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Rate of Oxidative Stress-Mediated Acceleration of Ageing: Relationship with Habitual Emotional Disposition and Personality Traits

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Abstract: The study was set out to see if any statistically verifiable correlation exists among oxidative status, personality and rate of ageing. Appropriate measurement scales were Used To Sort 155 Volunteers Into Six Personality Trait Categories, Openness To Experience, Conscienciousness, Extroversion, Agreeableness, Neuroticism, And Psychoticism (OCEAN-P). Blood samples were collected from the volunteers for the determination of the plasma activities of two endogenous antioxidant enzymes-Superoxide Dismutase (SOD) and catalase and of two markers of oxidative damage-Malondialdehyde (MDA) and Erythrocyte Osmotic Fragility (EOF). A factor, "personality factor of Ageing (PFA) here also called *the Iyamu factor of ageing* named after the originator, was also obtained for each volunteer. The results show that rate of ageing is more affected by oxidative status in persons of four personality types-psychoticism, Neuroticism, Extroversion, and Agreeableness-than in consciencousness and open minded (openness to experience) persons-it also suggests that open minded persons have the slowest rate of ageing.

Keywords: Ageing, chronological age, oxidative status, personality, stress, subjective age

INTRODUCTION

It is well known that the rate of ageing differ significantly among persons of the same or different parentage, sex, tribe, race or environmental exposure. Among the different theories of ageing, the oxidation stress of ageing has accumulated a wide body of evidence all suggesting that the oxidative stress that result from a pro-oxidant oxidative status is central to the gradual process of ageing. Several factors may be identified that could explain the observed variation in the rates of ageing among individuals but could personality traits and habitual emotional disposition be a factor? Does any correlation exist among oxidative stress, personality and rate of ageing?

LITERATURE REVIEW

Accumulation of reactive oxygen species or other species is the price that aerobic organisms have to pay for using the various oxidative processes that generate energy for existence. These species including superoxide ion (O_2^-), hydrogen peroxide (H_2O_2) hydroxyl ion (OH^-), and others have some deleterious consequences including the destructive modification of structural macromolecules at genetic, molecular, cellular, organ and systemic levels which impact on critical aspects of the ageing process and contribute to impaired physiological function, increased incidence of disease and a reduction in life span (Kregel and Zhang, 2007).

The classification of individuals as types (such as the Carl Jung and Briggs Meyer's type A or type B), temperaments (such as the Galen's four temperaments derived from the four humours of Hippocratic medicine) or Gordon Allport's central, cardinal or secondary traits are no longer relevant to modern literature. A six factor model derived from a combination of the psychoticism dimension of Eysenck (1992) and the five factor model proposed by other researchers present a useful classification of personality traits (with a mnemonic OCEAN-P). The respective features of each can be summarized as:

Openness to experience: Wide interest, imaginative, insightful, progressive, flexible, innovative (De Young *et al*., 2005)

Consciencousness: Orderly, competitive, dutiful, achievement driven, self-disciplined, scrupulus, meticulous, principled, guided by one's own conscience (Heaven *et al*., 2001; Casper *et al*., 1992).

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Extraversion: Active, sociable, expressive, assertive, ambitious, dogmatic, aggressive, dominant, lacks reflection, irresponsive, shares certain genetic markers with substance abuse (Wright *et al*., 2006; Luo *et al*., 2007).

Agreeableness: Compliant, trusting, altruistic, modest, tender minded, friendly and of a cooperative nature (Rankine, 2004; Graziano and Tobin, 1993; Bergeman, 2002).

Neuroticism: Inferiority, unhappiness, anxiety, dependence, hypochondriac, guilt-feeling, obsessiveness, lack of autonomy, tense, moody, depressed, low self esteem (Miller, 2006).

Psychoticism: Aggressive, impulsive, cold, unempathetic, creative, antisocial, egocentric, tough-minded, risk taking, irresponsible, manipulative, sensation seeking, practical.

