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RESEARCH ARTICLE

POSSIBILITY OF USAGE OF AGE, B.M.I.AND B.S.A. AS PREDICTORS OF MORNINGNESS-EVENINGNESS IN HUMAN BEINGS

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ABSTRACT

This paper presents the outcome of study conducted among 150 normal individuals using Morningness-Eveningness Questionnaire by J.A. Horne and O. Ostberg , to know whether 'owl/lark' nature (morningness/eveningness) is a function of age, B.M.I. and B.S.A. and if at all so, which one is a better predictor of "morningness/ eveningness".

The results of MEQ scores suggest that the subjects (N=150) could be assigned three major types, i.e., morning type (119), intermediate type (30) and evening type (01). When the simple regression analysis of these results was carried out, the coefficients of significance gave values 0.094, 0.805 and 0.189 for age, B.M.I. and B.S.A. respectively. This indicates that age, B.M.I. and B.S.A. are not good predictors of morningness, eveningness traits in the sampled population.

INTRODUCTION

Rhythmicity is part of our life. In the last decade there has been increasing interest in research focusing on the interplay between the human circadian timing system and behavioral patterns in health and illness. It has long been known-that most physiological variables demonstrate predictable, rhythmic variability within the 24-hour day. For example, body temperature is lower during the early morning hours and progressively increases during the waking hours. Along the same lines, human body is built to perform at its optimum capacity at certain times of the day while during other portions of the day; it cannot call up the same caliber performance. The fluctuation of any variable within the 24-hour day is described as a "circadian" rhythm. If not measured at equal time intervals throughout the 24-hour day, changes in a variable are best described as "time of day" or "chronobiological" variation.

The Chronotype is an attribute of human beings reflecting whether they are alert and prefer to be active early or late in the day. The continuum is often referred to as "morningness/eveningness" or "larks" and "owls" where morning people wake up early and are most alert in the first part of the day and evening people are most alert in the evening hours and prefer to go to bed late. Commonly, people showing these patterns have received names such as 'owl' (evening chronotype) or 'lark' (morning chronotype) (1), but many people are neither strongly morning nor evening type.

The study of interplay between the body's timing system and the thousands of other psychobiological rhythmic functions occurring everyday and within every human being is referred to as Chronobiology.

Chronobiology is one of the most important branches of Life Science because it studies how a shift in the body clock can have profound effects on how people perform. For example, on average, people drop six or seven points on intelligence tests if they take them at the wrong time of day for their type.

It has long been clear that different individuals can have markedly different sleep patterns. Most of us display some degree of "morningness" or "eveningness": we are either "larks" or "owls". Ongoing research in this field is largely focused upon the question that whether "morningness" or "eveningness" is a matter of genetics. Natural early risers are born that way, and so are people who prefer to get up late and stay up deep into the night.

The objective of the present study was to decipher whether 'owl/lark' nature is a function of age, B.M.I. and B.S.A. and if at all so, which one is a better predictor of "morningness/eveningness".

Review of Literature

O. Öquist's thesis, 1970, at the Department of Psychology, University of Göteborg,Sweden, introduces the modern research into chronotypes. It is entitled "Kartläggning av individuella dygnsrytmer", Charting Individual Circadian Rhythms. O. Östberg modified Öquist's questionnaire and in 1976, together with J. A. Horne, he published the Morningness - Eveningness Questionnaire, MEQ, which still is used and referred to in virtually all research on this topic.

"Morningness – Eveningness" in human beings has been investigated as a function of various factors like adolescence (Andrade *et al*., 1992), behavioural states (Hidalgo *et al*.,

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2002) climate (Gupta and Pati, 1995), gender, age and habitat (Achari and Pati, 2007).

MATERIALS & METHODOLOGY

The study was carried out on normal volunteers. Subjects of this study include participants of refresher course, few of the faculty members & students of Pt. Ravishankar Shukla University and the general public. Of the 150 individuals who composed the sample, 77 were males and 73 females. Their age ranged from 19 yrs to 69 yrs. The bar charts in Figures 1 & 2 depict their population classified according to their marital status and different age groups respectively. The subjects filled up MEQ. The format of the MEQ is as shown in Appendix-1.
Subjects were classified into various groups according to their self-perceptions. A summary of the data collected on the basis of MEQ is presented in the Table-1.The MEQ scores were classified as per the standard classes (Table-2) as shown in Figure- 3.

