# PJC

# PAKISTAN JOURNAL OF CARDIOLOGY

VOLUME 24, NO. 3-4, JULY — DECEMBER 2013

PJC Vol 24, No. 3 & 4
July — December 2013



# CORONARY HEART DISEASE AND FIVE FACTOR MODEL OF PERSONALITY: A STATISTICAL ASSESSMENT OF THE LINK[1]

*NAVEED YAZDANI *, AHMED FAISAL SIDDIQI ***

**This empirical study explores the role of personality traits in causation of Coronary Heart Disease (CHD). A total of 231 participants including both confirmed cases of CHD and non-patients were surveyed. Data regarding personality traits was collected by using TIPI instrument while closed-ended questions elicited data about other medical and demographic variables of interest. Logistic Regression analysis[2] was used to isolate significant personality traits in relation with the dependent variable CHD. Baron & Kenny mediation approach was employed in the attempt to isolate mediators of the study. Analytical findings are discussed in the light of cardiology and personality literature review undertaken to arrive at theory developed in the paper. Future research implications and major limitations of this study are also discussed.**

**Key Words: Coronary Heart Disease (CHD), Five Factor Model (FFM) of Personality, Logistic Regression, Mediation Analysis, Personality/Heart Disease Link**

**PJC 2013; 24: 05-22**

## INTRODUCTION

Medical research has linked some personality traits with the occurrence of coronary heart disease (CHD). Some researchers however challenge the validity of such claims (Nicholson et al., 2006; Khan et al., 2010; Kuper, 2009) but generally it is accepted that personality traits play a role in the causation of CHD. This paper attempts to study the link between personality traits and CHD by employing a well-researched, well-accepted and comprehensively tested Five Factor Model (FFM) of personality from Organization Theory.

According to WHO CHD is "an acute or chronically impaired performance of the heart caused by a reduction or complete interruption of myocardial blood supply resulting from atherosclerosis of the cardiac arteries" (Lohe, 2003, p. 2). Putting simply CHD is manifested as a typical type of chest pain with or without progressing to a heart attack or myocardial infarction (Dulmus & Rapp-Paglicci, 2005, p. 165).

CHD results from many interacting causal factors. These factors are demonstrated to be additive in their predictive power (Schinka et al., 2003, p. 340). Non modifiable CHD risk factors are age, male gender and family history of coronary artery disease in young age. This paper focuses on modifiable risk factors of CHD which include hyperlipidemia, hypertension, diabetes mellitus, cigarette smoking, obesity, physically inactive life style and, certain personality traits (Carpenter et al., 2007, p. 98-99; Colledge et al., 2008, p. 578-579; Caballero, 2009, p. 122; Sokolov, 1994, p. 140; Lohe, 2003, p. 16-33; Dulmus & Rapp-Paglicci, 2005, p. 167-174; Baliga et al., 2005, p. 96; Gotto, 1998, p. 1-10; Shah, 2006; Jowett & Thompson, 2003, p. 47-56;

* *spa.dir@umt.edu.pk*
*Director School of Professional Advancement University of Management & Technology Lahore.*

** *afs.ahmedsiddiqi@gmail.com*
*Associate Dean*
*School of Business & Economics University of Management Technology, Lahore.*

Floyed et al., 2007, p. 245-251; Rubin, et al., 2008, p. 446; Neaton & Wentworth, 1992; Stamler et al., 1986; Wilson et al., 1998).

This paper employs logistic regression to assess the link between Five Factor Personality Traits and incidence of CHD. It also explores the possibility of other variables acting as partial or full mediator in this relationship. The paper has six sections. The first two briefly surveys the literature for link between personality traits and CHD and also introduces the Five Factor personality model. Section three covers the research strategy of this paper including sampling, consent procedures and discussion on the measuring instrument used to collect data for this study from 231 participants including CHD patients and non patients. Section 4 details the assumptions and the analytic plan undertaken along with reporting the results while section 5 discusses the results and points towards future directions. Section 6 presents the major limitations of this study.

## 1. CHD and Personality Traits

Research links CHD with many personality related factors such as anger, hostility, aggressiveness, depression, negative emotional states and stress handling and coping capabilities (Khan et al., 2012; Vitaliano et al., 2002; Krantz & Mc Ceney, 2002; Wulsin & Singal, 2003). Rosenman et al. (1975) identified Type A personality traits as impatient, quick tempered, hard-driven, aggressive, ambitious, hostile, anxious, irritable and, competitive. By and large medical research follows this model of personality as a causative factor in producing CHD (Floyd et al., 2007, p. 29-30: Schinka, et al., 2003, p. 349; Riska, 2004, p. 50-54).

Most of the above mentioned Type A personality traits are thought to produce stress which "is the excitement, feeling of anxiety, and/or physical tension that occurs when the demands placed on an individual are thought to exceed the person's ability to cope" (Hellriegel & Slocum, 2009, p. 189-190; Ader, 2007, p. 726; Katiyar et al., 1989; Srivastava et al., 2003). Stress results in changes in body physiology by altering hormone levels (e.g. ACTH), causing immune deficiencies and setting forth vascular changes which ultimately lead to CHD, hypertension, immune disorders, diabetes mellitus and other disease (Feldman et al., 2003, p. 304-309; Squires, 2010, p. 247-250; Guthrie & Guthrie, 2009, p. 53; Samaras, 2007, p. 247). Medical research specially highlights the link between CHD and stress and depression prone personality traits (Smith & Traupman, 2011, p. 197-217; Stampfer et al., 2012; Frasure-Smith & Lesperance, 2006; Kuper et al., 2006; Van der Koy et al., 2007; Rugulies, 2002; Bunker, 2003).

Stress is an inescapable fact of life. But it is also known through research that not everyone is prone to stress in same way. Different individuals deal with stress differently. This differential in stress coping and handling capabilities is rooted in certain personality traits. It is personality traits of an individual person which prompts one to adopt either healthy or unhealthy habits such as hostility, anger, negative feelings, smoking, excessive drinking, over eating and, physical inactivity. As discussed above these factors have confirmed link with the development of coronary heart disease through increasing incidence of hypertension, increased cholesterol levels, diabetes and increase in production of stress related hormones like cortisol and adrenaline (Miller & Shelly, 2010, p. 54-61; Contrada & Baum, 2011, p. 386-387; Rubin et al., 2008, p. 446). Persistent elevated levels of these hormones cause vascular damage leading to the development of CHD.

For example emotional stress is known to impact the metabolism of glucose by impairing the glucagon/insulin axis to disturb the glucose homeostasis which leads to diabetes mellitus (Davidson, 2000, p. 778). This observation implicates personality based stress handling and

coping capabilities in the production of diabetes which is a modifiable risk factor for CHD. A meta-analytic study involving 25,469 participants confirmed expectations that elevated blood pressure is associated with specific personality traits like negative affectivity, defensiveness and anger (Jorgensen et al., 1996) and thereby personality is again linked with production of modifiable risk factor for CHD. Obesity is also known to be linked with a specific type of personality which is outgoing, socially skilled and productive group members (Blackburn & Kanders, 1994, p. 155; St. Jeor, 1997, p. 367-370). Studies have also linked obesity with a specific type of personality exhibiting symptoms such as fear of abundance, emptiness and boredom, frequent angry outbursts, impulsiveness and suicidal tendencies (www.ncbi.nln.nihi.gov; Sansone et al., 1997). Smoking is also known to be linked with conscientiousness, extraversion, hostility and, neuroticism (Turner et al., 1995, p. 73; Matthews et al., 2003, p. 288). The biological mechanism underpinning personality type/CHD link is that CHD prone personality has more tendency for increased lipid deposition within arterial walls. It is also documented that such personalities have active vasomotor function that change endothelial lining of the arteries which leads to vasoconstriction (Piette, et al., 1996, p. 72-73; Friedman, 1990, p. 289-290) and hence increasing the incidence of CHD.