Habitual emotional state has been shown to affect the integrity of several structural components and processes of the biophysical make-up including cardiovascular activities (Leor, 1996; Ghiandoni *et al*., 2000; Harris, 2003) immune function (Dillon, 1985; Berk, 1993; McClelland and Cheriff, 1997), glucose metabolism (Hayashi, 2003) and gene expression (Hayashi, 2007; Ichihara, 2004). Japanese researchers have recently shown that positive emotions increase the free radical scavenging capacity of human saliva (Atsumi, 2004). Melatonin is a known endogenous antioxidant. Positive affect have been shown to increase melatonin levels. This hormone reduces allergic response by inhibiting mast cell responses (Kinata, 2007).

A relationship between personality and chronological and/or subjective ages have been implied in several studies including those of Staats *et al*. (1993), Galambos *et al*. (2005), Kleinspehn-Ammerlahn *et al*. (2008) and Stefan *et al*. (2012). Most of these studies relate personality, feeling of well-being, and age satisfaction with chronological or subjective age. However none has considered the possible differences in the rate or extent of any well elucidated biochemical process in persons with different personality traits as a possible explanation for the observed differences in the rate of ageing among persons of similar or varying socio-demographic characteristics and environmental exposure. This study therefore seeks to compare the oxidative status of persons of varying personality traits with the aim of seeing if any correlation exits among oxidative stress, personality and the rate of ageing.

MATERIALS AND METHODS

Reagents and equipments: All reagents used were product of either BDH chemical limited or Randox laboratory limited, USA. The equipments used were those obtainable in the biochemistry laboratory of Ambrose Alli University, Ekpoma, Nigeria. Clinical equipments used were those of the department of internal medicine, Central Hospital, Benin City, Nigeria where ethical consent for the study was also obtained.

Sample population design:

Sample demographics: A total of 155 volunteers were randomly selected from among apparently healthy subjects visiting the medical records and internal medicine departments of central hospital Benin City, Nigeria.

Age range: 26-76 years Mean: 41.75 years SD: 11.24 years
Gender: Male 50.96%, Female 49.04%
Education:

Completely illiterate = 11.34%
Elementary complete/incomplete = 15.48%
Secondary incomplete = 13.29%
Secondary complete = 34.57%
First degree tertiary complete/incomplete =17.21%
Higher degrees = 8.11%

Inclusion criteria:

- Purpose of visit to the records department is to obtain a medical certificate of wellness.
- Willingness to endure the rigors of the interview.
- Clinical evidence that subject has no known acute or chronic medical condition.
- Availability of at least two close associates who have known the subject for at least two years and have sufficient education to understand the descriptive features of the personality traits.

Exclusion criteria:

- Blood transfusion within the last three months.
- Intravenous fluid management in the last 24 h.
- Patient's refusal.

Questionnaire design and administration: A modification of the combination of the method of Chauhan *et al*. (2012) and the Subjective Age Identity Scale (SAIS) (Hubley, 1998, 2004; Hubley *et al*., 2008) was used. A six-category personality classification was used. There were 57 traits sorted into six groups (OCEAN-P). At least three independent raters were asked to look at a subject (volunteer) and give their subjective assessment of the volunteer's age based on certain phenotypic features and the average of the three raters' assessment was taken and recorded as the apparent age, A, of the volunteer. The volunteer was then taken for this/her real (chronological) age. The difference between the real and apparent ages was recorded as the personality factor of ageing, "PFA", here called *the Iyamu factor of ageing*, named after the originator.

Pfa = Real age-apparent age

A positive PFA value means that the volunteer is older than the looks while a negative value suggests that the volunteer looks younger than the real age.

The volunteer and his associates were asked to carefully study the six personality trait categories and using phenotypic features agree on which best fits the volunteer. The volunteers were thus sorted to six groups O, C, E, A, N, P.

ASSAY/TEST PROCEDURES

Blood collection: Blood samples were obtained from the patients were kept in heparinized bottles and frozen in the refrigerator at 4°C before used. A maximum of two freeze thawing cycles was allowed since three or more cycles modify the oxidative status of the blood (Kampa *et al*., 2002) and storage increases the level s of the markers of oxidative markers of oxidative damage (Oyewale *et al*., 1991). The plasma was assayed for superoxide dismutase activity, catalase activity and Malondialdehyde (MDA) level.

