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MODELING A STRESS INDEX WITH MULTIVARIATE PARAMETERS UNDER A TYPICAL ENGINEERING ENVIRONMENT

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ABSTRACT

As technology advances ahead, new forms of issues will normally rise. The world has witnessed the same when TV was introduced. Likewise when computers, mobile and social media were introduced to the world. The situation demonstrates an important hidden parameter in common. It is always work and work for human beings. Knowingly or unknowingly they get involved with work or these gadgets and media to a large extent and put themselves into trouble. Computers will induce a type of stress, where the upper portion of the body being active and lower one less active. This can lead to mental stress. Mental stresses are less exhibitive and affect human beings internally. In the case of a typical physical activity body mechanisms alert human beings of being tired. This is absent in mental stress and is classified as more harmful to humans. The Engineering industry of today is focusing on how stress affects well-being of women in their day to day activities in an organization. All organizations now look for gender diversity and are committed to achieve equal gender diversity. Hence more work related issues are also been seen as potential factor for consideration amongst women. [11]Stress is on the rise for women as they struggle to find a balance between their homes & careers. It is very important for the employees especially women to handle stresses as it affects her second innings at home. Here an attempt is made by us to consider the factors responsible for stresses in women. A stress index which can measure this intangible will be of use in current situation. A multi linear regression model is thought and analyses are made for measuring stress. The analyses is continued using appropriate sample criteria to arrive at noteworthy solutions. This could be used as solutions to augment human comfort.

Key words: Women stress, stress index, Stress parameters, engineering environment

INTRODUCTION

In our daily life humans are subjected to lot of pressures [2]. These pressures are called stress. We call so as it is a compulsory assignment for every woman to accomplish them into disturbed health conditions. So we will get adjusted to such conditions rather than opposing them. Many of them face the same problems, yet unable to share it with others. The trauma seems to be so rampant in every individual's life in the present day scenario. It is well understood that these stresses are exceedingly significant provider to illness. Indian women do not give much prominence to themselves; rather they would suffer by keeping it for themselves. If this trauma is prolonged for many days sustaining, a day arises where it becomes inevitable for a person to consult doctor. Later when the doctor diagnosis the problem and recommends the necessary actions, the solution is attained. It is not a hard task to apply ergonomics, to a certain extent applying ergonomics means to visualize the routine activities in a somewhat different perspective. I always recommend women to first identify what is the cause of stress? Some of them might be complicated to divulge or disclose but they might be simple to identify. The reaction levels in men the task within the stipulated time bound. This tends to strain them. And if the usual retort is long-drawn out due to lack of time, because of their personal works, be it research work or any other work, puts and women vary largely. Women as much as possible try to respond coolly and calmly. They try to avoid any quarrels; rather they try to patch up the things. Whilst men's reactions are violent with a fight or flight response.

SCOPE OF STUDY

The study is carried in Bangalore city among women employees. The study was carried out with the academicians. Women were expressing that they are unable to cope up with the work pressure, due to which they are facing imbalanced health conditions. Hence to determine the stress analysis due to the said reason the study was carried out.

OBJECTIVES

- To develop and fit a multi linear regression model and study its effects.
- To examine the varieties of stresses & issues concerned with women at work.
- To study the factors relating to working stress.

- To investigate the factors leading to stress.

LITERATURE REVIEW

After referring many articles & Journal papers it was understood that women try to care for everyone expect for themselves. the time is fixed to complete the assigned work. On the other hand if the pain is borne for a long period, neglecting it leads to severe problems known as long term stress as it was ignored for many days. Age group & stress are correlated.

IMPORTANT PARAMETERS

In the recent newspaper i.e Vijay Karnataka published at Bangalore, dated 26-10-2016, it was mentioned that women are disturbed a lot because of various problems. The important parameters considered for the study includes as mentioned below:

Age Self Induced High pressure, Changes in hormones due to body Composition Pregnancy & Post-delivery issues Surrounding Environment Psychological Reason Urgency of completion of Work

Initially the work started off with noise studies that revealed as one of the parameter which caused stress. Then it was followed by a questionnaire wherein lot of data was collected both at the construction industry as well as at garment industry and found