### *Proposed Theory*

The above discussion leads to our theory that the stress prone personality traits either directly cause CHD through arterial damage and vasoconstriction or indirectly leads to it by increasing the incidence and propensity of an individual to develop diabetes, hypertension, hyperlipidemia, smoking, alcohol consumption, bad dietary habits, and obesity which are all known to be predisposing factors for CHD.

## 2. Five Factor Model (FFM) of Personality

Human beings are thought to be different from each other on basis of their personality traits (Goldberg, 1990). Studies suggest that upto 60% of personality traits are inherited while the rest are acquired through environment (Livesley, 2003, p. 70; Benjamin et al., 2002, p. 57-58; Matthews et al., 2003, p. 159; Carducci, 2009, p. 368-370; Loehlin & Nicholas, 1976; Loehlin, 1982; Tellegen et al., 1988). Personality theory attempts to frame and evaluate models of human nature (Hogan, 1991). Different theories and frameworks of personality have been put forth. This paper uses the FFM of personality which is rooted in the lexical work of Sir Francis Galton (Goldberg, 1990). FFM is chosen for this study because of its long history of use during which it has withstood tests of generalizability, validity and reliability (Clarke & Robertson, 2005; Guenole & Chernyshenko, 2005; Bono & Judge, 2004; Barrick & Mount, 1991; Judge et al., 1997; Judge et al., 2002; Barrick et al., 2002; Judge et al., 2002; Llies & Judge, 2003; Thoresen et al., 2004) to the extent that it is termed as "latitude and longitude" (Funder, 2001) of the construct personality. During the recent years FFM has been successfully and reliability used in diverse fields such as accident propensity, cross cultural research on work values, adult attachment and job mobility, mental ability and career success, formation and violation of psychological contracts, transformational and transactional leadership and, counseling and clinical psychology (Clarke & Robertson, 2005; McCaan, 2005; Furnham et al., 2005; Aluja & Garcia, 2004; Judge & Higgins, 1999; Raja et al., 2002; Bono & Judge, 2004; Guenole & Chernyshenko, 2005; McCrae & Costa 1985 & 1987; McCrae & John, 1992).

There are five basic components of FFM Model: Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience. A brief description of the five elements follows.

### I. Extraversion

Extraversion is one of the most researched of all the personality traits of FFM (Raja et al., 2002; Goldberg, 1990; McCrae & Costa, 1989). Extraverts are sociable, gregarious, assertive, talkative, active, energetic, enthusiastic, high sensation seekers, have positive emotions (PA), spontaneity, boisterousness, conceit, vanity, and sensuality, lower level of vigilance, risk takers and thrill seekers and bored by monotonous conditions (Hogan, 1983; Bono & Judge, 2004).

### II. Agreeableness

Individuals high in agreeableness basically value affiliation and avoid conflict (Bono & Judge, 2004). Individuals high on agreeableness are generally easy to get along and friendly. One of their cardinal traits is flexibility and ability to adapt and adjust in diverse situations and circumstances. They are likeable characters who easily conform to social norms. They are problem solvers and unlikely to engage in conflicts and acts of hostility and anger. Considered as natural team players they are courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted, tolerant, appreciative, generous, kind, sympathetic, pleasant, non-defensive, tactful, friendly, humane, moral, amiable, warm, natural and easy to go along (Costa & McCrae, 1992; Goldberg, 1990).

### III. Conscientiousness

Conscientious individuals are organized, reliable, hardworking, determined, self-disciplined and achievement oriented (Barrick et al, .2002). Along with extraversion, Conscientiousness is also one of the extensively studied factors of the FFM. At the heart of conscientious behavior lies the desire to exercise self-control and autonomy and to follow dictates of one's conscience (Costa & McCrae, 1992). Not surprisingly most of conscientious individuals focus on task accomplishment and fulfillment of obligations. They are found to be thorough in decision making and perceive themselves to be healthy, strong willed, achievers, dependable, careful, hard-working, reliable, mature, objective, logical, punctual and conventional (Barrick et al, 2002).

### IV. Neuroticism

After extraversion and conscientiousness, neuroticism is the third most researched personality trait of FFM (Raja et al, 2002). Individuals high on neuroticism are emotionally unstable, with frequent mood swings and closely associated with negative affectivity or NA. The element of NA tends to force neurotics with a negative world view with a propensity to be anxious, sleepless and doubting. As a result they are less inclined to seek control of their life and work environment. "They easily experience negative affects and are easily distractible, respond negatively to environmental stresses, anxious, depressed, angry, hostile, insecure, worried, self-pitifying, touchy, unpredictable, fearful, envious, timid and immature (Bono & Judge, 2004).

### V. Openness to Experience

Openness to experience is the least studied FFM personality dimension. Individuals high on openness to experience tend to be highly sensitive to art, science, culture and civilization (Clark & Robertson, 2005). Because they are 'open to experience' they are more effective in managing change and transition (Thoresen et al., 2004). They are unconventional, curious, cultured, intelligent, open to new ideas, flexible, reflective, imaginative, original, insightful and, artistic (Bono & Judge, 2004).

Based on the above discussion of CHD and FFM the proposed link between personality traits and CHD is sought by this study's exploratory research question framed as the following hypothesis:

*Hypothesis 1: How does extraversion, agreeableness, conscientiousness, neuroticism and openness to experience impacts incidence of CHD?*

## 3. Research Methodology

### *Participants*

A total of 231 participants (159 males and 72 females) from different areas of Punjab participated in this research. The sample comprises of two broad groups: 176 CHD patients and 55 non-patients. CHD patients are diagnosed cases of CHD who were either surveyed in the in-doors or out-doors of public and private hospitals and clinics in Lahore. CHD patients' demographics were intentionally mirrored in the non-patient group in order to ensure the two sample groups have no demographic biases affecting the results of the study. In this sense the sample of this study can be considered as purposive. The overall mean age for CHD patients is 55 years and for non patients it is 53 years. Overall mean age for men is 53 while for women it is 59 years. Table 1 depicts the demographics of both groups of participants:

