A Novel Job Stress Scale for Employees in the Midst of Post Covid Work Environment: Empirical Evidence from Indian IT Sector

Gireesh Y. M.[a*], **Nandeesh V. Hiremath**[a*] **Nagaraj B V**[b], **Sunilkumar R Hiremath**[b] and **K V Manjunath**[b]

[a]*Assistant Professor, Department of MBA, Siddaganga Institute of Technology, Tumakuru. E-mail: gireeshym@sit.ac.in*
[a]*PhD Research Scholar, Shri Jagdish Prasad Jhabarmal Tibrewala University (SJJTU), Jhunjhunu, Churela, Rajasthan.*
[b]*Associate Professor, Kirloskar Institute of Advanced Management Studies, Harihar, Karnataka.*
[b]*Associate Professor, Dr D Veerendra Heggade Institute of Management Studies and Research, Dharwad, Karnataka.*
[b]*Assistant Professor, Department of Industrial Engineering and Management, Siddaganga Institute of Technology, Tumakuru.*

Abstract

Work from home has become a norm to support business continuity during pandemic. Covid-19 has forced many businesses to shift to remote working. Though remote working brings many comforts to employees in terms of being available close to family, discomfort and time wastage of travelling, it breaks the barriers of work timings introducing work life imbalance. This in-addition to other factors like safety perception, contagion risk, social alienation, job loss fears, and work coordination failures due to technological glitches etc pandemic brought an increase in psychological stress and depression for employees. The effect is more pronounced in Information Technology (IT) sectors. Human resource management in IT sectors needed a better means to quantize stress and reduce the stress induced attritions. Towards this need, this work proposes a novel job stress scale for pandemic created stressors to quantize the stress level of employees. The job stress scale is designed based on factors identified through analysis on questionnaire responses from employees. The job stress scale is very adaptive to gender, employment level etc. The effectiveness of the proposed job stress scale is tested as case study in a corporate company and the results were found to highly correlate to the most standard PSS-10 stress results.

Keywords: Job stressor, pandemic, Job stress scale, Work life imbalance.

1.0 Introduction

Covid-19 pandemic has changed the traditional way of work and introduced new norms like work from home. These norms were adopted by many organizations to support business. Continuity during lock downs, social isolation and fear of pandemic spread. Businesses without these new norms like work from home came to a grinding halt during pandemic

times. Their revenue and sales took a severe hit. Many companies revaluated their operations and enhanced their operations with more digital channels for ensuing business continuity. "Work from home" has become a new order of working in many companies. Though "Work from home" has facilitated much convenience to employees in terms of being close to family, avoiding travel discomforts, avoid time wastage in office travel, attending to personal chores etc, it breaks the regular work hour barriers. Employees need to stretch out their working hours due to glitches in

*Corresponding Author

coordination, technical failures, and resource availability. Frequent team coordination has to be done with video conferencing to avoid silos in working. These break into employees work life balance. Work life imbalance, role expectation and co-worker/manager support create psychological stress and depression for employees. The stress is further aggravated with additional stressors like job loss fears, risk of contagion etc. Stress induced health problems has increased the attrition levels in organizations. Human resource departments in many companies find it challenging to quantize the stress level among employees in this teleworking environment and adopt suitable stress management practices to facilitate a stress free working environment for the employees. A reliable stress scale to quantize the stress level of employees considering the new stressors created from pandemic situation is needed to roll in various organization plans which can foster positive attitude, reduce stress and adapt employees to the teleworking environment. The objective of this work is to design a reliable job stress scale considering the new job stressors created by pandemic and test the effectiveness of the designed job stress scale in teleworking environment.

2.0 Literature Review

Nixon et al (2011) studied the correlation between eight physical symptoms and the organizational stressors. Rosenthal approach was used to analyze the mental impact due to workload, working hour conflict on the stress level of the employees. Elahi et al (2012) analyzed the role stress on employees in banking sector. The questionnaire responses collected from 100 employees were analyzed using ANOVA model to understand the correlation between role conflicts and job stress. Shukla et al (2016) proposed a stress scale based on working hours specific to Indian working environment. The scale is derived using existing theoretical job stress models. Factor and correlation analysis was used to validate the job stress scale. Frantz et al (2019) modelled work stress in terms of physical sickness leave opted by the employees. The reliability of the model was tested using test-retest analysis on questionnaire responses from the employees. Holmgren et al (2009) proposed a stress assessment model for employees based on various work related and personal factors. Questionnaire responses from employees were tested using test-retest analysis to check the validity and consistency of the stress assessment model. Niedhammer et al (2006) studied the impact of major organizational changes on the stress level of the employees. Factors of job strains, over commitment, support from colleagues and effort reward imbalance were considered in stress assessment. Streiner et al (2015) proposed a mental health assessment model. It is based on the response