Preparation of erythrocyte (blood tissue) samples: The erythrocytes were washed by centrifugation method as described by Tsakiris *et al*. (2005). The samples were introduced into centrifuge test tubes containing 3.0 m/s of buffer solution (pH = 7.4) of 250 mM Tris (hydroximethyl) amino-ethane- HCl (Tris HCl), 140 mM NaCl, 1.0 mM $MgCl_2$ and 10 mM glucose. The suspension was centrifuged at 120 g for 10 min to separate the erythrocytes from the liquid phase. After centrifugations, the supernant was carefully withdrawn with Pasteur pipette and decanted. The sediment constituted harvested erythrocytes. The erythrocytes were re-suspended in the buffer and washed three times by similar centrifugation technique. The erythrocytes were finally suspended in 1mL of this buffer solution.

Estimation of Malondiadehyde (MDA) level: The extent of lipid peroxidation was determined spectrophotometrically by Thiobarbituric Acid Reactive Substances (TBARS) method as described by Varshney and Kale (1990). Results were expressed in terms of Malondialdehyde (MDA) fromed per mg protein. MDA, a product of lipid peroxidation (TBARS) under acid conditions forms a pink coloured product that has a maximum at 532 mm.

Determination of erythrocycte osmotic fragility: Erythrocyte fragility was determined by a slight modification of a blend of the methods of Kraus *et al*. (1997) and Mafuvadze *et al*. (2008) as modified by Karabulut *et al*. (2009). In principle erythrocyctes membranes undergo lysis when erythrocyctes are suspended in a NaCl less than the physiological concentration (about 0.85-0.9%). Hemoglobin released when the cells are haemolysed, absorbes maximally at 450 nm. The optical density increased with the amount of cells haemolysed, absorbs maximally at 450 nm. The optical density increased with the amount of cells haemolsed and hence the amount of haemoglobin released.

Assay of superoxide dismutase (SOD, EC. 1.15.1.1): SOD activity was determined using the inhibitory effects of SOD on the base-catalyzed auto-oxidation of adrenaline according to the method described by Fridovich (1989) and was expressed as enzymes unit/mg protein. One unit of enzymes is defined as the amount required for 50% inhibition of adrenaline auto oxidation.

Determination of catalase (CAT, EC, 1.11.1.1) activity: The method of Goth (1991) was followed in the determination of serum CAT to convert hydrogen peroxide to water and oxygen. Catalase activity (level) is the rate at which it causes the disappearance of the substance (H_2O_2). Briefly, aliquots of the blood (0.5 mL) were added into ice cold test tubes while the blank contained 0.5 mL distilled water. The reactions were initiated by adding sequentially, at fixed intervals, 5 mL of cold 30 mM of H_2O_2 and were mixed thoroughly by inversion. After exactly three minutes, the reaction was stopped sequentially at the same fixed intervals by rapidly adding 1 mL of 6M H_2SO_4 and was mixed quickly by inversion and, at absorbance of 480 nm, read within 30-60 sec. The spectrophotometer standard was prepared by adding 7 mL of 0.01 M potassium permanganate to a mixture of 5.5 mL o.5 M phosphate buffer, pH 7.0 and 1 mL 6 M H_2SO_4. The enzyme was expressed in terms of "Kat.f" as $Ks^{-1}mg^{-1}$ protein, where K is the first order rate constant.

Protein determination: Protein was determined by the Biuret method as described by Gornall *et al*. (1949) using Bovine Serum Albumin (BSA) as standard.

Statistical analysis: The parametric single factor Analysis Of Variance (ANOVA) was used in testing for significant differences in the indices of oxidative status among the various personality trait categories. Where significant differences ($p<0.0.5$, $p<0.01$, $p<0.001$) were detected by ANOVA, the *aposteriori* Duncan Multiple range test was used to locate the source(s) of significant difference (s) among the treatments (Ogbeibu, 2005). All statistical tests were carried out using SPSS version 16.0.