**TABLE-1**

| CHD Patients (176) | Non-Patients (55) |
|---|---|
| Gender: Male *(70.5) | 64 |
| Female (29.5) | 36 |
| Patient Category: General Patients (81.8) | 0 |
| Non-Patients (0) | 100 |
| Private Patients (18.2) | |
| Profession: Govt. Job (7.4) | 12.7 |
| Private Job (9.7) | 25.5 |
| Housewives (28.4) | 21.8 |
| Business/Self-employed (23.9) | 12.8 |
| Retired (8) | 14.5 |
| Laborer/Agriculture (21) | 12.7 |
| Creative work/poets (0.6) | 0 |
| Education: Non-educated (45.5) | 14.5 |
| Matriculate (21.6) | 14.5 |
| Graduate (22.7) | 27.3 |
| Post-graduate (9.7) | 41.8 |
| Cast: Syed (4.5) | 14.5 |
| Rajput (9.1) | 14.5 |
| Arian (13.1) | 16.4 |
| Jat (8.5) | 10.9 |
| Sheikh (4.5) | 3.6 |
| Other Punjabi (31.2) | 18.2 |
| Gujjar (1.7) | 1.8 |
| Malik (4) | 1.8 |
| Kashmiri/Butt (4.5) | 5.5 |
| Bhatti (6.2) | 3.6 |
| Non-Punjabi (7.4) | 5.5 |
| Income: upto 30,000pm (67) | 29.1 |
| 30-60,000pm (18.2) | 27.3 |
| 60-90,000pm (9.7) | 27.3 |
| Above 90,000pm (5.1) | 16.4 |
| Area of Residence**: Posh (11.9) | 52.7 |
| Non-posh (87.5) | 47.3 |

* All figures for both Patient and Non-Patient categories are in percentages.

** Posh areas of Lahore include DHA, Gulberg, GORs, Shadman, Cavalry, Model Town, Bharia Town, Cooperative Societies and certain Towns e.g. WAPDA Town.

### *Measuring Instrument*

Researchers use many versions of Big-Five personality instruments (Burisch, 1984; Sandvik et al., 1993). Realizing the need for developing a brief but reliable instrument Gosling et al. (2003) developed and tested Five Item Personality Inventory (FIPI) and Ten Item Personality Inventory (TIPI) for measuring the Big Five personality traits. Because this study primarily covers indoor and outdoor diagnosed cases of CHD who were questioned in the hospitals and private clinics and were short of time due to various factors therefore it employs Gosling et al. TIPI.

To test the reliability and validity of TIPI Gosling et al. (2003) conducted a study involving 1813 participants. The results showed satisfactory levels of convergent validity (mean r = .77), test-retest reliability (mean r = .72) and pattern of external correlates (exceeding 0.9). TIPI was also

3. The hospitals included Punjab Institute of Cardiology (PIC) and Sheikh Zayd Hospital.

found to be satisfactory psychometrically. They also reported Cronbach's alpha for measuring extraversion (.68), agreeableness (.40), conscientiousness (.50), neuroticism (.73) and openness to experience (.45). On the average a Cronbach's alpha of .55 was reported for TIPI.

### *Consent and Procedure*

Following Ang & Huan's (2006) methodology formal consent for conducting this research and data collection was obtained from the authorities for public hospital patients and from consultant cardiologist in case of private patients. All patient survey questionnaires bear relevant official seals. All patient and non-patients were also explained the purpose of the research and they participated on strictly voluntary basis. Medical information was obtained from the patients/relatives and cross checked from the hospital/ward files with the help of resident doctors and nursing staff. TIPI questionnaire was translated in Urdu and the scoring scale was carefully explained to the participants and their attending relatives. In order to boost the reliability most of the time TIPI responses given by the participants were cross checked from the relatives.

## 4. Data Analytic Plan

A meta-analysis study (Kohli & Devaraj, 2003), covering 66 firms shows that choice of dependent variable is an important determinant of the type of regression analyses to be undertaken. The relationship between a single dependent and multiple independent variables is best assessed through logistic regression. This is especially true when the dependent variable is not numeric (for example age) but binary or categorical or dichotomous with two categories. Because of the binary nature of the dependent variable, finding the relationship between independent variables and a logit function of probability (also called the log-odds function) of occurrence is possible. Because of logistic regression's ability to predict the probability of an event's occurrence, it has been widely employed in medical research (Sweet & Grace-Martin, 2010, p. 157-167; Meyers et al., 2006). Over and above logistic regression does not require some the tough assumptions of multiple and discriminant regression techniques (Leech et al., 2005, p. 109).

The type of dependent variable used in this study has only two categories: CHD patients or non-patients coded as 1/2 and are mutually exclusive. The independent variables of this study are multiple and therefore logistic rather than linear regression is employed for analysis. Discriminant analysis is not employed for this study because there is no issue of classifying observations (Press & Wilson, 1978) and also because of much stringent assumptions required to be met for it. The data plan of this study develops the logit probability function in determining which independent variables are to be used in formulating the function. The independent variables used in the function development are the ones which have a significance level below 0.05. This cut-off point is consistent with many social science studies employing statistical methods which utilize Bonferroni correction (Morgan et al., 2004, p. 121; Leech et al., 2005, p. 109-110).

The goal of multiple regression employed in this study is however explanatory rather than investigatory or analytic. This is because this paper seeks to gain insights and understanding of different personality traits (independent variables') relation with CHD or the dependent variable. The analytic plan of this study will therefore pay prime attention to interpreting the size and sign of the regression weights while R-square will only be of limited value from the perspective of this study. This is consistent with standard practices employed by researchers when interpreting multiple regression analyses (Beckstead, 2012).

Tables 2 to 4 report some of the key findings.

**TABLE-2**

| Omnibus Tests of Model Coefficients | | | | |
|---|---|---|---|---|
| | | Chi-square | df | Sig. |
| Step 1 | Step | 15.196 | 10 | .125 |
| | Block | 15.196 | 10 | .125 |
| | Model | 15.196 | 10 | .125 |

The first step in this analysis checks goodness of the fit of the model. In logistic regression the R-square type of fitness analysis carried out in linear regression is conducted through examining Chi-Square which tests whether the model as a whole is able to make a good prediction or not. In this case low Significance value (0.125) does not suggest that this 10 variable mode is particularly useful for making prediction.

**TABLE-3**

| Model Summary | | | |
|---|---|---|---|
| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
| 1 | 238.384[a] | .064 | .096 |

Similarly the Cox & Snell and Nagalkerke R Squares values (0.064) and (0.096) do not seem very high.

The above Table is most important in formulating a logistic regression-based function equation. The B values indicate that Neuroticism has the highest value (-0.282). This means that this variable is the most important determinant of predicting CHD on the basis of personality. Similarly Openness (-0.281) and Agreeable (R) (0.250) are also important determinants. These three variables are also the only significant variables (p value less than 0.05) whereas all the other variables are non-significant. The B values in Logistic Regression are a bit more complex than linear regression coefficients because B values represent the influence of a one-unit change in the independent variable on the log-odd of the dependent variable.