options of employees to various organizational challenges. Test-retest analysis was used to check the reliability and validity of the model. Stanton et al (2001) used exploratory factor analysis for identification of factors inducing stress on employees. Methods like oblique rotation and maximum likelihood are used for factor analysis. Inoue et al (2016) proposed a new job stress scale combining various stressors used in organizations. Correlation coefficient analysis on various job stress scale resulted in a 23 item questionnaire. Test-retest analysis was used for testing the validity of questionnaire items. Foroutan et al (2015) devised a occupational stress assessment model for Tehran municipality using Osipow questionnaire. The most influential factors in the questionnaire items were found using correlation analysis. Job burnout factors were found to have more influence of occupational stress compared to her factors. Spector et al (1998) proposed three occupational job stress scale based on conflicts, organizational constraints and work load. Correlation between job scale and other variables is found using meta analysis. Spector (2016) analyzed the correlation between stress and control on employees. The study inferred that stress is directly correlated to level of control of the employees. Bjerkeli et al (2020) proposed a stress scale correlating stress to sickness absence. Through questionnaire response analysis on 271 health care workers, study found a higher correlation between stress level and sickness leave. Wännström et al (2009) studied the correlation between psychological and social factors at work to the Psychometric properties in General Nordic Questionnaire. Out of 26 scales, 24 scales in General Nordic questionnaire were found to be good indicator of stress at workplaces. Duchaine et al (2020) studied the correlation between job stressors and mental disorder. Meta analysis on various data acquired from MEDLINE found a strong correlation between job stress and mental health. Among many factors, effort reward imbalance was found to be most important factors contributing to the job stress. Ouimet et al (2020) proposed a stress model in terms of objective measurement of mental health. Cox regression analysis on questionnaire responses from while collar workers in Canada proved a stronger association between mental health and job stressors and the relation is more strong in women compared to men. Nielsen et al (2019) correlated the workspace bullying and absence due to medical sickness using regression analysis. The study found that longer sickness absence is strongly correlated to work space bullying. Indregard et al (2017) proposed a stress assessment model based on medical sickness. The study found role conflict as a dominant factor in inducing work related stress. Kevin et al (2021) made a review on implications over employees due to emergent work practices like work from home and virtual teams. The implications were analyzed in three factors of economic, social and

psychological. Their view inferred though many works found significant impact of emergent work practices on economic, social and psychological level, they could not quantify the effect. Piotrowski et al (2021) analyzed the impact of stress using mix of sense of stress questionnaire scale and resilience scale. The survey on 75 participants found that Covid has significant impact on occupational stress. But the study could not quantize the impact on different employee levels. Yasmin et al (2020) attempted to understand the impact of Covid induced stress over students. Though the study detailed the stress factors it could not model or quantify the impact of stress. Kumari et al (2020) presented a review on stressors and coping strategies for employees in aviation industry sector. The review stressed the need for training to cope up with job induced stress. Sheela et al (2020) analyzed the Covid induced anxiety stress on university students. Zung's self rating questionnaire responses were collected from 983 respondents and responses were analyzed. The study found a higher anxiety stress among students but it could not quantify the stress. Quintana et al (2021) analyzed the Covid impact over job security fear of employees in hospitality industry. Though the work proposed a structural model, it is specific to hospitality industry and cannot be extended for other domains. Nastiti et al (2021) made a study on impact of Covid over employee's anxiety and safety factor for employee's working in higher educational sector. The study was descriptive and it could provide any measurement model. Gallegos et al (2020) adapted the original Covid stress scale specific to health care professionals. The work related stress to number of patient arrival and measured the stress. But the work cannot be extended for other domains. Kang et al (2021) proposed a conceptual model correlating the Covid stress to organizational trust, job satisfaction and self esteem of the employees in hospitality industry. The model is designed to check the employees attribution and not useful for analyzing the social relationship in work places. Kondratowicz et al (2020) extended the job esteem scale to analyze the impact of Covid induced stress on job and life satisfaction of employees. The study did not model other factors like work life imbalance and intra team conflicts etc and not diverse. Sahibzada et al (2017) designed a stress scale to measure self efficacy, job stress and internal service quality. Study found a significant impact of self efficacy on job stress and internal service quality. Hamouche et al (2020) analyzed the impact of Covid over employee's mental health especially stress and depression. Main stressors were identified and the moderating factors which may mitigate or aggravate the impact of Covid on employee's job stress were discussed. Zhou et al (2022) examined the effects of Covid related job stressors on Chinese health care workers. Authors also investigated the moderating effects of social support and

organizational support on relationship between job stress and burnout using Job demands – resources model. This paper work adapts the job demands resource model to analyze the job stressors for IT employees.