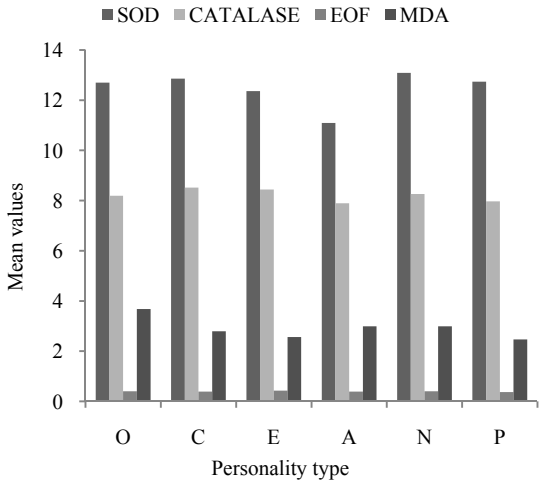

Fig. 1: Mean values of indices of oxidative status of the various personality types in the female population

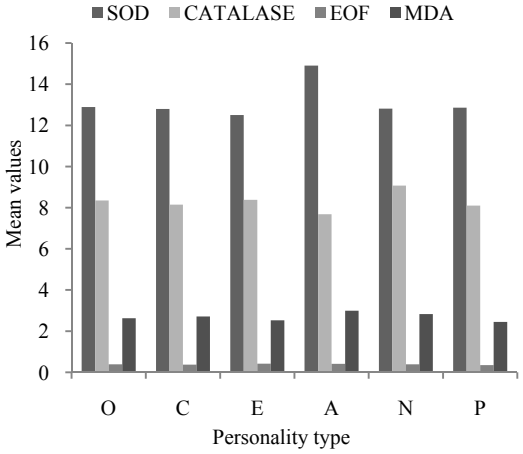

Fig. 2: Mean values of indices of oxidative status of the various personality types in the male population

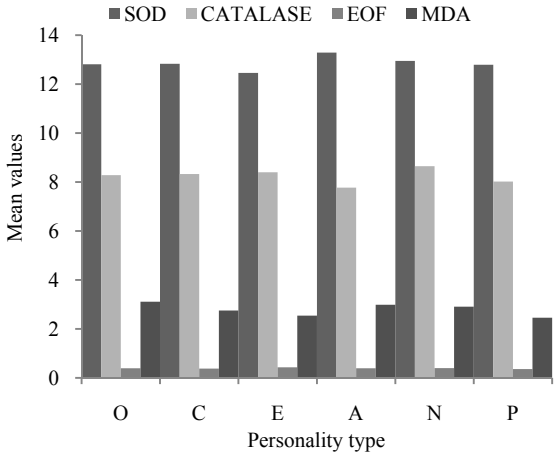

Fig. 3: Mean values of indices of oxidative status of the various personality types in the general population

RESULTS AND DISCUSSION

Personality is a descriptive phenomenon of an individual`s natural dispositions, likes and dislikes, carriage, attitudes, character, and constitutive expression. Its correlation with rate of ageing is rather interesting as it gives a predictive tool for assessing how psychological processes impact on physiological phenomena. A careful look at Table 1 to 3 and Fig. 1 to 3 indicates that four of the personality traits, Agreeableness, Neuroticism, Psychoticism and Extraversion showed the extreme (highest and lowest) values of the various indices of oxidative stress, suggesting that in persons with the other two clusters of personality traits, openness to experience and conscientiousness, rate of ageing is not strikingly affected by the oxidative status. Also it can be seen from Table 4 that openness to experience had the highest mean PFA value, suggesting that persons of this

Table 1: Mean values of indices of oxidative status of the various personality types in the female population

Parameters	O$\bar{x}\pm$SE	C$\bar{x}\pm$SE	E$\bar{x}\pm$SE	A$\bar{x}\pm$SE	N$\bar{x}\pm$SE	P$\bar{x}\pm$SE	p-value
SOD	12.7^{a} ±0.07	12.86^{a} ±0.15	12.36^{a} ±0.07	11.09^{b}±1.24	13.09^{a} ±0.13	12.74^{a} ±0.16	p<0.05
Catalyst	8.19 ±0.09	8.52 ±0.44	8.44 ±0.04	7.89 ±0.14	8.26 ±0.06	7.97 ±0.10	p>0.05
EOF (x100% fragility)	0.40^{a}±0.009	0.39^{a}±0.018	0.43^{a} ±0.02	0.39^{a} ±0.011	0.40^{a} ±0.012	0.37^{b} ±0.008	p<0.05
MDA (Unit/mg)	3.68±1.00	2.79±0.09	2.56 ±0.04	2.99 ±0.08	2.99±0.14	2.47±0.09	p>0.05

