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# A study on occupational stress of bus drivers using chi square test

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***ABSTRACT***
*The occupational stress of bus drivers working in a public transport corporation has to be tackled properly to lead normal life without strain. A sample survey is conducted to understand the demographics of drivers for further analysis. The factors influencing stress, impact of stress and stress handling measures are ranked using percentage analysis. The results of chi square tests show that significant relationships exist for age and stress in personal life and for ergonomics and stress in professional life.*
***KEYWORDS***: *occupational stress, drivers, ranking, chi square*

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## I. INTRODUCTION

Transportation plays a crucial role in development of a nation because it helps in distribution of products, people etc. There are various modes of transportation namely airways, seaways, railways and roadways in India. Many people use conveyance like bus, rails and airways daily to commute from one place to other for his or her personal, professional, recreational purposes etc. India's public road transport system is among the foremost heavily utilized within the world and mostly travel by government owned Transport Corporation. Tamilnadu is leading publicly transport system with many government and private buses.

In the fast changing world of today, every individual is affected from stress, whether it's within the family, business, organization, study, work, or the other social or economical activity. The occupational stress is one among the main health hazards of workplace. It accounts for much of physical illness and family problems experienced by many workers throughout the world. Stress results in physical, mental and behavioral changes. Job stress problem pose risks to employee well being also on organizational performance. Though study on stress management isn't a replacement idea and it's been conducted on various occupations. Working in transport department is identified as most stressful profession today. This might have varied reasons like work load, government rules and regulations, dealing with safety and time management. Most of the people use buses because it is reasonable and convenient mode of transport. Therefore, stress at drivers' level is extremely vital because it ensures safe travel of passengers.

This study concentrates on factors causing stress, how drivers cope up with strain, steps taken by them to avoid stress both mentally and physically. It is important because the numbers of vehicles within roads have grown tremendously and drivers are to be stress free while driving to possess a safety and secure journey. Hence, it becomes essential to understand causes for strain, and consequently it is often reduced. This study is going to be also helpful to seek out impacts of occupational stress in drivers and also steps followed by the drivers to scale back the strain. From, the sample data collected various factors were interpreted and relationship among them was found. This study can identify various psychological factors undergone by drivers during their work.

## II. LITERATURE REVIEW

The study was conducted to find out the drivers stress and satisfaction level towards each factor like compensation, working environment, career growth, management support, level of stress and job satisfaction [1]. The impact of fatigue causes stress due to their occupation both in drivers personal and work life [2]. The study finds that the participatory approach from all levels of management (Top, Middle, and Bottom) leads to some reduction in stress level [3]. Stress has been identified to be a serious problem within the operation of mode of travel. Therefore, the factors include road conditions, concentration on road, lack of poor working conditions and style of auto etc. [4]. Indu [5] studied about human resource department practices, policies etc in Tamil Nadu State

**Table 1. Distribution of sample data**

| S.No | Sample variables | | Number of respondents | Percentage |
|---|---|---|---|---|
| 1 | Age group | | | |
| | | 21-30 | 8 | 9 |
| | | 31-40 | 22 | 26 |
| | | 41-50 | 27 | 32 |
| | | Above 50 | 28 | 33 |
| | | Total | 85 | 100 |
| 2 | Marital status | | | |
| | | Married | 76 | 89 |
| | | Unmarried | 9 | 11 |
| | | Total | 85 | 100 |
| | | | | |
| 3 | No of children | | | |
| | | Above 2 | 42 | 55 |
| | | 2 | 20 | 26 |
| | | 1 | 14 | 19 |
| | | Total | 76 | 100 |
| 4 | Educational qualification | | | |
| | | $10^{th}$ | 22 | 25 |
| | | $12^{th}$ | 55 | 64 |
| | | Ug | 9 | 11 |
| | | Total | 85 | 100 |
| 5 | Experience | | | |
| | | 0-5 | 22 | 26 |
| | | 6-15 | 35 | 41 |
| | | Above 15 | 28 | 33 |
| | | Total | 85 | 100 |
| 6 | Nature of employment | | | |
| | | Permanent | 79 | 93 |
| | | Temporary | 5 | 6 |
| | | Contract | 1 | 1 |
| | | Total | 85 | 100 |
| 7 | Number of kilometers (DAILY) | | | |
| | | Above 300 | 80 | 94 |
| | | 100-300 | 4 | 5 |
| | | 0-100 | 1 | 1 |
| | | Total | 85 | 100 |
| 8 | Number of working hours(weekly) | | | |
| | | Above 50 hours | 59 | 69.51 |
| | | 41-50 | 26 | 30.49 |
| | | Total | 85 | 100 |
| 9 | Why do you continue this job | | | |
| | | I have no other option | 40 | 47.05 |
| | | Family situations | 16 | 18.82 |
| | | Job security | 27 | 31.76 |
| | | Jobs satisfaction | 2 | 2.35 |

