
QRS-T 1940	QRS-T angle, frontal, 1940	24.75 (± 18.07)°
QRS-T 1952	QRS-T angle, frontal, 1952	21.84 (± 19.71)°
QRS-T 1958	QRS-T angle, frontal, 1958	23.75 (± 22.18)°

Δ QRS-T 40-52	Change QRS-T angle, 1940-1952	3.22 (± 19.33)°
Δ QRS-T 52-58	Change QRS-T angle, 1952-1958	1.59 (± 18.72)°
Δ QRS-T 40-58	Change in QRS-T angle, 1940-1958	2.40 (± 23.04)°
Init, 0.04 1940	Initial 0.04 vector, 1940	46.68 (± 24.32)°
Init, 0.04 1952	Initial 0.04 vector, 1952	39.15 (± 44.52)°
Init, 0.04 1958	Initial 0.04 vector, 1958	33.62 (± 24.80)°
Δ Init, 0.04 40-52	Change initial 0.04 vector, 1940-1952	4.42 (± 20.91)°
Δ Init, 0.04 52-58	Change initial 0.04 vector, 1952-1958	5.43 (± 16.67)°
Δ Init, 0.04 40-58	Change initial 0.04 vector, 1940-1958	9.24 (± 22.16)°
Term. 0.04 1940	Terminal 0.04 vector, 1940	53.26 (± 80.36)°
Term. 0.04 1952	Terminal 0.04 vector, 1952	32.22 (± 85.25)°
Term. 0.04 1958	Terminal 0.04 vector, 1958	28.93 (± 81.62)°
Δ Term. 0.04 40-52	Change terminal 0.04 vector, 1940-1952	6.24 (± 31.72)°
Δ Term. 0.04 52-58	Change terminal 0.04 vector, 1952-1958	2.20 (± 28.44)°
Δ Term. 0.04 40-58	Change terminal 0.04 vector, 1940-1958	9.56 (± 39.52)°

DISCUSSION

No attempt will be made to comment on individual correlations or significant relationships; however, there are several considerations and qualifications to be recognized in interpreting this correlation matrix. From the statistical standpoint, the N, or number of paired observations, is large (usually over 600).

If the N is assumed to be 600, the correlations may be considered significant when exceeding the following values*: .70 at 5 per cent confidence level, .098 at 1 per cent level, and .108 at 0.5 per cent level. It will be recalled that at the 5 per cent confidence level one in twenty correlations will be "significant," though spurious, and

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*Determined by extrapolation from a standard table of significance values for correlation coefficients (4).

one in a hundred at the 1 per cent level. The importance of correlation coefficients at levels below .25 in a study of this size is well exemplified by experience with the analysis of factors influencing blood pressure (4). Correlations of .15 to .20 were present in several parameters when data from the entire group were examined. An analysis of variance of these parameters for groups within the study population revealed significant differences ($P < .01$ to $P < .001$) which had clinical importance. In a relatively homogeneous group there is a tendency for the large middle group without strong differences to "dilute" significant differences at the ends of distribution of a variable. Therefore, it may be of value to pursue significant, though less striking, correlations through selection of a group designed to emphasize the characteristics under consideration. The reverse proposition is also true. Where no significant correlation is present, a study of similar composition would not be expected to yield significant results.

Another consideration involves the factitial elevation of a correlation coefficient when the one variable is derived in part from its correlate. Several items within the matrix refer to "change" in a parameter between two examinations. The relationship between the "change" parameter and either of the two measurements from which it is derived should theoretically be $\pm .71$ even if the two measurements were unrelated (if the measurements had the same standard deviation). As a consequence, little importance can be attached to correlations between a variable and a derivative of this variable.

The Pearson product moment equation is designed to express linear relationships only. In spite of the fact that all of the relationships examined prior to use of the computor were linear (based on examination of scatter plots), there is no assurance that all of the underlying relationships among the variables are truly linear. The Pearson equation gives an underestimate of the true relationship between two variables when the true relationship is nonlinear.

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PROCEDURE

Several publications give detailed summaries of the selection, testing, and subsequent follow-up evaluations of this group (1-5). The study group is composed of 1056 healthy white males selected as physically qualified for flight training in 1940. The original studies were performed in 1940 when the mean age of the group was 23.6 years. Included in the original evaluation were height, weight, blood pressure (casual and basal), basal metabolic rate, electrocardiogram (3 standard leads plus Cf 4), somatotyping from profile nude photographs as described by Sheldon (6), Minnesota paper formboard scores, and Otis mental aptitude test scores.

In 1952, the group was re-evaluated with 88 per cent of the surviving members being examined. A history, physical examination, chest x-ray, and an electrocardiogram (12-lead) were included in this examination.

In 1958, all but three members of the original group were located, and 785 (96 per cent) of the surviving members were examined. All deaths were documented. Evaluation in 1958 included a detailed history and physical examination and the following laboratory studies: electrocardiogram (12 lead with "double" Master two-step test*), serum

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*Using standard Master steps and the table of trips (7), the subject makes double the regulation number of trips in double the usual period of time.

cholesterol and serum lipoprotein analyses. The electrocardiograms from all three examinations were measured and interpreted by two physicians independently with the final interpretation being agreed upon by both. Data from these examinations were coded and placed on IBM cards. An IBM 1620 computor was utilized to calculate Pearson Product Moment Correlations coefficients according to the formula

where x and y are the variables and n the number of paired observations.

Preliminary plotting of correlations between randomly selected variables indicated the relationships examined were linear.

RESULTS

The correlation coefficients are presented in the usual matrix form. The correlation coefficient is the upper number, and the lower figure is the number of observations from which the correlation is derived. A list of the variables with the mean and standard deviation of each is listed below:

GENERAL DATA

Sys BP 1940	Systolic blood pressure, 1940 (casual, supine)	120.7 (± 8.6) mm Hg
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Dias BP 1952	Diastolic blood pressure, 1952 (casual, supine)	76.1 (± 10.7) mm Hg
Sys BP 1958	Systolic blood pressure, 1958 (casual, supine)	123.0 (± 13.5) mm Hg
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Δ Dias 40-52	Change in diastolic blood pressure 1940-1952	4.3 (± 12.2) mm Hg
Δ Sys 52-58	Change in systolic blood pressure 1952-1958	-0.96 (± 13.9) mm Hg
Δ Dias 52-58	Change in diastolic blood pressure 1952-1958	1.5 (± 11.6) mm Hg
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Δ Dias 40-58	Change in diastolic blood pressure 1940-1958	6.0 (± 11.4) mm Hg