2.1 Research Gap

From the survey, it could be seen that the existing job stress scales does not incorporate the newly induced stressors due to Covid-19 like safety, risk to life, Quarantine, work life imbalances due to teleworking, financial loss and job insecurity etc. But this is necessary as these factors will be prevalent in most of companies as most are adopting "work from home" for a major percentage of their workforce. This research gap has motivated us to study these novel factors and propose a new job stress scale to quantize stress level of employees.

3.0 Rationale of the Study

"Work from home" has become the new order of work during pandemic. Many companies are investing on IT infrastructures to facilitate remote working and business sustainability in the wake of lockdowns. Though "Work from home" brings many benefits, it is also witnessing various new stress factors to the employee. This has become more challenging to HR to quantize stress due to "Work from home" induced factors and other pandemic induced factors.

3.1 Aim

The aim of this work is to analyze the impact of "Work from home" and pandemic induced factors on stress level of employees.

3.2 Scope

Though the work can be applied for any industries, this research restricts its scope to the IT industries as "Work from home" are adopted for larger percentage of work force in IT industries and there is already higher stress level in IT sector, with new pandemic factors, the stress is even more aggravated

3.3 Objectives

IT organizations are facing a new norm and work culture post Covid. Remote working and virtual teams have become very common and it is expected these changes to continue. Reduction in expenses and ability to manage IT works remotely has made many IT organization rapidly adopt remote working. Though remote working bring convenience to employees, it brings various stressors to employees in the form of work life imbalance, lack of team coordination,

technical glitches (Hamouche et al 2020). The influences of these new job stressors on mental wellbeing on IT employees are unexplored. Though the impact of Covid induced job stressors have analyzed in other areas like health sector (Zhou et al 2022), it has not been studied in IT sector. The existing job stress scale were based mostly on factors of (1) pressures intrinsic to the job; the employee's role in the organization; (2) interpersonal relationships at work; (3) limitations in career development; and (4) organizational structure and climate (Shukla 2016). But the impact of Covid induced stressors like work life imbalance due to remote working, coordination problems in teams, lack of mentors in needed times, technical problems in team working and coordination, job security fears, failure in remote assistance to clients are not covered in existing job stress scales. This motivates to design new job stress scales accommodating Covid induced stressors. IT has been selected as the work culture and practices adopted post Covid is expected to persist and become new norms in IT organizations. Based on these observations, the objectives of this work are defined as:

(i) To design a new job stress scale for IT organization accommodating the Covid induced job stressors and work norms.
(ii) To validate the scale for its versatility against employee's levels and departments.
(iii) Test homogeneity of scale on diverse factors in IT organization.

3.4 Methodology

The job stress scale model proposed in this work is designed based on Job demands – resources (JDR) model (Zhou et al 2022). JDR model (Figure 1) classifies all working environment aspects to two classes of job demand and job resources. Stress is imbalance between job demands and job resources (Vegchel 2005). Job demand refers to aspects of job requiring effort either physical or psychological. High job demands lead to stress. In the context of IT organizations, work life imbalances, team conflict and job anxiety are important job demands. Work from home breaks the boundaries between work and personal time. Over indulgence in work either willingly or forces due to job expectations create work life imbalances. IT organizations are characterized by workers of cross culture. Team conflicts are very common in cross culture environment. Remote team meeting may not be effective in mitigating the team conflicts. Job anxiety is common when multiple persons work on projects and each have to wait for some others results. Slippage in schedules increases the job anxiety and creates stress. Job resources are the factors in organization that reduce physiological and psychological costs associated with job demands. Social support is the important resource to cope with job-related

stressors (Muller 2020). Perceived lack of social support was directly associated with depression, anxiety, stress, and inadequate sleeping (Arafa 2021). In IT organizations, managerial support and team support are two job resources which can help to cope with job related stress.