| | | | | |
|---|---|---|---|---|
| | | | 85 | 100 |
| 10 | During which season you feel more tough to work | | | |
| | | Rainy | 70 | 82.45 |
| | | Summer | 11 | 12.94 |
| | | Winter | 4 | 4.7 |
| | | Total | 85 | 100 |
| 11 | Does ergonomics are in good condition | | | |
| | | Frustrating | 49 | 57.64 |
| | | Satisfactory | 32 | 37.64 |
| | | Comfortable | 4 | 4.70 |
| | | | 85 | 100 |
| 12 | Stress affecting personal life | | | |
| | | Often | 15 | 17.64 |
| | | Sometimes | 62 | 72.94 |
| | | Never | 8 | 9.41 |
| | | Total | 85 | 100 |
| 13 | Stress affecting job life | | | |
| | | Often | 31 | 36.47 |
| | | Sometimes | 47 | 55.29 |
| | | Never | 7 | 8.23 |
| | | Total | 85 | 100 |
| 14 | Does unions help in solving problems | | | |
| | | Often | 1 | 1.17 |
| | | Sometimes | 59 | 69.41 |
| | | Never | 25 | 29.42 |
| | | Total | 85 | 100 |

Transport Corporation (TNSTC) and located that Corporation has good human resource recruitment wing. The musculoskeletal disorders are often prevented by designing drivers' workspace ergonomically, in order that design suits to all or any kinds of drivers [6]. Sergio et al. [7] discussed about the connection between psychosocial variables and two of the foremost important epidemiological indicators of transport companies: the prevalence of high rates of road accidents and traffic penalties or fines. The result suggests that older drivers reported much less stress than young drivers not only at intersections but also on the straight roads [8]. The Perceived Stress Scale (PSS) questionnaire and Pittsburgh Sleep Quality Index (PSQI) are used to measure stress level and sleep quality respectively [9]. Their study shows significant association between stress levels and poor sleep quality and also the bus drivers within the city are stressed regardless of age. The health of drivers within the cabins of passenger buses is usually suffering from hygiene hazards: fever, vibration, and emotional stress [10]. In India the ergonomics of the driving force is given least importance and therefore, drivers find themselves using pillows, towels and other materials to supply the cushioning and make their drive little comfortable to scale back the stress [11]. Valarmathi [12] concluded there is no relationship between age bracket and stress coping strategy adopted by the bus drivers using ANOVA test. From the review, it is evident that occupational stress among drivers in passenger transports plays major role in their life. It becomes necessary to seek out significance between age of drivers and stress and ergonomics of bus and stress.

## III. METHODOLOGY

Research Methodology may be a blue print which shows the research design, sampling technique, sample size and data collection methods and research tools used for the study. It is a selection of condition, collection and analysis of knowledge during a manner, aims to mix relevance to the research purpose. The descriptive type research is aimed towards current issues or problems through a process of knowledge collection that permits them to explain things more complete. It explains various phenomenons and also used to describe characteristics and behavior of sample population. The study is conducted in TNSTC, Chennai for a period of two months. The convenience sampling relies on data collection from population members who are conveniently available to participate within the survey period. The sample size of 85 is employed for the study.