Age 1940	Age, 1940	23.6 (± 2.3) years
Age 1952	Age, 1952	35.1 (± 2.3) years
Age 1958	Age, 1958	41.2 (± 2.3) years
Δ Age 40-52	Change in age, 1940-1952	11.5 (± 1.1) years
Δ Age 52-58	Change in age, 1952-1958	6.2 (± 1.1) years
Δ Age 40-58	Change in age, 1940-1958	17.7 (± 1.1) years
BMR	Basal metabolic rate	-1.7 (± 9.7)
OMA	Otis Mental Aptitude	35.0 (± 23.7)
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R 1952	Mean body radius*, 1952	140.1 (± 7.2)
R 1958	Mean body radius*, 1958	141.3 (± 7.1)
Δ R 40-52	Change in R, 1940 to 1952	6.05 (± 5.4)
Δ R 52-58	Change in R, 1952 to 1958	1.12 (± 4.3)
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Ht/Wt 1940	Height/weight, 1940	0.443 (± 0.038) in./lbs
Ht/Wt 1952	Height/weight, 1952	0.408 (± 0.042) in./lbs.
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*As described by Behnke (8).

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% Dev. 1958	Percent deviation from average weight (Metropolitan tables), 1958	+1.37(± 9.72)%
Δ %Dev.40-52	Change in % deviation from average weight 1940-1952	+2.62 (± 8.34)%
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Meso	Mesomorphy (score on each individual's mesomorphic components x 2 to eliminate fractions, 1940)	8.83 (± 1.69)
Ecto	Ectomorphy (score on each individual's ectomorphy components x 2 to eliminate fractions, 1940)	6.26 (± 2.14)
Endo-Meso	Endomorphy plus mesomorphy, 1940 (addition of these two components for each individual)	15.14 (± 2.22)

Chol.	Cholesterol, Abell method (9) 1958	226.6 (± 45.81)mg%
A.I.	Atherogenic Index (derived from lipoprotein analysis performed at Institute of Medical Physics: AI = 0.1 (Sf 0-12) + 0.175 (Sf 12-400) Sf in mg/100 ml 1958 (10)	84.71 (± 28.77)
Sf 12-20	Sf 12-20 Lipoprotein fraction, 1958	41.67 (± 10.67)

<u>Electrocardiographic Data</u>

Rate 1940	Rate, 1940	63.35 (± 10.60)per min.
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Δ PR 40-58	Change in PR, 1940-1958	0.011 (± 0.02) mm
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QRS 1952	QRS duration, 1952	0.086 (± 0.01) mm
QRS 1958	QRS duration, 1958	0.087 (± 0.01) mm
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Δ QRS Vec.52-58	Change QRS frontal vector, 1952-1958	6.59 ($\pm$ 18.80)°
Δ QRS Vec.40-58	Change QRS frontal vector, 1940-1958	19.63 ($\pm$ 24.59)°
Master rate	Maximum rate achieved after double Master two-step test, 1958	86.45 ($\pm$ 17.45)per min.
Master rate	Increase in rate with double Master two-step test, 1958	16.16 ($\pm$ 12.68)per min.
T Vec.1940	T frontal vector, 1940	43.08 ($\pm$ 18.29)°
T Vec. 1952	T frontal vector, 1952	41.13 ($\pm$ 18.41)°
T Vec. 1958	T frontal vector, 1958	39.13 ($\pm$ 19.24)°
Δ T Vec.40-52	Change in T vector, 1940-1952	3.23 ($\pm$ 18.04)°
Δ T Vec.52-58	Change in T vector, 1952-1958	2.70 ($\pm$ 16.32)°
Δ T Vec.40-58	Change in T vector, 1940-1958	4.86 ($\pm$ 19.03)°
QRS-T 1940	QRS-T angle, frontal, 1940	24.75 ($\pm$ 18.07)°
QRS-T 1952	QRS-T angle, frontal, 1952	21.84 ($\pm$ 19.71)°
QRS-T 1958	QRS-T angle, frontal, 1958	23.75 ($\pm$ 22.18)°

△ QRS-T 40-52	Change QRS-T angle, 1940-1952	3.22 (± 19.33)°
△ QRS-T 52-58	Change QRS-T angle, 1952-1958	1.59 (± 18.72)°
△ QRS-T 40-58	Change in QRS-T angle, 1940-1958	2.40 (± 23.04)°
Init, 0.04 1940	Initial 0.04 vector, 1940	46.68 (± 24.32)°
Init, 0.04 1952	Initial 0.04 vector, 1952	39.15 (± 44.52)°
Init, 0.04 1958	Initial 0.04 vector, 1958	33.62 (± 24.80)°
△ Init, 0.04 40-52	Change initial 0.04 vector, 1940-1952	4.42 (± 20.91)°
△ Init, 0.04 52-58	Change initial 0.04 vector, 1952-1958	5.43 (± 16.67)°
△ Init, 0.04 40-58	Change initial 0.04 vector, 1940-1958	9.24 (± 22.16)°
Term. 0.04 1940	Terminal 0.04 vector, 1940	53.26 (± 80.36)°
Term. 0.04 1952	Terminal 0.04 vector, 1952	32.22 (± 85.25)°
Term. 0.04 1958	Terminal 0.04 vector, 1958	28.93 (± 81.62)°
△ Term. 0.04 40-52	Change terminal 0.04 vector, 1940-1952	6.24 (± 31.72)°
△ Term. 0.04 52-58	Change terminal 0.04 vector, 1952-1958	2.20 (± 28.44)°
△ Term. 0.04 40-58	Change terminal 0.04 vector, 1940-1958	9.56 (± 39.52)°

DISCUSSION

No attempt will be made to comment on individual correlations or significant relationships; however, there are several considerations and qualifications to be recognized in interpreting this correlation matrix. From the statistical standpoint, the N, or number of paired observations, is large (usually over 600).

If the N is assumed to be 600, the correlations may be considered significant when exceeding the following values*: .70 at 5 per cent confidence level, .098 at 1 per cent level, and .108 at 0.5 per cent level. It will be recalled that at the 5 per cent confidence level one in twenty correlations will be "significant," though spurious, and

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*Determined by extrapolation from a standard table of significance values for correlation coefficients (4).

one in a hundred at the 1 per cent level. The importance of correlation coefficients at levels below .25 in a study of this size is well exemplified by experience with the analysis of factors influencing blood pressure (4). Correlations of .15 to .20 were present in several parameters when data from the entire group were examined. An analysis of variance of these parameters for groups within the study population revealed significant differences ($P < .01$ to $P < .001$) which had clinical importance. In a relatively homogeneous group there is a tendency for the large middle group without strong differences to "dilute" significant differences at the ends of distribution of a variable. Therefore, it may be of value to pursue significant, though less striking, correlations through selection of a group designed to emphasize the characteristics under consideration. The reverse proposition is also true. Where no significant correlation is present, a study of similar composition would not be expected to yield significant results.