ANALYSIS & DISCUSSION

In the analysis the dependent parameter age relies on four different independent parameters such as pressure, work rest, ambience & the work content. Age considered is between twenty to thirty, thirty to forty, forty to fifty and so on. The growing experiential research has shaped the required effectual technique for determining the sample size. So in my paper using Krejcie Higher the P value, more true the null hypothesis lower the t value, less amount of deviation from the null hypothesis. So priority- high 'p' & low 't'. Regression statistics is just the expression of various parameters in numerical forms. Residual analysis is the analysis of differences obtained due to various different sequences of the independent parameters observed in the dependent parameter(age).Higher the P-value more likely it is that the data is true with respect to the null hypothesis. From the results obtained it is seen that the P-value for ambience is highest followed by work pressure, work content & finally work rest. Through the above results obtained it's found that , highest being for ambience & least for work rest.

Scientists revealed that at the time of stress their responses actually strengthen. Stresses are of different types. One is short term stress & the other one long term stress. When time bound is specified for completing the work we call it short term stress i.e many of them faced lots of back injuries. Later literature survey was done to understand the concepts to reach our destination at ergonomic solutions. Further studies were urged to carry on arriving with a process model represented by Cause and Effect diagram shown in the above figure 1(Cause and Effect Diagram).

The process model shown in figure 2 below tells us that after working for 8 hours a day a woman feels that she is under pressure as she is continuously working without rest. The surrounding work environment also is a problem for her to continue with her activities. Women also mentioned that they are stressed as they have more than one task to be completed within a specified day both in and out. Age is a dependent factor which relies on various independent factors mentioned above. If this stress is lead for many days i.e. if human beings sustained this pain for a long period, a day arises where it becomes unavoidable that they have to meet doctors, consider their recommend-ations to get a solution.

& Morgan (1970) table was used to determine sample size for the data considered as reference. Regression model is fitted based on this data. Here for a population of 10 the sample size considered is 10 as per the said table and a multivariate regression analysis is done using Minitab software. The output of the analysis is shown below.

Interpretation

For the graph shown above goodness-of-fit in regression and ANOVA were used to inspect the residual plot. These plots were further utilized to find the least square assumptions. Since the regression has produced the unbiased coefficient estimates with minimum variance, it is said that the assumptions considered are true. In the residual versus order plot, it is seen that the residuals are uncorrelated with each other. In the histogram of residuals it is seen that In the normal probability plot i.e residual versus percent it can be inferred that all the points lie on the linear regression line. As the data points have a linear pattern we can say that the normal distribution is the best fit model for the above considered data.

From the fitted line plot, it is seen that lesser the age more is the pressure and vice versa. Therefore [10]linear relationship is described in an equation preceding the graph and confirmed by the high R-Squared value (85.6%) followed by work rest (72.9%), ambience (38.65) & least being work content(19.6%).

The above figure (fig.5) represents residuals on Y-axis & the independent variables on the X-axis. As the data points are random in nature around the X-axis, the best fit model is a linear regression model. The inputs & outputs are as shown in the table 3. The displays of residual (e) & the non dependent variable (X) are represented in figure 5.as a residual plot. Every plot shows somewhat unsystematic pattern –which is represented in case of Residual versus Pressure, may or may not indicate a linear relationship. Under these circumstances we are happy to suggest the residual error (e) as acceptable and would like to suggest linear regression model is suited to current analysis. Our approach to determine stress on multifactors has good relevance and accuracy.

RESULTS & CONCLUSION

Since the correlation value is larger than 0.8, our model shows a better fit of regression equation to the data values considered. Thus it can be concluded that women are stressed out to a maximum extent due to pressure, work content, ambience & work rest relying on the age factor. This could be used as solution to augment women stress.