SAMPLE NO.	M/F	AGE	BMI (W/H2)	BSA 0.20247*S*T	Final Score
1	F	47	26.5625	6.78760428	27
2	F	22	19.97918835	4.641523515	27
3	F	29	19.39618823	4.41942911	27
4	F	37	26.63495838	5.065748783	27
5	F	57	33.33333333	7.018432734	31
6	M	64	27.81588173	7.37777649	30
7	F	49	27.34375	6.9872397	28
8	M	38	23.33546614	6.304736108	28
9	M	30	19.921875	5.09070321	26
10	M	33	24.4646016	6.609803984	27
11	M	20	21.484375	5.48997405	26
12	M	45	19.83471074	5.558598726	28
13	M	44	29.13631634	6.768888459	31
14	M	46	30.44383913	7.491319136	29
15	F	49	26.12244898	8.734049625	27
16	F	42	22.40587695	6.27915782	28
17	M	38	23.4375	5.9890626	29
18	F	48	29.96878252	6.962285273	25
19	M	37	29.296875	7.48632825	28
20	F	37	24.65303141	4.985894615	24
21	F	47	21.46915048	7.055864376	21
22	F	42	25.39021852	5.8986028	28
23	F	43	21.484375	5.48997405	23
24	F	42	27.76709812	6.204294537	24
25	F	40	24.43518667	6.012769306	26
26	F	36	23.4375	5.9890626	28
27	F	39	24.99890356	5.369568937	28
28	M	24	19.97918835	4.641523515	23
29	M	24	20.96436059	5.257274014	27
30	M	37	23.63403301	5.815629329	24
31	M	35	27.88761707	6.47879324	24
32	F	37	23.05175491	6.343415471	23
33	M	46	25.81663021	7.501300907	21
34	M	47	24.43518667	6.012769306	31
35	M	39	29.75206612	8.337898088	19
36	M	38	26.98961938	8.272392716	29
37	M	33	19.00390835	5.521790945	29
38	M	49	19.91836735	6.659712839	29
39	M	57	26.85440557	7.663504685	24
40	F	47	24.55775234	5.705205987	24
41	F	44	21.70792339	6.536812284	26
42	M	41	25.390625	6.48815115	29
43	M	44	23.93606231	5.778821548	27
44	M	48	33.64845377	8.279879045	29
45	M	42	21.97133586	6.974762486	27
46	F	46	20.71569381	6.691529734	23
47	F	21	20.54988662	6.078898539	28
48	F	26	23.33546614	6.304736108	27
49	F	21	21.92886277	4.710148191	27
50	F	21	22.47658689	5.221713954	27
51	M	28	29.6875	7.58614596	26
52	M	19	17.70857697	5.720178644	17
53	M	25	26.44628099	7.411464968	25
54	M	21	19.84126984	5.869281348	21
55	M	27	19.15158479	6.625400501	27
56	M	20	20.41522491	6.257322696	22
57	M	20	18.14486863	5.178043706	17
58	M	31	26.44628099	7.411464968	20
59	M	27	25.95155709	7.954223766	23
60	M	27	23.12467037	5.582929292	26
61	M	27	23.72528616	5.511809174	24
62	F	26	19.00390835	5.521790945	22
63	F	23	17.57706869	5.579809989	24
64	M	28	25.46938776	8.515698384	20
65	M	35	25.63691716	6.308479272	26
66	F	37	24.76756592	6.569253039	22
67	M	29	22.20408163	7.423942181	23
68	M	25	21.10726644	6.469435329	18
69	M	28	21.5450908	6.720851186	21
70	M	27	23.03004535	6.812558708	24
71	M	28	26.44628099	7.411464968	22
72	M	30	30.02150189	7.248013467	16
73	F	33	26.2226847	6.091999613	29
74	F	29	26.171875	6.68778657	23
75	F	52	24.88888889	5.240429775	18
76	F	35	29.21010994	7.052121212	25
77	F	50	21.09375	5.39015634	27
78	F	49	28.72008325	6.672190053	26
79	F	32	22.77318641	6.382094833	26
80	F	30	22.40587695	6.27915782	28
81	F	39	29.0486565	6.490646593	28
82	M	44	25.1486054	6.670318471	26
83	F	36	27.05515088	6.285396427	23
84	F	69	23.33546614	6.304736108	25
85	F	42	25.390625	6.48815115	30
86	M	40	26.57537949	5.484359304	23
87	M	40	23.68317179	5.086960046	18
88	F	28	28.13365651	6.163743593	24
89	F	28	25.80645161	5.995301207	22
90	F	69	22.64086462	5.058886315	29
91	F	42	22.83287935	5.618489352	24
92	F	47	22.7189744	5.484983165	24
93	F	28	18.68512111	5.727041111	19
94	F	56	24.12879237	6.050824808	20
95	F	26	18.68512111	5.727041111	20
96	F	33	25.4580659	7.397116172	21
97	M	37	24.97704316	6.999716914	24
98	M	34	17.99307958	5.514928478	23
99	M	47	25.34435262	7.102653927	25
100	M	45	25.71100827	6.447600205	27
101	M	41	26.5625	6.78760428	28
102	F	45	18.75	4.79125008	27
103	F	48	16.80613424	5.060757897	28
104	F	40	21.96712018	6.498132921	26
105	F	25	23.4375	5.9890626	26
106	F	49	26.75321258	5.746380793	29
107	M	48	30.22222222	6.363379013	21
108	M	35	28.19428425	6.299745222	24
109	M	47	28.9340689	7.533117802	17
110	M	60	30.48315806	8.08523451	13
111	M	38	25.84776822	6.729585236	29
112	M	40	22.32142857	6.602941517	28
113	M	52	25.20920136	7.591136846	26
114	M	35	21.2585034	6.28851573	26
115	M	38	23.828125	6.08888031	26
116	M	40	28.5075216	6.123192648	30
117	F	22	19.140625	4.89106779	26
118	F	21	20.56932966	5.764472753	27
119	M	23	20.79672989	6.042714619	29
120	M	21	23.72528616	5.511809174	29
121	F	21	19.83471074	5.558598726	23
122	M	25	22.86236854	6.063925883	22
123	F	21	18.73278237	5.249787685	26
124	M	22	22.75830678	6.853109652	23
125	M	22	24	5.053271569	28