Another consideration involves the factitial elevation of a correlation coefficient when the one variable is derived in part from its correlate. Several items within the matrix refer to "change" in a parameter between two examinations. The relationship between the "change" parameter and either of the two measurements from which it is derived should theoretically be $\pm .71$ even if the two measurements were unrelated (if the measurements had the same standard deviation). As a consequence, little importance can be attached to correlations between a variable and a derivative of this variable.

The Pearson product moment equation is designed to express linear relationships only. In spite of the fact that all of the relationships examined prior to use of the computor were linear (based on examination of scatter plots), there is no assurance that all of the underlying relationships among the variables are truly linear. The Pearson equation gives an underestimate of the true relationship between two variables when the true relationship is nonlinear.

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	Sys BP 1940	Dias BP 1940	Sys BP 1952	Dias BP 1952	Sys BP 1958	Dias BP 1958	Δ Sys 40-52	Δ Dias 40-52	Δ Sys 52-58	Δ Dias 52-58	Δ Sys 40-58	Δ Dias 40-58	Age 1940	Age 1952	Age 1958	Δ Age 40-52	Δ Age 52-58	Δ Age 40-58	BMR	ONA	NPF	R 1940	R 1952
Sys BP 1940 R N		.36 755	.15 651	.10 651	.19 695	.12 695	-.44 651	-.15 651	.06 603	.03 603	-.42 695	-.13 695	-.10 754	-.08 717	-.07 726	.05 717	-.01 690	.05 726	-.02 611	-.06 542	-.06 533	.05 755	.05 704
Dias. BP 1940			.07 651	.13 651	.13 695	.16 695	-.15 651	-.51 651	.04 603	.01 603	-.08 695	-.53 695	.03 754	.02 717	.01 726	-.04 717	.02 690	-.02 726	.00 611	-.01 542	.01 533	.04 755	.03 704
Sys. BP 1952				.64 695	.45 640	.31 640	.82 651	.51 651	-.54 640	-.35 640	.34 603	.22 603	.02 695	.02 695	.03 665	.02 695	.04 665	.05 665	-.00 560	-.06 502	-.01 490	.16 695	.23 687
Dias. BP 1952					.35 640	.36 640	.52 651	.78 651	-.29 640	-.64 640	.26 603	.20 603	.06 695	.05 695	.05 665	-.03 695	.02 665	-.01 665	-.02 560	-.02 502	-.02 490	.14 695	.21 687
Sys. BP 1958						.68 744	.29 603	.23 603	.51 640	.23 640	.82 695	.50 695	.01 744	-.02 704	.02 744	-.04 704	.07 704	.03 744	.04 607	-.07 535	-.05 527	.16 743	.20 689
Dias. BP 1958							.20 603	.20 603	.34 640	.50 640	.37 695	.75 695	.06 744	.04 704	.03 744	-.02 704	-.05 704	-.05 744	.01 607	-.05 535	-.03 527	.15 743	.18 689
Δ Sys. BP 40-52								.55 651	-.52 603	-.31 603	.54 603	.27 603	.08 651	.08 651	.09 626	.01 651	.03 626	.03 626	.02 526	-.01 471	.03 461	.14 651	.20 647
Δ Dias. BP 40-52									-.28 603	-.55 603	.30 603	.51 603	.03 651	.04 651	.04 626	.02 651	.01 626	.02 626	.00 526	.00 471	-.01 461	.11 651	.18 647
Δ Sys. BP 52-58										.55 640	.44 603	.26 603	-.00 640	-.01 640	-.01 640	-.02 640	.01 640	-.01 640	.06 522	-.02 464	-.08 456	-.02 640	-.00 635
Δ Dias. BP 52-58											.21 603	.43 603	-.01 640	-.01 640	-.03 640	.02 640	-.06 640	-.04 640	.02 522	-.05 464	-.04 456	.01 640	-.01 635
Δ Sys. BP 40-58												.54 695	.07 695	.04 662	.07 695	-.06 662	.07 662	.00 695	.07 566	-.02 500	-.00 493	.13 695	.17 651
Δ Dias. BP 40-58													.04 695	.04 662	.03 695	.04 662	-.06 662	-.02 695	.02 566	-.05 500	-.03 493	.10 695	.16 651
Age 1940														.59 768	.88 780	-.23 768	-.00 734	-.25 780	.00 660	.01 584	-.03 572	.08 814	.08 749
Age 1952															.89 734	.23 768	-.21 734	.01 734	.01 620	-.03 552	-.04 538	.10 767	.11 749
Age 1958																.02 734	.25 734	.24 780	-.02 635	-.04 558	-.06 550	.11 779	.11 718
Δ Age 40-52																	-.44 734	.54 734	.01 620	-.05 552	-.01 538	.04 767	.07 749
Δ Age 52-58																		.52 734	-.07 596	-.03 526	-.03 516	.01 733	.01 718
Δ Age 40-58																			-.05 635	-.08 558	-.04 550	.06 779	.07 718
BMR																				.05 525	.04 512	.03 660	-.01 604
ONA																					.29 553	-.11 584	-.02 538
NPF																						-.12 572	-.10 522
R 1940																							.68 748