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DEVELOPMENT OF INDEX

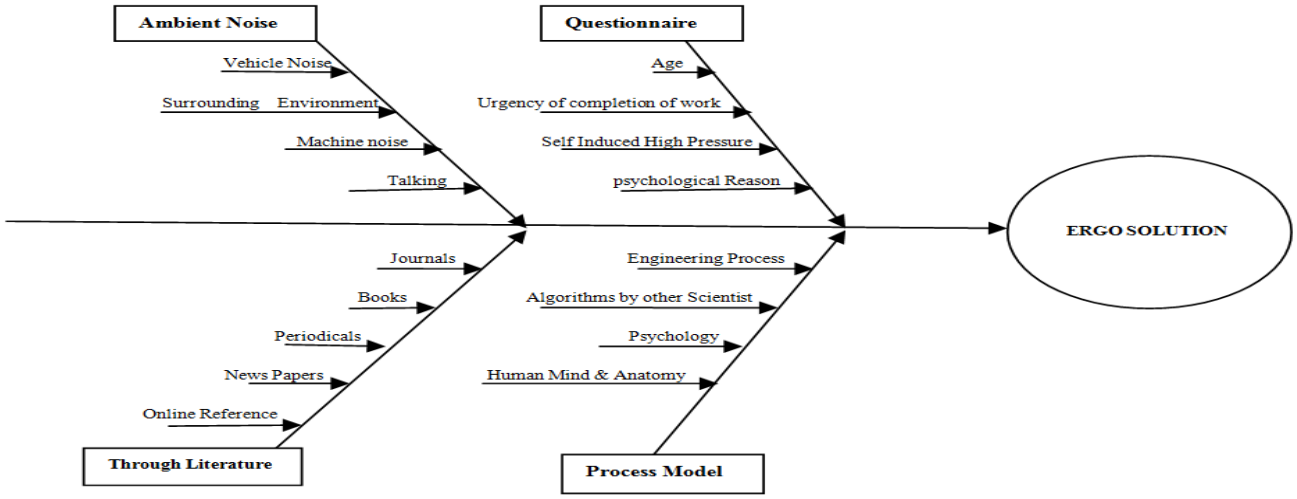

Fig 1. Cause and Effect Diagram

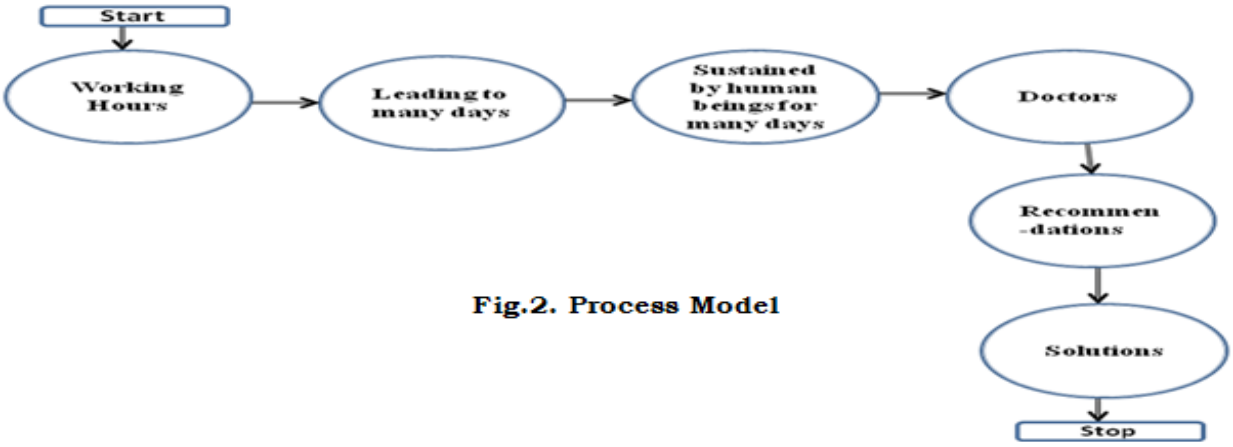

Fig.2. Process Model

Table 1 Dependent and Independent Parameters

Age	Pressure	Work Rest	Ambience	Work Content
30	40	10	30	20
40	30	20	20	30
50	20	30	30	20
60	20	20	20	40
70	20	40	20	20
80	0	80	20	0

Table 1 Output of the Regression Analysis

SUMMARY[a1] OUTPUT

Regression Statistics	
Multiple R	0.9459305
R Square	0.8947846
Adjusted R Square	0.2369615
Standard Error	9.5949722
Observations	6

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1565.873016	391.4683	5.6695402	0.303920488
Residual	2	184.1269841	92.06349		
Total	6	1750			

	[a1]*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	13.174603	86.6925364	0.151969	0.8931566	-359.833275	386.1824816	-359.8332752	386.1824816
Pressure	-0.2380952	1.473115076	-0.16163	0.8864516	-6.57639784	6.100207365	-6.576397841	6.100207365
Work Rest	0.8730159	1.094662835	0.79752	0.5087915	-3.83693816	5.582969908	-3.836938162	5.582969908
Ambience	0	0	0.65535	0.9132585	0	0	0	0
Work Content	0.8253968	0.955682109	0.863673	0.591986	-3.28657141	4.937365062	-3.286571412	4.937365062