Based on the JDR model, this work examine the impact of work environment anxiety, team conflicts due to remote working, work life imbalances (Job demands) and social support in team either managerial or colleague (Job resources) on stress level of employees. A new job stress scale is designed based on the job demands under moderating effect of job resources. The model of the new job stress scale is given in Figure 1.
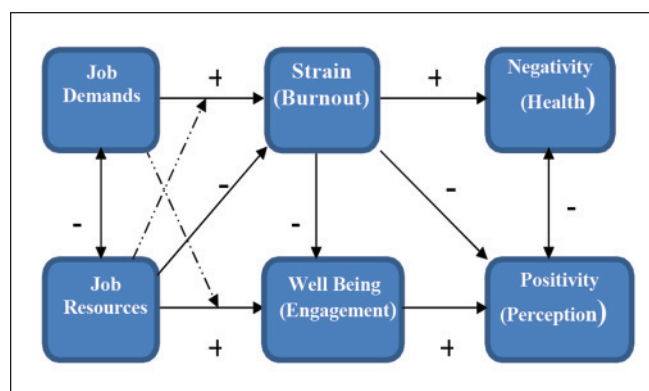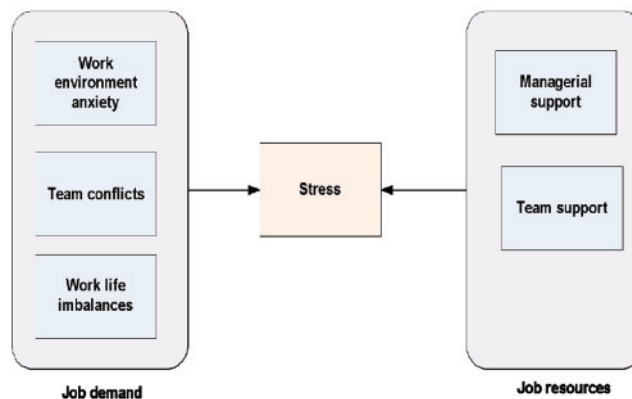

Figure 1: JDR Model

Figure 2: Job stress scale model

The impact of post Covid work culture is analyzed in terms of job stressors of anxiety, team conflicts and work life imbalances on employees. Teleworking from home introduces various challenges like tools un-availability, support unavailability and network connectivity glitches in needy times. This creates anxiety stress on the employees as they have to spend times exceeding their normal working hours to

meet their deadlines. In this situation of struggling to meet deadline, various conflicts occur in team in terms of roles, responsibilities and who should take the blame for schedule slippage and quality deterioration. Since employees are new to remote team coordination, conflicts escalate and create more stress for employees. It is also observed that team conflicts can result in getting support from co-worker or manger, depriving the employee of support from fellow staffs in needy situations. This increases the stress level for employees. Teleworking breaks the normal working hours and affects the work life balance for employees. An abnormal stretch in working hours to late night, disturbances from family members cause even more stress to employees. Each of the factors has multiple questions scored on a Likert 5-point scale as shown in Table 1.

Table 1: Job stress scale

Factors	Questions
Work environment anxiety (5)	What is the level of overload?
	Are you in pressure of schedule slippage?
	Are you in pressure of quality deterioration?
	Are you nervous to face job challenges?
	Are you feeling nervous to face challenges?
	Are you feeling heavy at work?
Conflict in Teams (5)	Are you finding it difficult to satisfy conflicting demands from my team?
	Are you burdened by different expectation from team and clients?
	Are you getting enough feedback about your work?
	Are you getting enough support from your team?
Work life imbalance (5)	Are you satisfied with work life balance?
	Are you satisfied with time allocated for personal work?
	Is work over stretched?
	How often do you have late meeting beyond working hours?
	How often do you have late support beyond working hours?

The job stress score is calculated as

$$JS = \frac{\sum_{i=1}^{k} \Phi_{r,f}(i) * R_i}{k}$$

Where K is the number of question items
R_i is the response for the question item i.
ϕ_{rf} is calculated as average importance given to the factor

by the employees in different employment levels.

$$\Phi_{r,f} = W_{f,0} + \sum_{q=1}^{p} W_{fqg,f.r_q} \left(2\Phi_{r,f} = w_{f,0} + \sum_{q=1}^{p} W_{f,q,r_q} (2\right.$$

Where p is the number of question items in the factor f.
$W_{f,q,f_r q}$ is the relevancy of question item in factor f to the job stress. It is calculated in terms of gaussian approximation function as

$$W_{f,q,f_r q} = \prod_{q=1}^{p} G(f_{r,q}, D_{e,q}, \sigma_{e,q}) W_{f,q,f_r q}$$
$$= (3) \, G(f_{r,q}, D_{e,q}, \sigma_{e,q})$$