	R 1958	Δ R 40-52	Δ R 52-58	Δ R 40-58	Ht/Wt 1940	Ht/Wt 1952	Ht/Wt 1958	Δ Ht/Wt 40-52	Δ Ht/Wt 52-58	Δ Ht/Wt 40-58	Ht 1940	Wt 1940	Wt 1952	Wt 1958	Δ Wt 40-52	Δ Wt 52-58	Δ Wt 40-58	% Dev 1940	% Dev 1952	% Dev 1958	Δ% Dev 40-52	Δ% Dev 52-58	Δ% Dev 40-58	Endo
Sys BP 1940	.07 721	.02 704	.02 673	.06 721	-.07 753	-.05 702	-.08 718	.01 702	.04 670	-.04 718	.08 755	.08 755	.08 704	.09 721	.03 704	.02 673	.06 721	.05 755	.07 704	.07 721	.03 704	-.01 686	.04 708	.04 616
Dias. BP 1940	.03 721	.00 704	.07 673	.02 721	-.06 753	-.04 702	-.04 718	.01 702	.05 670	-.01 718	.03 755	.05 755	.04 704	.04 721	.01 704	.05 673	.02 721	.03 755	.05 704	.01 721	.04 704	.01 686	.00 708	.05 616
Sys. BP 1952	.21 660	.13 687	-.06 655	.08 660	-.15 693	-.21 685	-.20 657	-.08 685	-.02 652	-.06 657	.04 695	.16 695	.22 687	.19 660	.14 687	-.04 655	.10 660	.17 695	.23 687	.22 660	.10 687	-.05 656	.08 659	.09 569
Dias. BP 1952	.17 660	.13 687	-.06 655	.08 660	-.15 693	-.19 685	-.16 657	-.08 685	-.04 652	-.04 657	-.03 695	.12 695	.18 687	.14 660	.13 687	-.06 655	.08 660	.16 695	.24 687	.19 660	.13 687	-.09 656	.08 659	.12 569
Sys. BP 1958	.28 744	.13 688	.06 689	.18 743	-.16 741	-.18 687	-.26 741	-.08 686	.07 686	-.13 740	.01 744	.15 743	.18 689	.26 744	.14 688	.07 689	.20 743	.16 743	.21 689	.28 744	.12 688	.04 702	.17 730	.13 601
Dias. BP 1958	.29 744	.11 688	.12 689	.21 743	-.15 741	-.16 687	-.28 741	-.05 686	.13 686	-.17 740	-.07 744	.10 743	.14 689	.24 744	.12 688	.13 689	.23 743	.14 743	.20 689	.30 744	.11 688	.09 702	.20 730	.17 601
Δ Sys. BP 40-52	.18 622	.12 647	-.07 619	.06 622	-.13 649	-.18 645	-.16 619	-.08 645	-.04 616	-.04 619	-.01 651	.12 651	.17 647	.16 622	.13 647	-.06 619	.07 622	.15 651	.19 647	.18 622	.09 647	-.05 619	.06 622	.08 539
Δ Dias. BP 40-52	.13 622	.13 647	-.10 619	.04 622	-.11 649	-.16 645	-.12 619	-.08 645	-.07 616	-.01 619	-.02 651	.09 651	.15 647	.11 622	.12 647	-.09 619	.05 622	.13 651	.20 647	.15 622	.10 647	-.10 619	.05 622	.12 539
Δ Sys. BP 52-58	.04 640	.02 635	.08 635	.08 640	.02 638	.01 633	-.03 637	-.02 633	.06 632	-.06 637	-.02 640	-.03 640	-.01 635	.03 640	.01 635	.08 635	.07 640	-.03 640	-.01 635	.03 640	.02 635	.06 636	.06 639	.02 527
Δ Dias. BP 52-58	.07 640	-.03 635	.13 635	.08 640	-.00 638	.02 633	-.07 637	.02 633	.13 632	-.08 637	-.05 640	-.01 640	-.02 635	.05 640	-.02 635	.14 635	.09 640	.01 640	-.03 635	.06 640	-.04 635	.14 636	.07 639	.04 527
Δ Sys. BP 40-58	.21 695	.11 651	.02 651	.13 695	-.12 693	-.14 649	-.19 692	-.06 649	.04 648	-.09 692	-.01 695	.11 695	.13 651	.19 695	.11 651	.04 651	.15 695	.11 695	.16 651	.22 695	.10 651	.03 663	.15 683	.11 567
Δ Dias. BP 40-58	.23 695	.11 651	.03 651	.18 695	-.10 693	-.13 649	-.22 692	-.06 649	.07 648	-.14 692	-.06 695	.07 695	.12 651	.19 695	.11 651	.05 651	.19 695	.10 695	.17 651	.25 695	.11 651	.04 663	.19 683	.11 567
Age 1940	.03 774	.02 748	-.10 712	-.04 773	-.08 812	-.07 747	-.05 771	-.00 746	-.06 709	.05 770	-.02 815	.06 814	.05 749	.03 774	.01 748	-.06 712	-.03 773	-.10 814	.05 749	-.02 774	.16 748	-.11 728	.08 757	.00 657
Age 1952	.07 728	.03 748	-.08 712	-.04 727	-.10 765	-.11 747	-.08 725	-.02 746	-.05 709	.04 724	-.01 768	.09 767	.09 749	.06 728	.02 748	-.05 712	-.02 727	-.05 767	.09 749	.02 728	.15 748	-.10 716	.08 723	.09 621
Age 1958	.07 774	.03 717	-.10 712	-.03 773	-.12 777	-.10 716	-.08 771	-.01 715	-.08 709	.05 770	-.00 780	.10 779	.09 718	.07 774	.01 717	-.07 712	-.02 773	-.06 779	.08 718	.00 774	.15 717	-.13 728	.05 757	.10 627
Δ Age 40-52	.08 728	.03 748	.03 712	.06 727	-.05 765	-.09 747	-.09 725	-.03 746	.02 709	-.04 724	.05 768	.05 767	.08 749	.08 728	.03 748	.03 712	.06 727	.09 767	.07 749	.08 728	-.02 748	.04 716	.00 723	.01 621
Δ Age 52-58	-.02 728	.01 717	-.05 712	-.04 727	-.00 731	.00 716	.03 725	-.01 715	-.05 709	.04 724	.01 734	.02 733	.00 718	-.01 728	.00 717	-.04 712	-.03 727	.00 733	-.01 718	-.05 728	-.00 717	-.08 716	-.06 723	.00 592
Δ Age 40-58	.07 774	.03 717	-.02 712	.02 773	-.07 777	-.07 716	-.06 771	-.03 715	-.03 709	.01 770	.05 780	.07 779	.07 718	.08 774	.03 717	-.01 712	.03 773	.10 779	.05 718	.04 774	-.03 717	-.03 728	-.05 757	.02 627
BMR	.01 630	-.00 604	-.01 575	-.00 630	-.04 658	.00 602	-.00 627	.01 602	-.02 572	.02 627	-.05 660	.01 660	-.03 604	.00 630	-.01 604	.00 575	-.00 630	.04 660	-.01 604	.00 630	-.02 604	-.00 588	-.03 617	.07 536
ONA	-.02 556	.08 538	.01 511	.09 556	.10 582	.03 536	.03 553	-.05 536	.01 508	-.08 553	.08 584	.07 584	.01 538	.01 556	.08 538	.02 511	.11 556	-.16 584	-.05 538	-.04 556	.08 538	.01 524	.12 543	-.02 476
NPF	-.06 548	.01 522	.03 499	.05 548	.10 570	.09 520	.05 545	-.01 520	.03 496	-.06 545	-.04 572	-.11 572	-.09 522	-.06 548	.01 522	.02 499	.04 548	-.09 572	-.10 522	-.06 548	-.01 522	.03 513	.01 534	-.07 467
R 1940	.62 773	-.17 748	-.14 711	-.24 773	-.97 814	-.68 746	-.62 770	.25 746	-.16 708	.35 770	.26 816	.94 816	.68 748	.62 773	-.10 748	-.12 711	-.15 773	.89 816	.61 748	.53 773	-.15 748	-.16 727	-.26 757	.53 659
R 1952	.81 712	.61 748	-.40 712	.31 711	-.67 746	-.97 747	-.81 709	-.48 746	-.39 709	-.19 708	.23 749	.66 748	.95 749	.79 712	.64 748	-.37 712	.37 711	.59 748	.93 749	.73 712	.52 748	-.40 712	.24 711	.46 603
R 1958		.42 711	.21 712	.61 773	-.61 771	-.80 710	-.98 771	-.31 709	.15 709	-.46 770	.24 774	.62 773	.80 712	.96 774	.48 711	.21 712	.66 773	.55 773	.75 712	.90 774	.35 711	.15 728	.49 757	.35 623
Δ R 40-52			-.37 711	.69 711	.16 746	-.57 746	-.41 708	-.91 746	-.33 708	-.65 708	.02 748	-.13 748	.55 748	.38 711	.97 748	-.35 711	.69 711	-.16 748	.59 748	.40 711	.86 748	-.35 711	.62 711	.02 603
Δ R 52-58				.41 711	.13 709	.37 710	-.19 709	.32 709	.89 709	-.37 708	.01 712	-.11 711	-.33 712	.18 712	-.34 711	.96 712	.38 711	-.10 711	-.38 712	.20 712	-.33 711	.90 712	.33 711	-.16 573
Δ R 40-58					.22 771	-.28 709	-.58 770	-.65 709	.36 708	-.92 770	.04 773	-.19 773	.29 711	.55 773	.68 711	.39 711	.97 773	-.23 773	.30 711	.58 773	.60 711	.36 727	.86 757	-.10 623
Ht/Wt 1940						.67 746	.61 770	-.30 746	.16 708	-.40 770	-.25 814	-.93 814	-.66 746	-.61 771	.11 746	.11 709	.16 771	-.88 814	-.60 746	-.52 771	.16 746	.16 725	.26 755	-.54 657
Ht/Wt 1952							.80 709	.51 746	.45 709	.17 708	-.24 747	-.66 746	-.94 747	-.77 710	-.62 746	.37 710	-.35 709	.59 746	-.91 747	-.72 710	-.50 746	.39 710	-.22 709	-.44 601
Ht/Wt 1958								.31 708	-.18 709	.68 770	-.24 771	-.61 770	-.80 709	-.94 771	-.46 708	-.21 709	-.64 770	.55 770	-.75 709	-.88 771	-.34 708	-.14 725	-.47 754	-.85 620
Δ Ht/Wt 40-52									.38 708	.70 708	-.02 746	.23 746	-.44 746	-.28 709	-.92 746	.34 709	-.65 709	.26 746	-.47 746	-.30 709	-.82 746	.32 709	-.60 709	.06 601
Δ Ht/Wt 52-58										-.39 708	-.02 709	-.15 708	-.35 709	.13 709	-.33 708	.91 709	.36 708	.13 708	-.38 709	.16 709	-.32 708	.85 709	.31 708	-.17 570
Δ Ht/Wt 40-58											-.01 770	.31 770	-.18 708	-.41 770	-.66 708	-.37 708	-.92 770	.35 770	-.19 708	-.45 770	-.59 708	-.35 724	-.82 754	.19 620
Ht 1940												.54 816	.49 749	.50 774	.09 748	.02 712	.10 773	.03 816	.02 749	.03 774	.06 748	-.01 728	.08 757	-.05 659
Wt 1940													.74 748	.70 773	-.07 748	-.10 711	-.11 773	.77 816	.54 748	.47 773	-.12 748	-.15 727	-.21 757	.45 659
Wt 1952														.86 712	.62 748	-.33 712	.37 711	.52 748	.84 749	.67 712	.49 748	-.35 712	.25 711	.37 603
Wt 1958															.45 711	.20 712	.63 773	.48 773	.67 712	.82 774	.33 711	.13 728	.46 757	.29 623
Δ Wt 40-52																-.36 711	.71 711	.13 748	.62 748	.46 711	.87 748	-.35 711	.63 711	.03 603
Δ Wt 52-58																	.40 711	.09 711	-.38 712	.21 712	-.35 711	.93 712	.34 711	-.15 573
Δ Wt 40-58																		.18 773	.34 711	.63 773	.61 711	.36 727	.87 757	-.08 623
																		041	042	043	044	045	046	047
% Dev. 1940																			.60 748	.56 773	-.29 748	-.13 727	-.35 757	.53 659
% Dev. 1952																				.79 712	.60 748	-.42 712	.30 711	.46 603
% Dev. 1958																					.40 711	.22 728	.61 757	.33 623
Δ % Dev. 40-52																						-.37 711	.72 711	-.02 603
Δ% Dev. 52-58																							.37 711	-.17 508
Δ % Dev. 40-58																								-.14 608