The table 1 shows the distribution of sample data collected. The distribution age ranges of respondents are 33% above 50, 32% between 41-50 and 26% in the group of 31-40. Only 9% of respondents' age is 21-30. The legal status of the respondents is 89% married and remaining unmarried. 55% of respondents have quite 2 children, 26% have 2 children and 19% have single child. Nearly 75% have completed $12^{th}$ standard and above. The table also shows experience of respondents, 41% of them have experience of 6-15 years, 33% have experience of quite 15 years, and 26% of remaining has experience of 0-5 years. Because the sample has been collected among drivers of state transport corporation 93% of them are permanent. The daily kilometer driven by 94% of drivers is above 300. 70% of respondents work weekly above 50 hours and 30% work between 41-50 hours. The table 1 shows work life balance of respondents during which 74% of them say they don't have work life balance and 26% have work life balance. The rationale for respondents to continue their job is that 47% of them haven't any other option. For 82% of respondents season was the toughest while for others summer and winter seasons. The ergonomic condition of drivers' cabin is frustrating for 58% and 38% feel satisfactory. It is evident that the stress affects 73% in personal life and 55% in work life of respondents. The employee unions may help in solving to beat stress associated with work. The rank analyses are conducted separately on factors influencing stress, impact of stress and stress handling measures supported with percentage. Two chi square tests namely for age and stress in personal life and for ergonomics and stress in professional life are conducted. Hypotheses are framed to spot the connection among above factors. The chi square test is employed for testing relationship between two variables. The null hypothesis is employed to check the independence of the variables.

## IV. RESULTS AND DISCUSSION

The tables 2, 3 and 4 show the factors for causing stress, impact of stress and stress handling measures respectively. These parameters are interrelated to occupational stress of drivers and health. The stress relieving measures adopted by the drivers are also discussed.

**Table 2. Factors inducing stress**

| S.No | Factors | Yes | No | Rank |
|---|---|---|---|---|
| 1 | Minor accidents | 66% | 34% | 4 |
| 2 | Multiple shifts on single day | 32% | 68% | 6 |
| 3 | Festival time crowds | 84% | 16% | 2 |
| 4 | Conflict with passengers | 47% | 53% | 5 |
| 5 | Conflict with co-workers | 10% | 90% | 8 |
| 6 | Conflict with management | 77% | 23% | 3 |
| 7 | Cope up with crowd safety and time | 95% | 5% | 1 |
| 8 | Breakdowns | 30% | 70% | 7 |

Among many factors, cope up with crowd safety and time ranks top with 95%. The festival time crowds also another major factor inducing the stress. The conflicts with management over work related issues contributes 77%.The multiple shifts and breakdowns do not create much stress among drivers. The minor accidents score 66% among other factors. The table 3 illustrates the impact of stress on the health of drivers.

**Table 3. Impact of stress**

| S.No | Impact on health | Yes | No | Rank |
|---|---|---|---|---|
| 1 | Insomnia | 20% | 80% | 5 |
| 2 | Fatigue | 95% | 5% | 1 |
| 3 | Frequent mood swings | 10% | 90% | 7 |
| 4 | Digestion problem | 40% | 60% | 3 |
| 5 | Blood pressure | 7% | 93% | 8 |
| 6 | Kidney stone | 33% | 67% | 4 |
| 7 | Muscular skeletal problems | 90% | 10% | 2 |
| 8 | Any other options | 18% | 82% | 6 |

The fatigue on 95% of sample is caused by various factors like multiple shifts per day, crowd management and keeping running time between terminals. 90% of drivers have muscular skeletal problems which make them uneasy. The irregular food habits and diet creates digestion problem for 40% of drivers. The kidney stone problems are seen commonly among 33% of drivers which may affect them during driving time.