The values of Exp(B) gauge the strength of the relationship. This ratio indicates how many times higher the odds of occurrence are for each one unit increase in the IV. For example in this case each one unit increase in reverse agreeableness increases the odds of CHD by a factor of 1.283. The odds of CHD are decreased by factors of 0.754 and 0.755 for neuroticisms and openness to experience. This forms a crude rank order to screen the individuals for having propensity to CHD by giving priority to the IVs in the following order:

**TABLE-4**

| Variables in the Equation | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | B | S.E. | Wald | df | Sig. | Exp(B) |
| Step 1[a] | Extraversion | .143 | .124 | 1.328 | 1 | .249 | 1.154 |
| | AgreeableR | .250 | .111 | 5.076 | 1 | .024 | 1.283 |
| | Conscient | .128 | .115 | 1.227 | 1 | .268 | 1.136 |
| | Neurotic | -.282 | .123 | 5.287 | 1 | .021 | .754 |
| | Openness | -.281 | .128 | 4.818 | 1 | .028 | .755 |
| | ExtraversionR | -.027 | .113 | .056 | 1 | .812 | .973 |
| | Agreeable | .033 | .134 | .062 | 1 | .803 | 1.034 |
| | ConscientR | .104 | .110 | .900 | 1 | .343 | 1.110 |
| | NeuroticR | -.035 | .116 | .092 | 1 | .762 | .966 |
| | OpennessR | -.084 | .123 | .471 | 1 | .492 | .919 |
| | Constant | -.942 | 1.653 | .325 | 1 | .569 | .390 |

1. Reverse agreeableness
2. Openness to experience
3. Neuroticism

Other personality variables are not included in this rank order because their significance values are quite high as compared to the above 3 factors.

Logistic Regression Function (LRF) Development

LRF of this study is developed following the procedural footsteps of Sweet & Grace-Martin (2010, p. 158-164). The LRF can help a medical researcher predict the possibility of developing CHD in an individual on the basis of above three personality traits.

Logistic Regression Equation or log-odds (Based on Variables in Equation Table)

= A+B(X) where A is the Constant, B the relevant B value of the variable and X is the degree of the IV (as measured on Likert scale of 1 to 7 in this case) which can be very low or very high or somewhere between the two extremes.

Taking anti-log the equation becomes
Odds = Exp (A+B(X))
The formula for converting odds to probabilities is now applied:
Probability = odds/1+odds or
Exp(A+B(X))/1+Exp(A+B(X))

The degree of IV or X is taken for all 3 variables as 7 which means very high. Now the probability are calculated for each the 3 variable.

Reverse agreeableness and CHD development probability

= (-0.942 + 0.250 (7))/1+ (-0.942 + 0.250 (7))
= 0.808/1.808
= 0.45 or 45%

The B values for openness to experience and neuroticism are negative and hence the probability of developing CHD will also be negative if the above function equation is applied in their cases.

## Mediation Analysis

This part of analysis will explore if the relationship between personality traits and CHD is mediated by other variables or not. Figure 1depicts the standard mediation model employed for this analysis.

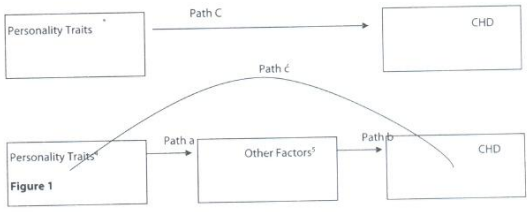

Figure 1

## Methodological Assumptions

Moderated and mediation multiple regression analyses have gained considerable importance in management research over the past few decades (Aguinis, 1995; Aguinis & Gottfredson, 2010; Collins et al., 1998). This analysis will assess if the relation between CHD and personality traits is intervened or mediated by other variables.

In line with the research practices prevalent in the behavioral science research this analysis will employ Barron & Kenny (BK) approach "which directly assess the effect of a proposed cause on some outcome through a proposed mediator" (Baron & Kenny, 1986; James & Brett, 1984; Praecher & Hayes, 2004; Dunegan et al., 2002).

BK approach involves 4 causal steps (Wood et al., 2008; James et al., 2006: Collins et al., 2010; Ang & Huan, 2006) which are based on the following conditions.

4. These include only three FFM factors reverse agreeableness, openness to experience and neuroticism because they reported p values<0.05.
5. Other factors include both medical (hypertension, diabetes, cholesterol level, smoking) and demographic factors like education, income level, area of residence, age, gender and cast.

1. 'variations in the levels of the independent variable significantly account for variations in the presumed mediator' (Path a)
2. 'variations in the mediator significantly account for variations in the dependent variable' (Path b)
3. 'when Path a and b are controlled, a previously significant relation between the independent and dependent variables is no longer significant, with the strongest demonstration of mediation occurring when Path c' is zero. This is consistent with full mediation, whereas a reduction in Path c is consistent with partial mediation' (Wood et al., 2008; Preacher & Hayes, 2004).

These assumptions result in the following sets of equations:

1. CHD = PTB1 + E (Path c)
2. AG = PTB2 + E1 (Path a)
3. CHD = AGB3 + E2 (Path b)
4. CHD= PTB4 + AGB5 + E

Where CHD = Coronary Heart Disease, PT = Personality Traits, AG = Respondents' Age, B1, B2, B3, B4 and B5 are the regression coefficients and E = Error Term.

If all Betas (B1, B2, B3, B4 and B5) are significant then AG or Age is a mediator between the relationship of Personality Traits and CHD.

**Methodological Steps undertaken for Mediation Analysis**

1. The three significant personality traits have come out to be reverse agreeableness, openness to experience and neuroticism. Alpha coefficient of the TIPI measuring instrument is reported.
2. It is assumed that the role of Personality Traits in causation of CHD is mediated by other medical and demographic variables like age, hypertension, diabetes, caste and, income and education levels.
3. Each personality trait is subjected to BK approach for all the possible mediators using linear regression technique.
4. The details of only one such analysis (age as a mediator between reverse agreeableness and CHD) is fully illustrated through regression tables.
5. The results of possibility of other medical and demographic variables acting as mediators are only reported.

Cronbach's Alpha of the measuring instrument (TIPI) comes out to be -0.823 when all ten items are considered. The negative value is due to a negative average covariance among items. This violates reliability model assumptions. The TIPI items were therefore split into two sets of 5 items (each set measuring Alpha Coefficient for the positive and negative items). The 5 items in the positive set report a Cronbach Alpha of 0.196 whereas for the other set the value (because of negative covariance among items) remained negative.

Mediation analysis using the BK approach is illustrated below by Tables 5 to 8.

**TABLE-5: EQUATION 1**

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.112 | .072 | | 15.448 | .000 |
| | AgreeableR | .032 | .017 | .125 | 1.901 | .059 |

a. Dependent Variable: Diagnosis

**TABLE-6: EQUATION 2**

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 54.509 | 1.569 | | 34.733 | .000 |
| | AgreeableR | .107 | .367 | .019 | .292 | .771 |

a. Dependent Variable: Age

**TABLE-7: EQUATION 3**

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.437 | .170 | | 8.476 | .000 |
| | Age | -.004 | .003 | -.079 | -1.192 | .235 |

a. Dependent Variable: Diagnosis

**TABLE-8: EQUATION 4**

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.316 | .180 | | 7.310 | .000 |
| | Age | -.004 | .003 | -.081 | -1.236 | .218 |
| | AgreeableR | .032 | .017 | .126 | 1.927 | .055 |

a. Dependent Variable: Diagnosis

As the above Tables show B1, B2, B3 and B4 are all non significant. Therefore Age is not a mediator between the relationship of reverse agreeableness and CHD.