126	F	49	29.7210791	7.883103647	25
127	F	25	21.05170826	4.521742263	27
128	M	57	25.05930703	8.09459242	27
129	F	24	22.37567995	5.8256111	27
130	F	27	25.87605807	5.557974865	27
131	M	24	20.93663912	5.867409766	30
132	M	30	25.33333333	5.334008878	29
133	F	25	24.1671624	6.650354929	28
134	F	23	18.75	4.79125008	25
135	F	26	21.90758246	5.289090909	27
136	F	22	19.48696145	5.764472753	22
137	F	26	26.22222222	5.521167084	20
138	M	35	24.14151925	5.608507581	28
139	M	20	22.36744002	4.804351154	25
140	F	23	16.10587865	4.849892985	31
141	M	23	25.15589569	7.441410281	24
142	F	24	20.17455375	4.333336335	20
143	F	26	17.1875	4.39197924	26
144	F	41	28.84153181	7.097039181	28
145	F	26	26.66666667	5.614746188	26
146	M	25	22.40587695	6.27915782	18
147	M	22	22.50692521	4.930994874	28
148	F	54	26.66666667	5.614746188	27
149	M	59	27.63036709	5.93478672	27
150	M	30	23.12467037	5.582929292	20

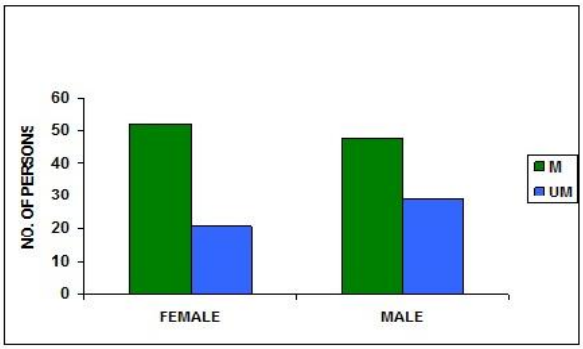

Figure 1Bar chart showing number of married and unmarried males and females

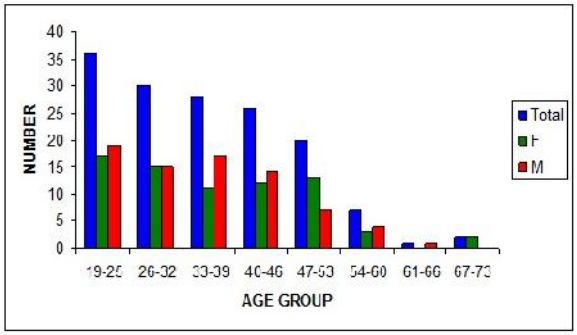

Figure 2 Bar chart showing number of males and females in different age groups

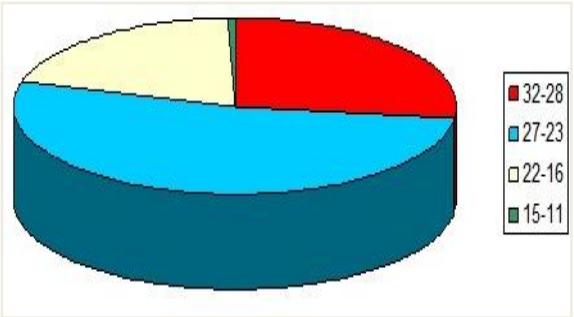

Figure 3 Pie diagram showing various classes of MEQ scores

The parameters B.M.I. (Body Mass Index)[Weight (in Kg)/ Height ^{2} (in metres)] and B.S.A. (Body Surface Area) [0.20247x (height in metres) x 0.725 x (weight in Kg.) x 0.425] were calculated as presented in Table-1.

RESULTS

Out of the total 150 subjects, total 41 self-reported as definitely morning type (24 males and 17 females), 78 as moderately morning type (34 males and 44 females), 30 as intermediate type (18 males and 12 females) and 1 male as moderately evening type. None of the subjects was found to be definitely evening type. The results are shown in the form of a bar diagram in Figure-4.