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12	R 1958	ΔR 40-52	ΔR 52-58	ΔR 40-58	Ht/Wt 1940	Ht/Wt 1952	Ht/Wt 1958	ΔHt/Wt 40-52	ΔHt/Wt 52-58	ΔHt/Wt 40-58	Ht 1940	Wt 1940	Wt 1952	Wt 1958	ΔWt 40-52	ΔWt 52-58	ΔWt 40-58
5 4	.07 721	.02 704	.02 673	.06 721	-.07 753	-.05 702	-.08 718	.01 702	.04 670	-.04 718	.08 755	.08 755	.08 704	.09 721	.03 704	.02 673	.06 721
3 4	.03 721	.00 704	.07 673	.02 721	-.06 753	-.04 702	-.04 718	.01 702	.05 670	-.01 718	.03 755	.05 755	.04 704	.04 721	.01 704	.05 673	.02 721
3 7	.21 660	.13 687	-.06 655	.08 660	-.15 693	-.21 685	-.20 657	-.08 685	-.02 652	-.06 657	.04 695	.16 695	.22 687	.19 660	.14 687	-.04 655	.10 660
1 7	.17 660	.13 687	-.06 655	.08 660	-.15 693	-.19 685	-.16 657	-.08 685	-.04 652	-.04 657	-.03 695	.12 695	.18 687	.14 660	.13 687	-.06 655	.08 660
0 9	.28 744	.13 688	.06 689	.18 743	-.16 741	-.18 687	-.26 741	-.08 686	.07 686	-.13 740	.01 744	.15 743	.18 689	.26 744	.14 688	.07 689	.20 743
8 9	.29 744	.11 688	.12 689	.21 743	-.15 741	-.16 687	-.28 741	-.05 686	.13 686	-.17 740	-.07 744	.10 743	.14 689	.24 744	.12 688	.13 689	.23 743
0 7	.18 622	.12 647	-.07 619	.06 622	-.13 649	-.18 645	-.16 619	-.08 645	-.04 616	-.04 619	-.01 651	.12 651	.17 647	.16 622	.13 647	-.06 619	.07 622