Gender, diabetes, cholesterol level, body weight, profession and educational levels show at least 2 significant B values and the significance of reverse agreeableness decreases from 0.059 (with CHD) to 0.052, 0.038, 0.040 and 0.019 in case of diabetes, body weight, profession and educational level respectively. But it is important to note that in all of these instances the relationship between CHD and the mediator is straightaway significant.

Similar analyses conducted for openness to experience and neuroticism report the following results.

Profession and diabetes show 2 while education, income and address have 3 significant B values when relation between openness to experience with CHD is assessed through mediation analysis.

In case of neuroticism gender, caste and weight have significance levels of 0.018, 0.012 and 0.025 with neuroticism while two significant B values are shown in the mediation relation involving education, income and address.

## 5. Discussion, Conclusion & Future Directions

The initial research inquiry of this study sought to explore the role played by FFM personality traits in the incidence of CHD. Logistic analysis employed in this study isolates three FFM traits as statistically significant ($p<0.05$): reverse agreeableness, openness to experience and neuroticism.

Before discussing the significance of reverse agreeableness it would be pertinent to know what it means. It is an exact opposite to agreeableness described in section 2 under the FFM model of personality. A reverse agreeable individual (either very low on agreeableness or high on reverse agreeable item of the TIPI) would be conflict prone, not valuing affiliations and relationships, difficult to get along, and unfriendly. This individual would also be inflexible and find it very difficult to adjust to diverse situations and to conform to social norms. He/she will be prone to bursts of anger and hostility and be viewed as unforgiving, non-trusting, discourteous, unsympathetic, unpleasant, defensive, and non-tactful (as implied in the description of agreeableness by Costa & McCrae, 1992; Goldberg, 1990; Bono & Judge, 2004).

In short the above describes personality pictures of an NA associated, stress-prone, angry, hostile and quarrelsome individual. This supports the theory presented in the first section where medical research was used as basis for forming a relation between stress-prone personality and CHD. This relation was postulated as working directly by causing stress-induced arterial damage or indirectly by increasing these individuals' propensity to develop hypertension, diabetes, increased cholesterol levels, unhealthy dietary habits and smoking. Table 4 shows that reverse agreeableness is ranked 3 in terms of B value (with a positive sign) whereas its p value is 0.024. On the basis of both theoretical and analytical support of this study it is plausible to conclude that reverse

agreeableness is linked with the incidence of CHD found in the sample. The Logistic Regression Function (LRF) developed on log-odds also predicts that an individual scoring very high on reverse agreeableness would have 45% chances of developing CHD[6].

The other statistically significant FFM trait of this study comes out to be openness to experience. A negative sign of its B value (Table 4) implies that its relation with CHD is of inverse nature: more an individual is low on openness to experience the higher is the incidence of CHD. The isolation of openness to experience is of special interest in the context that it is the least researched of all the FFM traits. It is associated with highly developed cultural, artistic and scientific tastes. Does this imply that people having these 'higher' qualities would be less susceptible to CHD is for question of future studies. The statistical analysis of this study seems to suggest that people devoid of these 'higher' qualities are more prone to be CHD patients. How does refined tastes (and probably education level) relate with pathophysiology of cardiovascular system is an interesting question for medical researchers to ponder.

The third significant FFM factor related with CHD is through this study is neuroticism. It has the largest B value out of all other factors and its traits of anger and hostility are too obvious to link it with stress and CHD. The surprising finding however is that its B value has a negative sign. It is difficult to interpret this finding but this study confirms that neuroticism is significantly related with the development of CHD in some way which is not as straightforward as the above two findings. Perhaps there are some hidden factors and variables which this analysis has not exposed till this point but they seem to be playing their part in linking neuroticism with CHD albeit in a curious and unexpected way.

The mediation analysis carried out in this study does not isolate any full mediator(s) in the sense of Preacher & Hayes (2004) and Woods et al. (2008) between the relation of FFM traits (reverse agreeableness, openness to experience and neuroticism) and CHD. But there are some interesting findings which seem to suggest that gender, caste diabetes, cholesterol levels, body weight, profession, education, income and area of residence do cause reduction in the initial significance level of FFM trait and CHD significance. Similarly these factors also yielded at least 2 betas (sometimes 3 but never all) as significant when the traditional Baron & Kenny approach was applied. As already discussed in the earlier sections age and male gender are non modifiable CHD risk factors while diabetes, cholesterol levels, and obesity are modifiable risk factors. That fits with mediation analysis findings of this study but the emergence of caste, area of residence, profession and education and income levels as partial mediators is quite interesting but again consistent with mainstream cardiology medical research which identifies 'inactive life style' as a modifiable risk factor. It is quite plausible that these partial mediators are related with life style in a way and affect the level of physical activity, choice of food and cigarette smoking of an individual. Curiously though, smoking does not appear as even a partial mediator in the relation between FFM traits and CHD. This is in conflict with personality studies (for example Turner et al., 1995 & Matthews et al., 2003) which link FFM personality traits with propensity to smoke. This is perhaps a culturally and contextually a specific finding but definitely interesting enough to generate future research. Same is the case with hypertension which did not appear as mediator of any sort in this study. While carrying out BK analysis it was important to note that most of the partial mediators (gender, diabetes, cholesterol level, body weight, profession and education levels) had a significant relation with the dependent variable of this study. Future studies need to further explore the role and link and direction of causality of FFM personality traits and modifiable CHD risk factors.

6 This finding is however difficult to generalize and interpret but at least provides empirical support to some link of reverse agreeableness and CHD.

The descriptive stats summarized in Table 1 substantiate the above discussion. Male/female gender ratio is 70.5/29.5 in CHD patients as compared to 64/36 in non patients. Non educated and matriculates account for 67% of CHD patients but only 31% of the non patients whereas more educated individuals (graduates and post-graduates) constitute only 32% of the patient category as compared to non patients where they form 69% of total. Low income categories (under 60,000 PKR per month) form the bulk of patient group (85%) and 87.5% of the patients live in non-posh areas.

It can be concluded from above discussion that theory presented at the end of section 1 is indicative of role of personality traits in the incidence of CHD but at the same time it is not proved unequivocally. Future cross regional and cultural studies of similar or longitudinal in nature with larger sample sizes and more rigorous statistical techniques can help explore the link between FFM personality traits and incidence of CHD in a more refined and detailed way.

## 6. Limitations

This study has utilized TIPI instrument to measure FFM personality traits. Not employing full FFM personality inventory questionnaire (containing over 700 items) is one of the major limitations of this study. Another limitation of this study was that the participant sample was limited to the hospitals and residents of Lahore and excluded other regions of Pakistan. A combination of relatively small and very contextualized sample and short version of the FFM instrument probably explains low model fit as reported in the analysis section.

The mediation analysis of this study only relies on the traditional Baron & Kenny approach and does not employ SPSS and SAS Macros and bootstrapping techniques.

It is not uncommon for participants to fake on personality scales. Many studies, for example, (LaHuis & Copeland, 2009; Wang et al., 2004) have been conducted to explain aberrant and spurious responses obtained through personality questionnaires. To counter this anomaly Conjin et al., (2011) have proposed person-fait analysis or PFA. This study has not undertaken this procedure despite employing logistic regression involving personality scale (TIPI).