Similar letters indicate mean that are not significant different from each other; p<0.05-Significant; p>0.05 - Not significant

Table 2: Mean values of indices of oxidative status of the various personality types in the male population

SOD = Superoxide dismutase activity (unit/mg blood tissue)
CATALASE = Catalase activity (K/min)
EOF = Erythrocyte osmotic fragility (x100% haemolysis)
MDA = Unit/mg blood tissue

Parameters	O$\bar{x}\pm$SE	C$\bar{x}\pm$SE	E$\bar{x}\pm$SE	A$\bar{x}\pm$SE	N$\bar{x}\pm$SE	P$\bar{x}\pm$SE	p-value
SOD	12.89±0.11	12.8±0.07	12.5±0.11	14.9±2.90	12.81±0.14	12.86±0.16	p>0.05
Catalyst	8.35^{b}±0.11	8.15^{b}±0.06	8.38^{b}±0.04	7.68^{b}±0.14	9.07^{a}±0.63	8.10^{b}±0.11	p<0.05
EOF (x100% fragility)	0.39^{a}±0.009	0.37^{b}±0.009	0.42^{a} ±0.011	0.41^{a}±0.02	0.39^{a}±0.009	0.35^{b}±0.02	p<0.01
MDA (Unit/mg)	2.63^{b}±0.09	2.71^{b}±0.04	2.53^{c} ±0.05	2.99^{a}±0.06	2.83^{a}±0.07	2.45^{c}±0.13	p<0.001

Similar letters indicate mean that are not significantly different from each other; p<0.001; p<0.01-Highly significant; p<0.05-Significant; p>0.05-Not significant

Table 3: Mean values of indices of oxidative status of the various personality types in the general population

Parameters	O$\bar{x}$ ± SE	C$\bar{x}$±SE	E$\bar{x}$±SE	A$\bar{x}$±SE	N$\bar{x}$±SE	P$\bar{x}$ ± SE	p-value
SOD	12.81±0.07	12.83±0.08	12.46±0.07	13.29±1.76	12.95±0.09	12.79±0.11	p>0.05
CATALASE	8.28^{b}±0.07	8.33^{b}±0.21	8.40b ±0.03	7.77^{c} ±0.10	8.65^{a} ±0.31	8.02^{b}±0.08	p<0.05
EOF (x100% fragility)	0.39^{b}±0.007	0.38^{b}±0.009	0.43^{a} ± 0.010	0.39^{b} ±0.009	0.40^{a} ±0.008	0.36^{b}±0.008	p<0.001
MDA (Unit/mg)	3.11±0.46	2.75±0.05	2.54±0.03	2.99±0.05	2.91 ± 0.08	2.46 ± 0.07	p>0.05

Similar letters indicate mean that are not significantly different from each other; p<0.001 - Highly significant; p<0.05-Significant; p>0.05-Not significant

Table 4: Descriptive analysis of PFA

	Descriptives					
Personality type	N	Mean PFA value	S.D.	S.E.	Min.	Max.
O	23	4.23	10.433	2.224	-15	22
C	27	-6.44	10.917	2.101	-21	12
E	28	0.11	6.285	1.188	-17	14
A	22	-11.71	9.773	2.133	-44	2
N	29	-6.41	9.116	1.693	-20	14
P	26	-7.85	10.950	2.147	-28	13
Total	155					

p<0.001-Highly significant

personality trait most commonly appear younger than their real ages, and thus age at a much slower rate in comparison to other personality traits. This approximates the findings of Stefan *et al*. (2012) who also found openness to experience to be associated with a younger subjective age at older age. The effect of a physiological or pathological variable on a psychological phenomenon implied in the present study corroborates the finding of Kleinspehn-Ammerlahn *et al*. (2008) that a number of illnesses attenuate the change in felt age discrepancy during ageing.

The sample size of 155 may appear rather small for a study of this nature and future study should therefore target a much larger size. Also the Personality Factor of Ageing (PFA) empirically derived here may require a more rigorous scientific evaluation to accommodate other relevant variables. Future studies on this line of investigation should consider this. In the meantime, it is held from the present study that persons with the psychological trait, -openness to experience- age at a much slower rate when compared to persons with the other personality traits.