[illegible]

% Dev. 1940

% Dev. 1952

% Dev. 1958

Δ % Dev. 40-52

Δ% Dev. 52-58

Δ % Dev. 40-58

ENDO.

MESO.

ECTO.

ENDO-MESO

CHOL.

A.I.

Sf 12-20

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	S.f 12-20	Rate 1940	Rate 1952	Rate 1958	Δ Rate 40-52	Δ Rate 52-58	Δ Rate 40-58	PR 1940	PR 1952	PR 1958	ΔPR 40-52	ΔPR 52-58	ΔPR 40-58	QRS 1940	QRS 1952	QRS 1958	QT 1940	QT 1952	QT 1958	Δ QT 40-52	Δ QT 52-58	Δ QT 40-58	QRS vec. 1940	QRS vec. 1952	QRS vec. 1958	ΔQRS vec 40-52	ΔQRS vec 52-58	ΔQRS vec 40-58	Master rate	Δ Master rate	T vec. 1940	T vec. 1952	T vec. 1958	Δ Tvec. 40-52	Δ Tvec. 52-58	Δ Tvec. 40-58	QRS-T 1940	QRS-T 1952	QRS-T 1958	Δ QRS-T 40-52	Δ QRS-T 52-58	Δ QRS-T 40-58	init.04 1940	init.04 1952	init.04 1958	Δ init.04 40-52	Δ init.04 52-58	Δ init.04 40-58	term. .04 1940	term. .04 1952	term. .04 1958	Δ term.04 40-52	Δ term.04 52-58	Δ term.04 40-58	
07 61	.02 426	.02 673	-.02 644	-.04 680	-.05 593	.00 590	-.06 618	-.00 673	.02 644	.02 680	.01 592	.01 590	.02 618	-.03 678	.03 645	.10 680	-.05 673	.00 642	.02 690	.06 593	.04 591	.06 618	-.02 671	-.01 633	-.01 663	-.00 585	-.05 571	-.01 603	-.01 425	.03 418	-.05 679	-.03 644	-.05 676	.02 593	-.02 587	.04 616	.01 671	-.05 633	-.02 662	-.05 585	.00 571	-.01 603	-.06 544	.01 623	-.06 678	-.05 458	-.02 569	-.09 498	-.01 544	.02 623	.03 676	-.05 454	.00 569	-.02 498	R N Sys. BP 1940
01 61	-.01 426	.03 673	.01 644	.03 680	-.01 593	-.00 590	.02 618	.04 673	.02 644	.03 680	.01 592	.05 590	.03 618	.03 678	.00 645	.04 680	-.02 673	-.01 642	.01 690	.03 593	.09 591	.05 618	-.06 671	-.04 633	-.04 663	.03 585	-.03 571	.02 603	.11 425	.09 418	-.09 679	.00 644	-.04 676	.06 593	-.02 587	.02 616	-.01 671	-.02 633	.00 662	-.02 585	.00 571	-.01 603	-.02 544	.02 623	-.05 678	-.03 458	-.02 569	-.04 498	.00 544	-.02 623	-.04 676	.01 454	-.06 569	-.06 498	Dias. BP 1940
09 34	.08 418	-.02 620	.17 667	.14 628	.17 609	-.06 609	.12 570	.03 620	.04 667	-.02 628	-.00 608	-.00 609	-.01 570	.02 624	.03 668	.02 628	.02 620	-.09 666	-.01 636	-.09 609	.04 610	-.04 570	-.04 617	-.06 654	-.07 610	.02 601	-.05 589	-.01 555	.16 402	.12 395	-.07 625	-.08 667	-.05 623	-.00 609	.02 605	-.01 568	-.01 617	.04 654	.05 608	.04 601	.00 588	.02 555	-.09 492	-.14 646	-.11 626	.07 467	-.03 588	.00 451	-.01 492	-.02 646	-.01 624	-.00 463	.02 588	.02 451	Sys. BP 1952
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	% Dev. 1958
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Δ% Dev. 40-52
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Δ% Dev. 52-58
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Δ% Dev. 40-58
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ENDO-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	MESO-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ECTO-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ENDO-MESO
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CHOL
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A.I.