Confirmatory factor analysis (CFA), structural equation modeling, criterion-relevant variance (CRV) and criterion-irrelevant variance (CIV) (Beckstead, 2012) are also not included as part of analytic plan of this paper.

## ACKNOWLEDGEMENTS

The authors graciously acknowledge the efforts of Mr. Syed Ali Hussain Bukhari, Mr. Zakee Sadaat and Mr. Nauman Bin Arif (all Program Coordinators at School of Professional Advancement University of Management & Technology) in their endeavors for collecting data from all participants of this study. We also thank and acknowledge the cooperation of the medical staff of Punjab Institute of Cardiology (especially Dr. Salman Munir) and Shiekh Zayed Hospital Lahore in allowing us to collect data from their Indoor and Outdoor patients.

SPSS Version 16 is employed for statistical analysis in this study.

## REFERENCES

Adler, R. (Ed.) (2007). Psychoneuroimmunology Vol. 1, 4th edition, USA: Elsevier Academy Press.

Aguinis, H. (1995). "Statistical power problems with moderated multiple regression in management research". Journal of Management, Vol. 21 (6), p. 1141-1158.

Aguinis, H., & Gottfredson, R.K. (2010).

"Best-practice recommendations for estimating interaction effects using moderated multiple regression". Journal of Organizational Behavior, Vol. 31, p. 776-786.

Aluja, A., & Garcia, L.F. (2004). Relationship between Big 5 personality factors and Values. Social Behavior & Personality, Vol. 32, p. 619-626.

Ang, R.P., & Huan, V.S. (2006). Relationship between academic stress and suicidal ideation: Testing for depression as a mediator using multiple regression. Child Psychiatry Human Development, Vol. 37, p. 133-143, doi: 10.1007/s10578-006-0023-8.

Baliga, R., Sina, A., & Noble, M. (2005). Cardiology: Crash course, Philadelphia: Elsevier Mosby.

Baron, R.M., & Kenny, D.A. (1986). "The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations". Journal of Personality and Social Psychology, Vol. 51, p. 1173-1182.

Barrick, M.R. (1991). The Big five personality dimensions and job performance: A meta-analysis. Personnel Psychology, Vol. 44, p. 1-25.

Barrick, M.R., Stewart, G.L., Greg, L., & Piotroweski, M. (2002). Personality and job performance: Test of the mediating effects of motivation among sales representatives. Journal of Applied Psychology, Vol. 87, p. 43-51.

Beckstead, J.W. (2012). "Isolating and examining sources of suppression and multicollinearity in multiple linear regression". Multivariate Behavioral Research, Vol. 47, p. 224-246.

Benjamin, J., Ebstein, R.P., & Belmaker, R.H. (Eds.) 2002). Molecular genetics and the human personality, Washington: American Psychiatric Publishing, Inc.

Blackburn, G.L. & Kanders, B.S. (Eds.) (1994). Obesity: Pathophysiology, Psychology, and treatment, New York: Chapman & Hall.

Bono, J.E.,, & Judge, T.A. (2004). Personality and transformational and transactional leadership: A meta-analysis. Journal of Applied Psychology, Vol. 89, p. 901-910.

Bunker, S.J. (2003). Stress and coronary heart disease: Psychosocial risk factors. Medical Journal of Australia, Vol. 178, p. 272-276.

Burisch, M. (1984). Approaches to personality inventory construction: A comparison of merits. American Psychologists, Vol. 39, p. 214-227.

Caballero, B. (Ed.) (2009). Guide to nutritional supplement , Oxford: Elesvier Ltd.

Carducci, B.J. (2009). The psychology of personality, 2nd edition, USA: Wiley-Blackwell.

Capenter, C.C.J., Griggs, R.C., & Benjamin, I.J. (Eds.) (2007). Anderoli and Carpenter's Cecil essentials of medicine, 7th edition, New Delhi: Elsevier.

Clark, S., & Robertson, I.T. (2005). A meta-analytic review of the Big five personality Factors and accident involvement in occupational and non occupational settings. Journal of Occupational & Organizational Psychology, Vol. 78, p. 355-376.

Colledge, N.R., Walker, B.R., & Ralston, S.H. (Eds.) (2008). Davidson's principles and practices of medicine, 21st edition, New Delhi: Elservier.

Collins, L.M., Graham, J.J., & Flaherty, B.P. (1998). "An alternative framework for defining mediation". Multivariate Behavioral Research, Vol. 33 (2), p. 295-312.

Conjin, J.M., Emons, W.H.M., Van Assen, M.A.L.M., & Sijtsma, K. (2011). "On the usefulness of a multilevel logistic regression approach to person-fit- analysis". Multivariate Behavioral Research, Vol. 46 (2), p. 365-388.

Contrada, R.J., & Baum, A. (Eds.) (2011). The handbook of stress science: Biology, Psychology, and Health, New York: Springer Publishing Company, Inc.

Davidson, J.K. (2000). Clinical Diabetes Mellitus: A problem-oriented approach, New York: Thieme Medical Publishers, Inc.

Digman, J.M. (1990). Personality structure: Emergence of the Five Factor Model. Annual Review Inc., p. 417-440.

Dulmus, C.N., & Rapp-Paglicci, L. A. (Eds.) (2005). Handbook of preventive interventions for adults, New Jersey: John Wiley & Sons, Inc.

Dunegan, K., Uhl-Bien, M., & Duchon, D. (2002). "LMX and subordinate performance: The moderating effects of task characteristics". Journal of Business and Psychology, Vol. 17 (2), p. 275-285.

Epstein, S., O'Brien, E.J. (1985). The person-situation debate in historical and current perspective. Psychological Bulletin, Vol. 3, p. 513-537.

Feldman, M.D., & Christensen, J.F. (2003). Behavioral medicine in primary care: A practical guide, USA: The McGraw-Hill Companies, Inc.

Floyd, P., Mimms, S.E., & Yelding, C. (2007). Personal health: Perspectives and lifestyles, 4th edition, Thomson: Wadsworth.

Fraser-Smith, N., & Lesperance, F. (2006). Recent evidence linking coronary heart disease and depression. Canadian Journal of Psychiatry, Vol. 51, p. 730-737.

Friedman, H.S. (Ed.) (1990). Personality and disease, USA: John Wiley & Sons, Inc.

Funder, D.C. (2001). Personality. Annual Review Psychology, Vol. 52, p. 197-221.

Furnham, A., Petrides, K.V., Tsaousis, I., Pappas, K., & Garrod, D. (2005). A cross-cultural investigation into the relationship between personality traits & work values. Journal of Psychology, Vol. 139, p. 5-32.

Gerber, A.S., Huber, G.A., Doherty, D., & Dowling, C.M. (2011). "The big five personality traits in the political arena". Annual Review of Political Science, Vol. 14, p. 265-287. DOI: 10.1146/annurev-polisci-051010-111659.

Goldberg, L.R. (1990). An alternative "Description of Personality": The Big-Five Factor structure. Journal of Personality and Social Psychology, Vol. 59, p. 1216-1229.

Gosling, S.D., Rentfrow, P.J., & Swann Jr., W.B. (2003). A very brief measure of the Big-Five personality domains. Journal of Research in Personality, Vol. 37, p. 504-528.