**Table 4. Stress handling measures**

| S.No | Measures taken to control stress | Yes | No | Rank |
|---|---|---|---|---|
| 1 | Physical exercises | 13% | 87% | 5 |
| 2 | Medication | 3% | 97% | 7 |
| 3 | Yoga/Meditation | 20% | 80% | 4 |
| 4 | Listening to Music | 83% | 17% | 1 |
| 5 | Spending time with family | 32% | 68% | 3 |
| 6 | Concentrating on favourite hobby | 81% | 19% | 2 |
| 7 | Any other options | 8% | 92% | 6 |

The table 4 shows the various measures taken by drivers to control the stress. 83% drivers are getting relieved from stress by listening to music both while in driving and also in rest time. The spending of quality time on favourite hobbies like gardening, watching movies and playing games relieve nearly 81% of drivers from occupational stress. Nearly 32% of drivers feel comfortable by mingling with their families.

**(i) Chi square test for age and stress in personal life**

A chi square test is conducted to find out if there is any significant relation between any two variables. The independence of variables is checked by framing null hypothesis ($H_0$) and alternate hypothesis ($H_1$).

$H_0$: There is no significant relationship between age and stress in personal life.

$H_1$: There is significant relationship between age and stress in personal life.

**Table 5. Age and stress in personal life**

| Does stress affect your personal life(Observed values(O)) | | | | |
|---|---|---|---|---|
| Age | Often | sometimes | never | Total |
| 21-30 | 2 | 5 | 1 | 8 |
| 31-40 | 1 | 18 | 3 | 22 |
| 41-50 | 1 | 23 | 3 | 27 |
| >50 | 11 | 16 | 1 | 28 |
| Total | 15 | 62 | 8 | 85 |
| AGE | Expected values(E) | | | |
| 21-30 | 1.41 | 5.83 | 0.75 | |
| 31-40 | 3.88 | 16.04 | 2.07 | |
| 41-50 | 4.76 | 19.69 | 2.54 | |
| >50 | 4.94 | 20.42 | 2.63 | |

The table 5 shows the observed values (O) of various age groups with respect to frequencies of stress that affects their personal life. The expected values (E) are calculated by product of sum of total of respective rows and total of respective column which is whole divided by the total number of data. For an example to find the expected value for the observed value of 2 (age 21-30 & often) (8*15)/85=1.41.In similar way all other expected values are found out.

**Table 6. Chi square calculation**

| O | E | O-E | $(O-E)^2$ | $(O-E)^2/E$ |
|---|---|---|---|---|
| 2 | 1.41 | 0.59 | 0.35 | 0.24 |
| 5 | 5.83 | -0.83 | 0.69 | 0.11 |
| 1 | 0.75 | 0.25 | 0.06 | 0.08 |
| 1 | 3.88 | -2.88 | 8.29 | 2.13 |
| 18 | 16.04 | 1.96 | 3.84 | 0.23 |
| 3 | 2.07 | 0.93 | 0.86 | 0.41 |
| 1 | 4.76 | -3.76 | 14.13 | 2.96 |
| 23 | 19.69 | 3.31 | 10.95 | 0.55 |
| 3 | 2.54 | 0.06 | 0.00 | 0.06 |
| 11 | 4.94 | 6.06 | 36.72 | 7.43 |
| 16 | 20.42 | -4.42 | 19.53 | 0.95 |
| 1 | 2.63 | -1.63 | 2.65 | 1.07 |
| | | | Total (calculated value) | 16.22 |

The table 6 exhibits the chi square calculation with observed and expected values. The value of $\sum(O-E)^2/E$ is calculated and it is found to be 16.22. This calculated value has to be compared with the chi square chart value.