REFERENCES

Atsumi, T., 2004. Pleasant feeling from watching a comical video enhances free radical scavenging capacity in human whole saliva. J. Psychos. Res., 56: 377-379.

Bergeman, C.J., 2002. Genetic and environmental effects on openness to experience, agreeableness and conscientiousness: An adoption/twin Study. J. Pers., 70(5): 159-179.

Berk, L.S., 1993. Eustress of humour associated with laughter modulation specific immune system components. Ann. Behav. Med., 15(Suppl.): 5111.

Casper, R.C., D. Hedeker and J.F. McClough, 1992. Personality behaviour and Eating disorders and their relevance for Subtyping. J. Am. Acad. Child Adol. Psychiat., 31(5): 830-840.

Chauhan, N., J.P. Warner and P.A. Adamson, 2012. Perceived age change after aesthetic facial procedures: quantifying outcome of ageing facial surgery. Arch. Facial Plast. Surg., 14(4): 258-262.

De Young, C.G., J.B. Peterson and D.M. Higgins, 2005. Sources of openness/intellect: Cognitive and Neurophysical correlates of the fifth factor of personality. J. Personality, 73(4): 825-858.

Dillon, K.M., 1985. Positive emotional states and enhancement of the immune system. Int. J. Psychiat. Med., 5: 13-18.

Eysenck, H.J., 1992. The definition and Measurement of Psychoticism. Pers. Individ. Differ., 13: 757-785.

Fridovich, I., 1989. Superoxide dismutase. An adaptation to a pragmatic case. J. Biol. Chem., 264: 7762-7764.

Galambos, N.L., K.T. Pamela and L.C. Tilton Weaver, 2005. Chronological and subjective age in emerging childhood: The cross over effect. J. Adol. Res., 20(5): 538-556.

Ghiandoni, L.C., A.E. Donald, M. Cropley, M.J. Mullen, G. Oakley, M. Taylor, G. O'Connor, J. Betteridge, N. Klein, A. Steptoe and J.E. Deanfield, 2000. Mental stress induces transient endothelial dysfunction in humans. Circulation, 102: 2473-2478.

Gornall, A.G., C.J. Baradawill and D. Maxima, 1949. Determination of serum proteins by means of the Buiret reaction. Biol. Chem., 177: 751-766.

Goth, L., 1991. A simple method for the determination of serum catalase activity and revision of reference range. Clin. Chem. Acta., 196: 143-152.

Graziano, W.G. and R.M. Tobin, 1993. Agreeableness: Dimension of personality or social desirability artifact? J. Pers., 61(2): 152-170.

Harris, K.F., 2003. Association between psychological traits and endothelial function in postmenopausal women. Psychos. Med., 65: 402-409.

Hayashi, T., 2003. Laughter lowered the increase in post prandial blood glucose. Diabetes Care, 26(5): 1651-1652.

Hayashi, T., 2007. Laughter modulates prorenin receptor gene expression in patients with type and DM. J. Psychos. Res., 62: 703-705.

Heaven, P.C., K. Mulligan, R. Meriles, T. Woods and Y. Fairooz, 2001. Neuroticism and Conscientiousness as predictions of emotional, external and restraines eating behaviours. Int. J. Eat. Disorder, 30(2): 161-166.

Hubley, A.M., 2004. Subjective Age Identity Scale (SAIS). Unpublished Manuscript, University of British Columbia, Vancouver, BC, Canada.

Hubley, A.M., 1998. Subjective Age Identity Scale (SAIS). Unpublished Manuscript, University of Northern British Columbia, Prince George, BC.

Hubley, A.M, A. Gadermann, L.B. Russel and A. Palepu, 2008. Subjective age, age satisfaction, and self rated health in adults who are homeless or vulnerably housed. Proceeding of the 7th International Conference on Urban Health. Vancouver, BC, Canada, Oct. 29-31.

Ichihara, A., 2004. Inhibition of diabetic Nephropathy by a decay peptide corresponding to the handle region for nonproteolytic activation of Prorenin. J. Chem. Investigat., 114: 1128-1135.