Statistical computations were carried out using the SPSS software. Regression analysis was performed by considering MEQ scores as dependent variable and B.S.A., B.M.I., and age as independent variables. The results of the analysis are summarized in Table-3 and Table-4.

Table-2 MEQ scores classified as per the standard classes

Attribute	Score	'f'	class
Definitely morning type	32 to 28	41	119
Moderately morning type	27 to 23	78	
Either type	22 to 16	30	30
Moderately evening type	15 to 11	1	1
Definitely evening type	10 to 06	0	

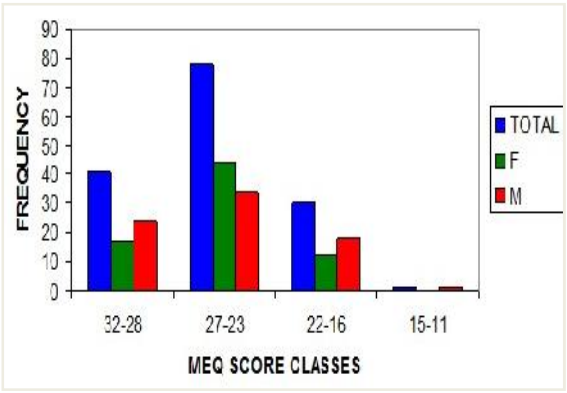

Figure 4 Results of various classes of MEQ scores

Table3 Results of statistical analysis

		BMI	BSA	AGE
N	Valid	150	150	150
	Missing	0	0	0
Mean		23.938113	6.2005472140E0	35.61
Std. Error of Mean		.2875473	.07700156010	.929
Median		23.776706	6.1075961306E0	35.00
Mode		22.4059[a]	5.98906260[a]	21
Std. Deviation		3.5217213	.94307265826	11.373
Variance		12.403	.889	129.354
Skewness		.157	.368	.570
Std. Error of Skewness		.198	.198	.198
Kurtosis		-.345	-.259	-.259
Std. Error of Kurtosis		.394	.394	.394
Range		17.5426	4.40071329	50
Minimum		16.1059	4.33333634	19
Maximum		33.6485	8.73404962	69
Sum		3590.7170	9.30082082E2	5341
Percentiles	25	21.416489	5.5216349799E0	26.00
	50	23.776706	6.1075961306E0	35.00
	75	26.446281	6.7735674145E0	44.00

a. Multiple modes exist. The smallest value is shown

Regression is the determination of a statistical relationship between two or more variables. One variable (independent) is the cause of the behavior of another one (dependent). The Regression equation tells basic relationship between two variables X and Y and is expressed as Y= a + bX which means that each unit change in X produces a change of b in Y.