RESIDUAL OUTPUT

Observation	*Predicted Age*	*Residuals*	*Standard Residuals*
1	28.888889	1.111111111	0.200574
2	48.253968	-8.253968254	-1.48998
3	51.111111	-1.111111111	-0.20057
4	58.888889	1.111111111	0.200574
5	59.84127	10.15873016	1.833818
6	83.015873	-3.015873016	-0.54441

PROBABILITY OUTPUT

Percentile	*Age*
8.333333333	30
25	40
41.66666667	50
58.33333333	60
75	70
91.66666667	80

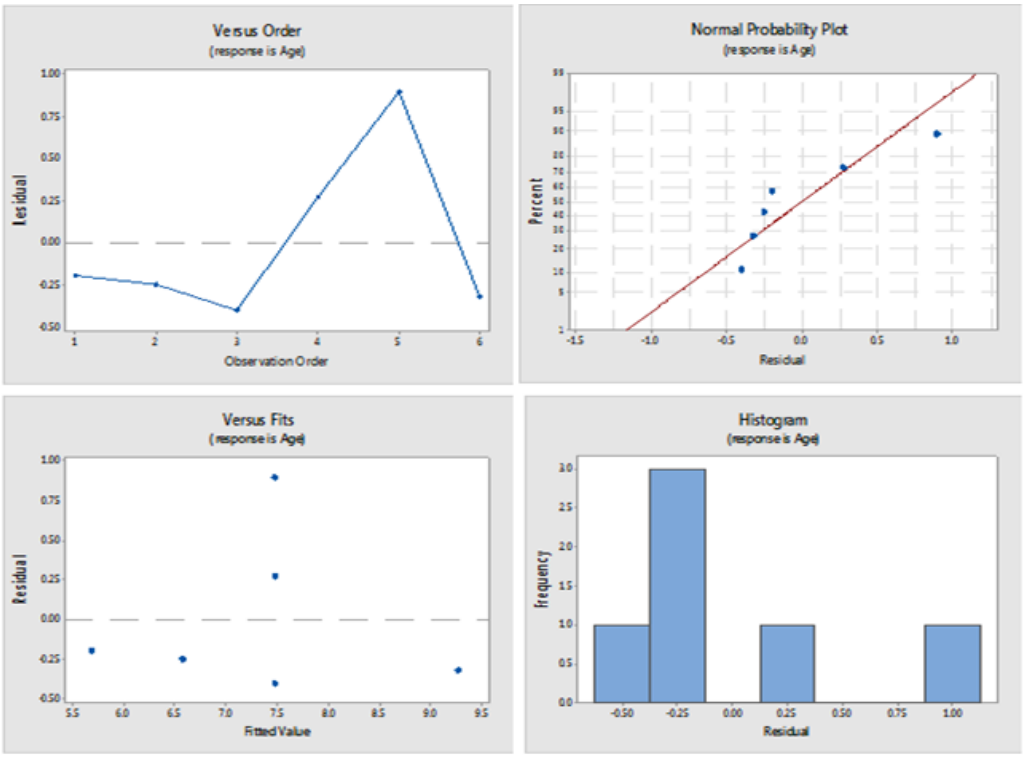

Fig.3 Residual Plots to Examine Goodness of Fit

Table 3 Output of the Regression Analysis

Age	Pressure	Work Rest	Ambience	Work Content	FITS	RESI	SRES	BFITS
30	40	10	30	20	5.675526	-0.1983	-0.52871	32.2116
40	30	20	20	30	6.573393	-0.24884	-0.5139	43.20949
50	20	30	30	20	7.471259	-0.40019	-0.78802	55.81971
60	20	20	20	40	7.471259	0.274708	0.540927	55.81971
70	20	40	20	20	7.471259	0.895341	1.763018	55.81971
80	0	80	20	0	9.266991	-0.32272	-1.0538	85.87713