**Table 7 Chi square chart**

| df | P = 0.05 | P = 0.01 | P = 0.001 |
|---|---|---|---|
| 1 | 3.84 | 6.64 | 10.83 |
| 2 | 5.99 | 9.21 | 13.82 |
| 3 | 7.82 | 11.35 | 16.27 |
| 4 | 9.49 | 13.28 | 18.47 |
| 5 | 11.07 | 15.09 | 20.52 |
| 6 | 12.59 | 16.81 | 22.46 |
| 7 | 14.07 | 18.48 | 24.32 |
| 8 | 15.51 | 20.09 | 26.13 |
| 9 | 16.92 | 21.67 | 27.88 |

Degrees of freedom (df) = (number of rows -1) x (number of columns - 1) = (3-1) x (4-1) = 6.From the table 7 chart value is 12.59 for 5% (P = 0.05) significance level and 6 degrees of freedom. The chart value is lesser than calculated value (12.59 < 16.22). So, $H_o$ is rejected and alternative $H_1$ is accepted. Thus, there is significant relationship between age and stress in personal life.

**Table 8. Ergonomics and stress in professional life**

| Does Stress affect your professional life (Observed values(O)) | | | | |
|---|---|---|---|---|
| How is driver's cabins ergonomics | Often | Sometimes | Never | Total |
| Frustrating | 16 | 30 | 3 | 49 |
| Satisfactory | 16 | 14 | 3 | 33 |
| Comfort | 1 | 1 | 1 | 3 |
| Total | 33 | 44 | 7 | 85 |
| Expected values(E) | | | | |
| Frustrating | 19.02 | 12.81 | 1.16 | |
| Satisfactory | 25.94 | 17.47 | 1.58 | |
| Comfort | 4.03 | 2.71 | 0.24 | |

**Table 9. Chi square calculation**

| O | E | O-E | $(O-E)^2$ | $(O-E)^2/E$ |
|---|---|---|---|---|
| 16 | 19.02 | -3.02 | 9.12 | 0.47 |
| 30 | 12.81 | 17.19 | 295.49 | 23.06 |
| 3 | 1.16 | 1.84 | 3.38 | 2.91 |
| 16 | 25.94 | -9.94 | 98.80 | 3.80 |
| 14 | 17.47 | -3.47 | 12.04 | 0.68 |
| 3 | 1.58 | 1.42 | 2.01 | 1.27 |
| 3 | 4.03 | -1.03 | 1.06 | 0.26 |
| 1 | 2.71 | -1.71 | 2.34 | 1.07 |
| 1 | 0.24 | 0.76 | 0.58 | 2.42 |
| | | | Total (Calculated value) | 35.94 |

**(ii) Chi square test for ergonomics and stress in professional life**

The table 8 shows the observed and expected values for the two variables of ergonomics and professional stress. The following hypotheses are framed to check the relationship between variables.

$H_0$: There is no significant relationship between ergonomics and stress in professional life

$H_1$: There is significant relationship between ergonomics and stress in professional life.

The table 9 shows the chi square calculation for second test on ergonomics and professional life. The degree of freedom (df) is (3-1) x (3-1) = 4 for this test. From the table 7, for 5% (P =0.05) level of significance and degrees of freedom of 4, chi square chart value is 9.49. Therefore, the chart value is lesser than calculated value (9.49 < 35.94).So, $H_o$ is rejected and $H_1$ is accepted, which implies that there is significant relationship between ergonomics and stress in professional life.

## V. CONCLUSION

Many factors are inducing stress in both personal and professional life of bus drivers in a public transport corporation. The cope up strategy with crowd safety and maintaining time of travel between terminals is the major factor for inducting stress among 95% of the drivers. This results in fatigue which is major strain for them. The simplest way adopted by them to relieve stress is listening to music both in driving and rest time. Null hypotheses in both chi square tests are rejected at 0.05 significances level indicating there is some relationship among age and ergonomics of vehicle with stress in life. Further study may be continued by considering other stress inducing factors like revenue generation through ticket collection and fuel efficiency.

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