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[illegible]	[illegible] 259	[illegible] 259	[illegible] 428	[illegible] 408	.12 479	.04 366	[illegible] 404	.10 423	.08 428	.07 408	-.00 479	.05 366	.02 404	.03 423	-.06 431	-.14 410	-.09 479	.01 428	-.01 407	-.09 485	-.03 366	-.11 404	-.09 423	-.06 424	-.10 398	-.07 464	-.06 358	[illegible]	-.06 411	.08 326	.02 322	-.04 432	-.07 409	-.07 476	-.02 366	-.04 401	-.06 423	-.11 424	[illegible]
A. I.		.46 457	-.01 629	.01 436	.11 459	.02 404	.04 424	.10 420	-.02 629	.04 436	.06 459	.03 403	-.02 424	.03 420	-.07 432	-.08 437	-.04 459	-.03 529	-.03 435	-.06 462	.02 404	-.01 425	-.05 420	-.01 426	-.13 428	-.13 448	-.20 397	[illegible] 411	-.18 409	.08 300	.01 293	-.03 432	-.14 436	-.11 436	-.09 403	-.04 421	-.05 417	-.08 426	[illegible]
Sf 12-20			-.00 414	.03 419	.08 441	.05 390	.00 407	.08 405	-.00 414	.07 419	-.05 441	.09 389	-.08 407	.03 405	-.04 417	-.11 420	-.08 441	.00 414	-.00 418	-.05 444	-.01 390	-.06 408	-.07 405	-.04 411	-.04 411	-.09 430	-.07 383	[illegible]	-.13 394	.12 299	.11 292	-.07 417	-.08 419	-.09 438	-.06 389	-.01 404	-.03 402	-.07 411	[illegible]
Rate 1940				.23 629	.29 656	-.54 629	.00 574	-.56 656	-.17 722	-.01 629	.02 656	.15 628	-.04 574	.17 656	-.04 721	-.02 629	-.03 656	-.72 722	-.16 625	-.23 639	.52 629	-.08 575	.43 656	.00 712	.05 620	.04 641	.06 619	.01 558	.08 639	.16 398	-.01 391	.04 721	.06 628	-.01 653	-.01 628	-.07 571	-.03 653	-.04 712	[illegible]
Rate 1952					.39 629	.59 631	-.53 628	.14 577	-.00 629	-.13 690	.05 629	-.14 630	.19 628	.02 577	-.06 631	-.09 690	-.10 629	-.17 629	-.59 686	-.22 633	-.24 631	.18 629	-.04 577	.01 623	.04 675	.02 610	.05 622	[illegible] 607	.03 561	.23 402	.02 395	.05 632	.06 689	.07 625	.01 631	-.01 624	-.00 575	-.01 623	[illegible]
Rate 1958						.12 577	.48 630	.57 658	-.13 656	-.09 629	-.04 731	-.00 576	.00 630	.02 658	.03 659	-.00 631	-.08 731	-.17 656	-.30 625	-.49 727	-.07 577	-.24 631	-.25 658	.02 651	-.01 617	.01 712	-.03 568	-.04 609	-.00 643	.66 450	.04 443	.02 660	-.07 630	-.05 726	-.07 577	.00 626	-.05 657	-.03 651	[illegible]
Δ Rate 40-52							-.48 576	.55 577	.12 629	-.11 631	.01 577	-.16 630	.19 576	-.07 577	-.00 631	-.06 631	-.09 577	.38 629	-.39 627	-.01 581	-.60 631	.22 577	-.33 577	.02 622	.02 622	.01 562	.01 621	-.00 560	-.03 560	.08 362	.01 355	-.02 631	-.03 630	.06 574	-.01 630	.09 573	.02 574	.06 622	[illegible]
Δ Rate 52-58								.37 576	-.11 574	.05 628	-.06 630	.15 575	-.17 629	.00 576	.03 576	.07 630	.02 630	.04 574	.30 624	-.19 628	.16 576	-.38 630	-.20 576	-.01 568	-.07 616	-.05 611	-.10 567	-.01 608	-.05 560	.32 402	-.03 395	-.03 577	-.08 629	-.09 626	-.06 576	-.02 625	-.04 574	-.02 568	[illegible]
Δ Rate 40-58									.03 656	-.10 577	-.04 658	-.12 576	.07 576	-.10 658	.07 658	.04 577	-.01 658	.43 656	-.12 573	-.18 656	-.47 577	-.11 577	-.55 658	.04 649	-.02 568	.00 643	-.08 567	-.04 560	-.07 641	.39 398	.02 391	.03 658	-.08 576	.00 655	-.08 576	.07 573	-.01 655	.01 649	[illegible]
PR 1940										.55 629	.24 656	-.45 628	.05 574	-.48 656	.01 721	-.01 629	.08 658	.16 722	.04 625	.10 639	-.12 629	.01 575	-.08 656	-.03 712	-.01 620	-.07 641	.03 619	-.06 558	-.07 639	-.12 398	-.01 391	-.01 721	.05 628	.02 653	.06 628	-.01 571	.04 653	.03 712	[illegible]
PR 1952											.32 629	.35 630	-.39 628	.05 577	-.06 631	-.05 690	-.00 629	-.05 629	.11 686	.07 633	.12 631	-.06 629	.07 577	-.05 623	-.08 675	-.09 610	-.04 622	-.01 607	-.07 561	-.03 402	.04 395	-.03 632	-.08 689	-.05 625	-.05 631	.03 624	.01 575	-.00 623	[illegible]
PR 1958												.09 576	.16 630	.23 658	-.01 659	.01 631	.04 731	-.06 656	-.04 625	.20 727	.03 577	.04 631	.09 658	.03 651	-.01 617	-.00 712	-.02 568	.03 609	-.04 643	-.13 450	-.05 443	.02 660	-.03 630	-.02 726	-.07 577	.03 626	-.03 657	.00 651	[illegible]
Δ PR 40-52													-.38 576	.53 576	-.10 630	-.03 630	-.06 576	-.21 628	.10 626	-.01 580	.24 630	-.10 576	.14 576	-.01 621	-.07 621	-.02 561	-.10 620	.09 559	-.00 559	.01 362	.02 355	-.03 630	-.12 629	-.09 573	-.10 629	.05 572	-.02 573	-.02 621	[illegible]
Δ PR 52-58														.33 576	.06 576	.00 630	-.00 630	.04 574	-.21 624	.09 628	-.17 576	.26 630	.05 576	.09 568	.09 616	.09 611	.03 567	.00 608	.01 560	-.02 402	-.03 395	.07 577	.04 629	.01 626	-.03 576	-.00 625	-.06 574	-.01 568	[illegible]
Δ PR 40-58															-.05 658	-.05 577	-.01 658	-.20 656	-.11 573	.08 656	.08 577	.15 577	.24 658	.06 649	.01 568	.04 643	-.06 567	.06 560	-.00 641	.05 398	.03 391	.01 658	-.11 576	-.09 655	-.15 576	.02 573	-.08 655	-.05 649	[illegible]
QRS 1940																.73 631	.31 659	.10 721	.14 627	.01 665	-.06 631	-.03 577	-.09 658	-.26 718	-.04 622	.02 644	-.01 621	.02 560	-.02 642	-.05 401	-.10 394	.03 727	.02 630	.07 656	-.01 630	.05 573	-.01 656	.07 718	[illegible]
QRS 1952																	.66 631	.07 629	.20 686	.04 634	.07 631	-.11 631	-.04 577	-.05 623	-.04 677	-.00 612	.00 622	.02 609	.00 561	-.10 404	-.13 397	.01 632	.03 691	.08 627	.02 631	.01 626	-.02 575	.02 623	[illegible]
QRS 1958																		.07 656	.16 625	.17 727	-.00 577	.02 631	.06 658	-.10 651	-.07 617	-.05 712	.01 568	.01 609	.01 643	-.12 450	-.09 443	.01 660	.05 630	.03 726	.02 577	.00 626	-.01 657	.03 651	[illegible]
QT 1940																			.25 625	.23 659	-.68 629	-.00 575	-.66 656	.00 712	-.00 620	-.03 641	-.01 619	-.06 558	-.08 639	-.13 398	-.02 391	.00 721	-.01 628	.07 653	.02 628	.12 571	.06 653	.06 712	[illegible]
QT 1952																				.28 630	.46 627	-.50 625	.00 573	-.00 619	-.01 671	-.01 606	-.03 618	.00 603	-.05 557	-.23 401	-.04 394	-.07 628	-.00 685	-.02 621	.05 627	-.01 620	.06 571	.04 619	[illegible]
QT 1958																					-.03 581	.47 629	.43 656	-.07 657	-.03 620	-.06 708	.00 572	.02 607	-.03 641	-.38 453	-.01 446	-.07 666	-.02 633	.01 722	.02 581	.05 624	.01 655	.07 657	[illegible]
Δ QT 40-52																						-.34 577	.60 577	-.00 622	-.02 622	.01 562	-.03 621	.07 560	.05 560	-.04 362	-.01 355	-.04 631	.01 630	-.09 574	.03 630	-.13 573	-.03 574	-.02 622	[illegible]
Δ QT 52-58																							.38 577	-.03 569	-.01 617	-.01 612	.02 568	.02 609	.03 561	-.13 402	.06 395	.03 578	.02 630	.02 627	.03 577	.04 626	-.02 575	.05 569	[illegible]
Δ QT 40-58																								-.04 649	.01 568	-.01 643	.03 567	.07 560	.06 641	-.13 398	.02 391	-.06 658	.02 576	-.08 655	.04 576	-.08 573	-.04 655	.02 649	[illegible]
QRS vec. 40-52																									.80 622	.74 643	-.13 622	.16 560	.03 643	-.01 395	-.00 389	.40 719	.20 622	.21 648	-.20 622	-.00 565	-.08 648	.15 719	-.11 622
QRS vec. 52-58																										.86 609	.43 622	.02 609	.38 560	-.03 392	-.02 386	.36 623	.38 677	.30 613	.02 623	-.07 613	.01 566	.11 622	-.10 677
QRS vec. 40-58																											.28 560	.47 609	.63 643	-.03 436	-.00 430	.36 645	.32 611	.39 710	-.03 562	.09 610	.08 645	.11 643	-.06 609
Δ QRS vec. 40-52																												-.19 560	.56 560	.02 355	.03 349	-.00 622	.32 622	.17 565	.33 622	-.15 565	.14 565	-.05 622	.01 622
Δ QRS vec. 52-58																													.56 560	-.04 385	.01 380	.09 561	-.01 609	.23 608	-.12 561	.29 608	.12 561	.01 560	.03 609
Δ QRS vec. 40-58																														.01 387	.04 382	.08 643	.22 560	.34 643	.16 560	.15 560	.24 643	-.05 643	.01 560
																															.74 448	-.03 402	-.13 403	-.15 447	-.07 362	-.04 398	-.10 397	.02 395	.11 392
																																-.01 395	-.05 396	-.09 440	-.01 355	-.05 391	-.08 390	.04 389	.12 386
																																	.54 631	.49 657	-.42 631	-.03 574	-.33 657	-.36 719	-.11 623
																																		.64 626	.45 631	-.34 626	.15 574	-.18 622	-.22 677
																																			.16 574	.45 626	.53 657	-.14 648	-.08 613
																																				-.28 574	.48 574	.12 622	-.13 623
																																					.46 574	.04 565	.13 613
																																						.15 648	-.02 566
																																							.45 622