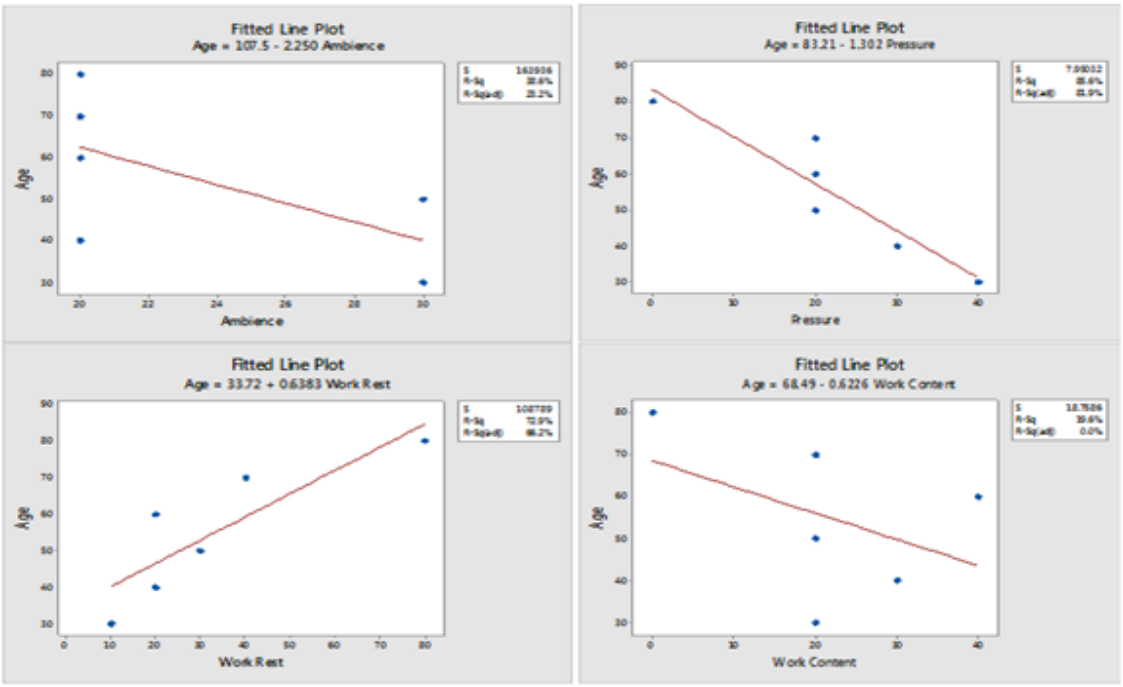

Fig.4 Fitted line plots for pressure, work rest, ambience & work content

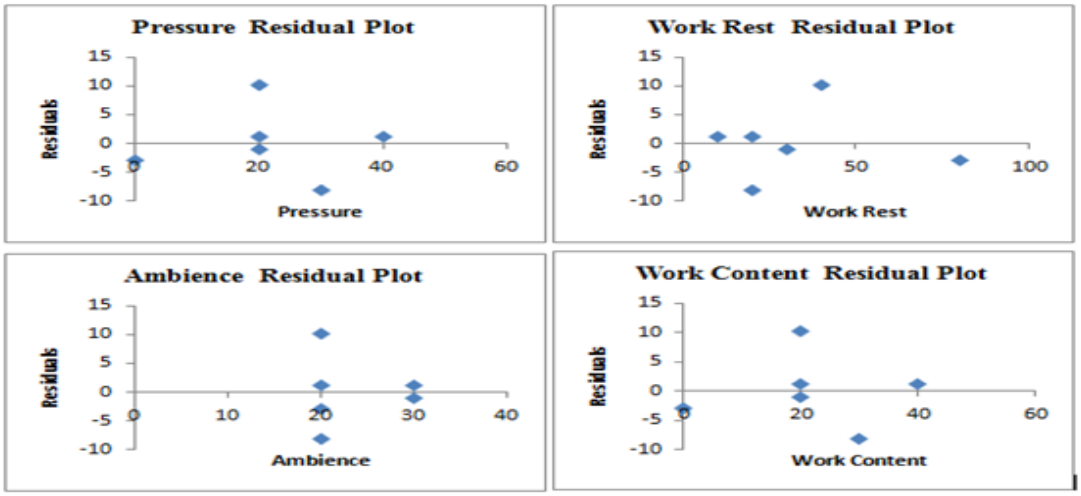

Fig. 5 Graph of residual & independent variable