Kampa, M., A. Nistikaki, V. Tsousis, N. Maliaraki, G. Notas and E. Castanas, 2002. A new automated method for the determination of the total antioxidant capacity (TAC) of human plasma based on the crocin bleaching assay. BMC Clin. Pathol., 2: 3.

Karabulut, I., A. Dicle Balkanci, B. Pehlivanoglu, A. Erdem and E. Fadillioglu, 2009. Effect of toluence on erythrocyte membrane stability under invivo and invitro conditions and assessment of oxidant/antioxidant status. Toxicit. Ind. Health, 25: 545-550.

Kinata, H., 2007. Laughter elevates the levels of breast milk melatonin. J. Psychos. Res., 62: 699-702.

Kleinspehn-Ammerlahn, A., D. Kotter-Gruhn and J. Smith, 2008. Self perception of ageing: Do subjective age and satisfaction with ageing change during old age? J. Gerontol. B Psychol. Sco. Soc. Sci., 60(6): 377-385.

Kraus, A., H.P. Roth and M. Kirchgessner, 1997. Supplementation with Vitamin C, Vitamin E, or β - Carotene influences osmotic fragility and oxidative damage of erythrocytes of Zinc- deficient rats. Jour. Nutr., 127: 1290-1296.

Kregel, K.C. and H.J. Zhang, 2007. An integrated view of Oxidative stress in ageing: basic mechanisms, functional effects, and pathological consideration. AJP, 292: R18-36.

Leor, J., 1996. Sudden cardiac death triggered by an earthquake. New Engl. J. Med., 334: 413-419.

Luo, X., H.R. Kranzler, L. Zuo, S. Wang and J. Gelernta, 2007. Personality traits of agreeableness and extraversion are associated with ADH4 variation. Biol. Psychiat., 61(5): 599-608.

Mafuvadze, B.M., H. Nyanungo, B. Saina, T. Gorgena, T. Mashamombe and K.H. Eriwanger, 2008. Deprivation of drinking water up to 48 hours does not affect the osmotic fragility of erythrocytes from captive helmeted guinea fowl (*Numida mealagris).* Int. J. Poult. Sci., 7: 59-63.

McClelland, D. and A.D. Cheriff, 1997. The immunoenhancing effects of humor on secretory IgH and resistance to respiratory infections. Psychol. Health, 12: 329-344.

Miller, J.L., 2006. Neuroticism and Introversion: A risky combination for disorder and eating among a non-clinical sample of undergraduate women. Eat. Behav., 7(1): 69-78.

Ogbeibu, E.A., 2005. Biostatistics: A practical approach to research and data handling. Mindex Publishing Co. Ltd., Benin City, Nigeria, pp: 171-173.

Oyewale, J.O., A.A. Sanni and H.A. Ajibade, 1991. Effects of temperature, pH, and blood storage on osmotic fragility of duck erythrocytes. Int. J. Vet. Med., 38(4): 261-264.

Rankin, K.P., 2004. Right and left medical orbito-frontal volumes show an opposite relationship to agreeableness in FTD. Dement Geriatr. Cogn. Disorder, 17(4): 328-332.

Staats, S., K. Heaphy, D. Miller, C. Partlo, N. Romine and K. Stubbs, 1993. Subjective age and health perception of older persons: Maintaining the youthful bias in sickness and in health. Int. J. Ageing Human Develop., 37: 191-203.

Stefan, V., V. Demuher and A. Terraciano, 2012. Personality, self related health and subjective age in a life-span sample: The moderating role of chronological age. Psychol. Ageing, 27(4): 875-880.

Tsakiris, S., A. Giannoulia-Karantana, I.H., Simintzi and K.H. Schulpis, 2005. The effect of aspartame metabolites on human erythrocyte membrane acetylcholinesterase activity. Pharmacol. Res., 53: 1-5.

Varshney, R. and R.K. Kale, 1990. Effect of Calmodulin antagonists on radiation-induced lipid peroxidation in microsomes. Int. J. Radiation Biol., 58: 733-743.

Wright, C.I., D. Williams, E. Feczko, L.F. Barrett, B.C. Dickerson, C.E. Schwartz and M.M. Wedig, 2006. Neuroanatomical correlates of extraversion and neuroticism. Cerebral. Cortex., 16(12): 1809-1819.