Gotto, A.M. (Ed.) (1998). Multiple risk factors in cardiovascular disease: Strategies of prevention of coronary heart disease, cardiac failure, The Netherlands: Kluwer Academic Publishers.

Guenole, N., & Chernyshenko, O.S. )2005). The suitability of Goldberg's Big Five IPIP personality markers in New Zealand: A dimensionality, bias & criterion validity evaluation, New Zealand Journal of Psychology, Vol. 34, p. 86-96.

Guthrie, D.W., & Guthrie, R.A. (2009). Management of diabetes mellitus: A guide to the pattern approach, 6th edition, New York: Springer Publishing Company, LLC.

Hellriegel & Slocum (2009). Organizational behavior, South-Western: Cengage Learning.

Hogan, R.T. (1991). Personality and personality measurement. In MD Dunnette & LM Hough (Eds.), Handbook of industrial and organizational psychology, 2, p. 873-919. Palo Alto: CA Consulting Psychologist Press.

James, L.R., & Brett, J.M. (1984). "Mediators, moderators, and test for mediation". Journal of Applied Psychology, Vol. 69, p. 307-321.

James, L.R., Mulaik, S.A., & Brett, J.M. (2006). "A tale of two methods". Organizational Research Methods, Vol. 9 (2), p. 233-244.

Jorgensen, R.S., Johnson, B.T., Kolodziej, M.E., & Schreer, G.E. (1996). Elevated blood pressure and personality: A meta-analytic review, Psychological Bulletin, Vol. 120 (2), p. 293-320. doi: 10. 1037/0033-2909.120.2.293.

Jowett, N.I., & Thompson, D.R. (2003). Comprehensive coronary care, 3rd edition, UK: Elsevier Science.

Judge, T.A., Heller, D., & Mount, M.K. (2002). Five-Factor Model of personality and job satisfaction: A meta-analysis. Journal of Applied Psychology, Vol. 87, p. 530-541.

Judge, T.A., & Higgins, C.A. (1999). The Big 5 personality traits, general mental ability and career success across life span. Personnel Psychology, Vol. 52, p. 621-652.

Judge, T.A., Locke, E.A., & Durham, C.C. (1997). The dispositional causes of job satisfaction: A core evaluation approach. Research in Organizational Behavior, Vol. 19, p. 151-188.

Kang, S.M., & Waller, N.G. (2005). "Moderated multiple regression, spurious interaction effects, and IRT". Applied Psychological Measurement, Vol. 29 (2), p. 87-105.

Katiyar, M., Gupta, S.C., & Singh, H. (1989). Role of neuroticism and extraversion in patients of acute myocardial infarction. Indian Journal of Clinical Psychology, Vol. 15, p. 18-20.

Khan, A.A., Hassan, M., Kumar, P., Mishra, D., & Kumar, R. (2012). Personality profile and coping skills among coronary heart disease patients and non-patient groups. Delhi Psychiatry Journal, Vol 15 (2), p. 352-358.

Khan, F.M., Kulaksizoglu, B., & Cilingiroglu, M. (2010). Depression and coronary heart disease. Current Atherosclerosis Reports, Vol. 12, p. 105-109.

Kohli, R., & Devaraj, S. (2003). "Measuring information technology payoff: A meta-analysis of structural variables in firm-level empirical research". Information Systems Research, Vol. 14 (2), p. 127-145.

Krantz, D.S., & Mc Ceney, M.K. (2002). Effects of psychological and social factors on organic disease: A critical assessment of research on coronary heart disease. Annual Review of Psychology, Vol. 53, p. 341-369.

Kuper, H. (2009). Evaluating the causal relevance of diverse risk markers: Horizontal systemic review. British Medical Journal, Vol. 339, b4265. Doi: 10.1136/bmj.b4265.

Kuper, H., Nicholson, A., & Hemingway, H. (2006). Searching for observational studies: What does citation tracking add to PubMed? A case study in depression and coronary heart disease. BMC Medical Research Methodology, Vol. 6 (4). Doi: 10.1186/1471-2288-6-4.

LaHuis, D.M., & Copeland, D. (2009). "Investigating faking using a multilevel logistic regression approach to measuring person fit". Organizational Research Methods, Vol. 12 (2), p. 296-319.

Leech, N.L., Barrett, K.C., & Morgan, G. A. (2005). SPSS for intermediate statistics: Use

and interpretation. New Jersey: Lawrence Erlbaum Associates, Publishers.

Livesley, W.J. (2003). Practical management of personality disorders, New York: The Guildford Press.

Llies, R., & Judge, T.A.( 2003). On the heritability of job satisfaction: The mediating role of personality. Journal of Applied Psychology, Vol. 88, p. 750-759.

Loehlin, J.C., & Nicholas, R.C. (1976). Heredity, environment and personality: A study of 850 sets of twins, Austin Texas: University of Texas Press.

Loehlin, J.C. (1982). Are personality traits differentially heritable? Behavior Genetics, Vol. 12 (4), p. 417-428.

Lohe, E.V.D. (2003). Coronary heart disease in women: Prevention, diagnosis, therapy, Berlin: Springer-Verlag.

Matthews, G., Deary, I.J., & Whiteman, M.C. (2003). Personality traits, 2nd edition, Cambridge: Press Syndicate of the University of Cambridge.

McCaan, S.J.H. (2005). Longevity, Big 5 Personality Factors, and health behaviors: Presidents from Washington to Nixon. Journal of Psychology, Vol. 139, p. 273-286.

McCrea, R.R., & Costa, P.T. (1985). Updating Norman's "adequacy taxonomy". Intelligence and personality dimensions in natural language and in questionnaires. Journal of Personality and Social Psychology, Vol. 49 (3), p. 701-721. doi: 10.1037/0022-3514.49.3710.

McCrea, R.R., & Costa, P.T. (1987). Validation of the five-factor model of personality across instruments and observers. Journal of Personality and Social Psychology, Vol. 52 (1), p. 81-90. doi: 10.1037/0022-3514.52.81.

McCrea, R.R., & Costa, P.T. (1989). The structure of interpersonal traits: Wiggin's circumplex and the five-factor model. Journal of Personality and Social Psychology, Vol. 56 (4), p. 586-595. doi: 10.1037/0022-3514.56.586.

McCrea, R.R., & Costa, P.T. (1992). Normal personality assessment in clinical practice: The NEO personality inventory. Psychological Assessment, Vol. 4 (1), p. 5-13. doi: 10.1037/1040-3590.4.15.

McCrae, R.R., & John, O.P. (1992). An introduction to the Five-Factor Model and its applications. Journal of Personality, Vol. 60, p. 175-215.

Miller, A.R., & Shelly, S. (2010). Living with stress, New York: Infobase Publishing, Inc.

Morgan, G.A., Leech, N.L., Gloeckner, G.W., & Barrett, K.C. (2004). SPSS for introductory statistics: Use and interpretation. 2nd edition, New Jersey: Lawrence Erlbaum Associates, Publishers.

Meyers, L.S., Gamst, G., & Guarino, A.J. (2006). Applied multivariate research: Design and interpretation. Sage Publications.

Neal, S. (1996). Uses and abuses of coefficient alpha. Psychological Assessment, Vol. 8 (4), p. 350-353.