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Variable	Correlations (r over N)
A.I.	[illegible]
Sf 12–20	[illegible]
Rate 1940	[illegible]
Rate 1952	[illegible]
Rate 1958	[illegible]
Δ Rate 40–52	[illegible]
Δ Rate 52–58	[illegible]
Δ Rate 40–58	[illegible]
PR 1940	[illegible]
PR 1952	[illegible]
PR 1958	[illegible]
Δ PR 40–52	[illegible]
Δ PR 52–58	[illegible]
Δ PR 40–58	[illegible]
ORS 1940	[illegible]
ORS 1952	[illegible]
ORS 1958	[illegible]
OT 1940	[illegible]
OT 1952	[illegible]
OT 1958	[illegible]
Δ OT 40–52	[illegible]
Δ OT 52–58	[illegible]
Δ OT 40–58	[illegible]
ORS vec. 1940	[illegible]
ORS vec. 1952	[illegible]
ORS vec. 1958	[illegible]
Δ ORS vec. 40–52	[illegible]
Δ ORS vec. 52–58	[illegible]
Δ ORS vec. 40–58	[illegible]
Master rate	[illegible]
Δ Master rate	[illegible]
T vec. 1940	[illegible]
T vec. 1952	[illegible]
T vec. 1958	[illegible]
Δ T vec. 40–52	[illegible]
Δ T vec. 52–58	[illegible]
Δ T vec. 40–58	[illegible]
ORS–T 1940	[illegible]
ORS–T 1952	[illegible]
ORS–T 1958	[illegible]
Δ ORS–T 40–52	[illegible]
Δ ORS–T 52–58	[illegible]
Δ ORS–T 40–58	[illegible]
init. .04 1940	[illegible]
init. .04 1952	[illegible]
init. .04 1958	[illegible]
Δ init. .04 40–52	[illegible]
Δ init. .04 52–58	[illegible]
Δ init. .04 40–58	[illegible]
term. .04 1940	[illegible]
term. .04 1952	[illegible]
term. .04 1958	[illegible]
Δ term. .04 40–52	[illegible]
Δ term. .04 52–58	[illegible]
Δ term. .04 40–58	[illegible]

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Osborne, R. K. 1963
W. R. Harlan, Jr., A Graybiel

A LONGITUDINAL STUDY OF HEALTHY YOUNG MEN: CORRELATION COEFFICIENTS. BuMed Project MR005.13-3001 Subtask 2, Report No. 7. Pensacola, Fla.: Naval School of Aviation Medicine, 15 July.

A longitudinal study of a group of healthy young men followed over an 18-year period is described. The relationships among data from three examinations of this group are presented in the form of correlation coefficients. A correlation matrix of 106 continuous variables is recorded as a reference for other investigators. Pertinent statistical considerations are outlined and briefly discussed.

Aviation medicine

Medical statistics

Aviators—Follow-up study

Osborne, R. K. 1963
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