Table 4 Coefficients of significance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	23.973	1.966		12.192	.000	20.087	27.859
	AGE	.048	.028	.155	1.687	.094	-.008	.104
	BMI (W/H2)	-.023	.091	-.023	-.247	.805	-.203	.158
	BSA	-.401	.304	-.108	-1.318	.189	-1.001	.200

Thus the regression analysis is a statistical method to deal with the formulation of mathematical model depicting relationship among variables which can be used for the purpose prediction of the values of dependent variable, if the values of independent variable are given.

DISCUSSION AND CONCLUSION

The results of MEQ scores suggest that the subjects (N=150) could be assigned three major types, i.e., morning type (119), intermediate type (30) and evening type (01). When the simple regression analysis of these results was carried out, the coefficients of significance gave values 0.094, 0.805 and 0.189 for age, B.M.I. and B.S.A. respectively. This indicates that age, B.M.I. and B.S.A. are not good predictors of morningness, eveningness traits in the sampled population.

Studies suggest that being a morning person or an evening person may be built into our genes, like having red hair or blue eyes. This may explain why those of us who are early-to-bed, early-to-rise types, or late-to-bed, late-to-rise types, find it so hard to change our behavior.

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Appendix-1

Morningness-Eveningness Scale

(Adapted from an article: A Self Assessment Questionaire to Determine Morningness-Eveningness in Human Circadian Rhythms. by J.A. Horne and O. Ostberg, International Journal of Chronobiology, 1976, Vol. 4, 97- 110).

Read each question carefully. Select the most appropriate answer and note the corresponding value next to it.

1. If you were entirely free to plan your evening and had no commitments the next day, at what time would you choose to go to bed?

1. 8:00 pm – 9:00 pm..... 5
2. 9:00 pm – 10:15 pm.... 4
3. 10:15 pm – 12:30 am... 3
4. 12:30 am – 1:45 am..... 2
5. 1:45 am – 3:00 am..... 1

2. You have to do 2 hours physically hard work. If you were entirely free to plan your day, in which of the following periods would you choose to do the work?

1. 8:00 am – 10:00 am..... 4
2. 11:00 am - 1:00 pm..... 3
3. 3:00 pm – 5:00 pm..... 2
4. 7:00 pm - 9:00 pm..... 1

3. For some reason you have gone to bed several hours later than normal, but there is no need to get up at a particular time the next morning. Which of the following is most likely to occur?

1. Will wake up at the usual time and not fall asleep again…....4
2. Will wake up at the usual time and doze thereafter.....3
3. Will wake up at the usual time but will fall asleep again.....2
4. Will not wake up until later than usual.....1
5. You have a 2 hour test to sit which you know will be mentally exhausting. If you were entirely free to choose,

in which of the following periods would you choose to sit the test?

1. 8:00 am – 10:00 am..... 4
2. 11:00 am - 1:00 pm..... 3
3. 3:00 pm – 5:00 pm..... 2
4. 7:00 pm - 9:00 pm..... 1

5. If you had no commitments the next day and were entirely free to plan your own day, what time would you get up?

1. 5:00 am - 6:30 am.....5
2. 6:30 am - 7:45 am.....4
3. 7:45 am - 9:45 am.....3
4. 9:45 am – 1:00 am.....2
5. 11:00 am - 12:00 pm...1

6. A friend has asked you to join him twice a week for a work-out in the gym. The best time for him is between 10pm - 11pm. Bearing nothing else in mind other than how you normally feel in the evening, how do you think you would perform?

1. Very well.....1
2. Reasonably well.....2
3. Poorly.....3
4. Very poorly.....4

7. One hears about 'morning' and 'evening' types of people. Which of these types do you consider yourself to be ?

1. Definitely morning type..... 6
2. More a morning than an evening type.....4
3. More an evening than a morning type.....2
4. Definitely an evening type.... 0

Now add the scores together to get your total and compare your total score with the table below:

Morningness - Eveningness Scale

1. Definitely morning type .....32 - 28
2. Moderately morning type .....27 - 23
3. Neither type .....22 - 16
4. Moderately evening type..... 15 - 11
5. Definitely evening type.....10 – 6

****