Neaton, J.D., & Wentworth, D. (1992). Serum cholesterol, blood pressure, cigarette smoking, and death from coronary heart disease. Overall findings and differences by age for 316,099 white men. Multiple risk factor intervention trial research group. Archive of Internal Medicine, Vol. 152 (1), p. 56-64.

Nicholson, A., Kuper, H., & Hemingway, H. (2006). Depression as an aetiologic and prognostic factor in coronary heart disease: A meta-analysis of 6362 events among 146,538 participants in 54 observational studies. European Heart Journal, Vol. 27, p. 2763-2774.

Peterson, R.A. (1994). A meta-analysis of Cronbach's coefficient alpha. Journal of Consumer Research, Vol. 21 (2), p. 381.

Piette, J.D., Kaplan, R.M., & Ferrari, J.R. (Eds.) (1996). Preventing illness among people with coronary heart disease, USA: The Haworth Press, Inc.

Pohar, M., Blas, M., & Turk, S. (2004). "Comparison of logistic regression and linear discriminant analysis: A simulation study". Metodoloski Zvezki, Vol. 1 (1), p. 143-161.

Preacher, K.J., & Hayes, A.F. (2004). "SPSS and SAS procedures for estimating indirect effects in simple mediation models". Behavior Research Methods, Instruments, & Computers, Vol. 36 (4), p. 717-731.

Press, S.J., & Wilson, S. (1978). "Choosing between logistic regression and discriminant analysis". Journal of American Statistical Association, Vol. 73 (364), p. 699-705.

Raja, U., Ntalians, F., & Johns, G. (2002). The role of personality in psychological contracts: From formation to violation, Presented at the Annual Conference of the Academy of Management, Denver.

Riska, E. (2004). Masculinity and men's health: Coronary heart disease and public discourse, USA: Rowman & Littlefield Publishers, Inc.

Roseman, R.H., Brand, R.J., & Jenkins, C.D. (1975). Coronary heart disease in the western collaborative group study. JAMA, Vol. 233, p. 872

Rubin, E., Rubin, R., Strayer, D.S., McDonald, J.M., Michalopoulos, G.K., Trojanowski, J.Q., & Ward, P.A. (Eds.). (2008). Rubin's pathology: Clincopathological foundations of medicine, 5th edition, Baltimore: Lippincott Wiliams & Wikins.

Rugulies, R. (2002). Depression as a predictor foe coronary heart disease: A review and meta-analysis. American Journal of Preventive Medicine, Vol. 23, p. 51-61.

Sandrik, E., Diener, E., & Siedlitz, L. (1993). Subjective well-being: The convergence and stability of self-report and non-self-report measures. Journal of Personality, Vol. 61, p. 317-342.

Samaras, T.T. (Ed.) (2007). Human body size and the laws of scaling: Physiological performance, growth, longevity and ecological ramifications, New York: Nova Science Publishers Inc.

Sansone, R.A., Sansone, L.A., & Wiederman, M.W. (1997). The morbidity relationship and treatment implications of borderline personality and obesity. Journal of Psychosomatic Research, Vol. 43 (5), p. 541-543.

Schinka, J.A., Velicer, W.F., & Weiner, I.B. (Eds.) (2003). Handbook of psychology: Research methods in psychology, Vol. 2, New Jersey: John Wiley & Sons, Inc.

Shah, R.K. (2006). Risk factors in coronary heart disease: Fundamentals and clinical cardiology, USA: Taylor & Francis.

Smith, T.W., & Traupman, E.K. as in Allan, Robert Fischer, Jaffrey (2011). Heart and mind: The practice of cardiac psychology, 2nd edition, Washington DC USA: American Psychological Association.

Sokolov, E.I. (1994). Emotions, hormones and atherosclerosis, The Netherlands: VSP BV.

Squires, E.J. (2010). Applied animal endocrinology, 2nd edition, Oxfordshire: CABI.

Srivastava, K., Saxena, S., & Chaudhary, S. (2003). Hostility, Type A behavior pattern and life events in ischemic heart disease patients. Industrial Psychology Journal, Vol.

12 (1), p. 10-14.

Stamler, J., Wentworth, D., & Neaton, J.D. (1986). Is relationship between serum cholesterol and risk of premature death from Coronary Heart Disease continuous and graded? Findings in 356,222 primary screeners of the Multiple Risk Factor Intervention Trial (MRFIT), Journal of American Medical Association, Vol. 28 256 (20), p. 2823-2828.

Stampfer, H.G., Hince, D.A., & Dimmitt, S.B. (2012). Depression as a risk factor for coronary heart disease – How strong is the evidence? Open Journal of Psychiatry, Vol. 2, p. 284-291.

St. Jeor, S.T. (1997). Obesity assessment: Tools, methods, interpretations, New York: Chapman & Hall.

Sweet, S.A., & Grace-Martin, K. (2010). Data analysis with SPSS: A first course in applied statistics. 2nd edition, USA: Cornell University.

Tellegen, A., Lykken, D.T., Bouchard, T.J., Wilcox, K.J., Segal, N.L., & Rich, S. (1988). Personality similarity in twins reared apart and together. Journal of Personality and Social Psychology, Vol. 54 (6), p. 1031-1039. doi: 10.1037/0022-3514.54.6.1031.

Thoresen, C.J., Bradley, J.C., Bliese, P.D., & Thoresen, J.D. (2004). The Big 5 personality traits & individual job performance growth trajectories in maintenance & transitional job stages. Journal of Applied Psychology, Vol. 89, p. 835-853.

Turner, J.R., Cardon, L.R., & Hewitt, J.K. (Eds.) (1995). Behavior genetic approaches in behavioral medicine, Library of Congress Cataloging-in-Publishing Data.

Van der Koy, K., Van Hout H., Marwijk, H., Marten, H., Stehouwer, C., & Beekman, A. (2007). Depression and risk for cardiovascular disease: Systematic review and meta- analysis. International Journal of Geriatric Psychiatry, Vol. 22, p. 613-626. Doi: 10.1002/gps.1723.

Vitaliano, P., Scanlan, J., & Krenz, C. (2002). A path model of chronic stress, the metabolic syndrome, and coronary heart disease. Psychosomatic Medicine, Vol. 64, p. 418-435.

Wang, L., Reise, S.P., Pan, W., & Austin, J.T. (2004). "Multilevel modeling approach to detection of differential person functioning in latent trait models". Annual Meeting of American Education Research Association, San Diego.

Wilson, P.W.F., D'Agostine, R.B., Belanger, A.M., Silbershatz, H., Kannel, W.B., & Levy, D. (1998). Prediction of coronary heart disease using risk factor categories. Circulation, Vol. 97 p. 1837-1847.

Wood, R.E., Goodman, J.S., Beckmann, N., & Cook, A. (2008). "Mediation testing in management research: A review and proposals". Organizational Research Methods, Vol. 11 (2), p. 270-295.

Wulson, L.R., & Singal, B.M. (2003). Do depressive symptoms increase the risk of the onset of coronary heart disease? Systematic quantitative review. Psychosomatic Medicine, Vol. 65, p. 201-210.

**Web References**

http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001931/#adam_000935.disease.symptoms as accessed on 10/07/2011.