Where f is the feature, D is the median value of the feature and $\sigma_{e,q}$ $\sigma_{e,q}$ is the deviation from the median.

$$G(f_{r,q}, D_{e,q}, \sigma_e) = e^{\frac{(f_{r,q} - D_{\theta,q})^2}{\sigma_{\theta,p}^2}} \quad G(f_{r,q}, D_{e,q}, (5) = e^{\frac{(f_{r,q} - D_{\theta,q})^2}{\sigma_{\theta,p}^2}}$$

The reliability of the job stress scale given in Equation 1 is tested using: internal consistency test, Test-retest analysis and Intra class coefficient analysis. The new job stress scale is tested across 100 employees in a leading IT company located in Bengaluru. The 15-item questionnaire is distributed to 100 employees in three different employee levels of Developer, Senior Developer and Manager and in two categories of male and female. Psychometric test – (PSS-10) is also conducted for the 100 employees. The correlation between the proposed job stress scale and PSS-10 scores is analyzed for different employment levels and gender to prove the reliability of the proposed job stress scale.

4.0 Results

Convenience random sampling is adapted in this work. The sampling distribution is as given in Table 2.

The mean and standard deviation for the 15 questionnaire items in three categories of work environment anxiety, conflict in teams and work life imbalances are given below:

Test-retest was done with cronbach's alpha and Pearson correlation coefficients for each of the three factors and the result is given in Table 3.

The Cronbach's alpha coefficient for all factors are above threshold of 0.75 and Pearson correlation coefficient value for

Table 2: Sampling population

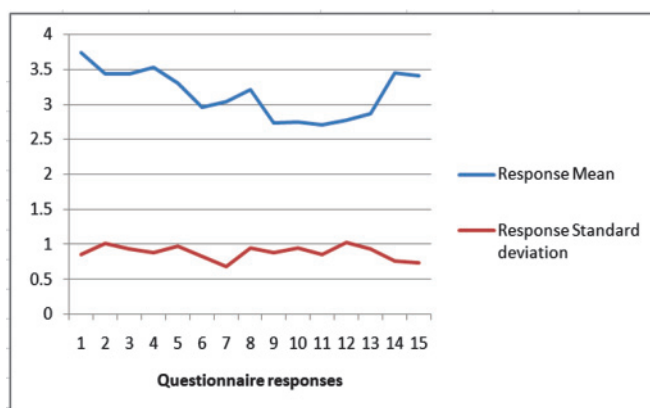| Employment levels	Developer	50
	Senior Developer	30
	Manager	20
Gender	Male	65
	Female	35

Figure 3: Mean and SD of responses

Table 3: Reliability of scale

Factors	Cronbach's alpha coefficient	Pearson correlation coefficient
Work anxiety	0.78	0.91
Conflict in teams	0.83	0.92
Work life imbalance	0.82	0.93

all factors are above threshold of 0.9 indicating a higher reliability and validity of questionnaire items of the factors. The correlation between PSS-10 score and the proposed job scale is measured for all three employment levels using linear regression and the result is given in Table 4:

Table 4: Regression results for Employment levels

Employment levels	Rcoeff	R square	Adjusted R square	Std error of estimate
Developer	0.760	0.5776	0.559	5.69
Senior Developer	0.761	0.5791	0.562	5.71
Manager	0.781	0.6099	0.610	5.31

The R coefficient value is above 0.75 indicating strong association between the PSS-10 score and the proposed job stress scale. The association is strong for manager compared to developer and senior developer. This is because the role of manger has become even more difficult with "work from home". He or she might face the schedule slippage and quality distortion. The correlation between PSS-10 score and the proposed job scale is measured for all male and female employees using linear regression and the result is given in Table 5.

The R coeff value is above 0.70 for both male and female

Table 5: Regression results for Genders

Employment levels	R coeff	R square	Adjusted R square	Std error of estimate
Male	0.726	0.527	0.53	5.69
Female	0.773	0.597	0.59	5.46

employees indicating a strong association between the PSS-10 score and the proposed job stress scale. The association is strong for female compared to male employees. This is because most female employees need more time for their personal chores compared to male and they find it difficult to do work life balances because of job stretch resulting from "Work from home".

5.0 Outcome

The new job stress scale proposed in work addressed the job stressors resulting from work culture shift post Covid. It is able to predict the job stress level for employees. The job stress scale proposed in this work has higher correlation to the job stress scale measurement of PSS-10 (>0.7). Extending from JDR model, this work analyzed the job stressors for three job demands of work environment anxiety, team conflicts, work life imbalance under the influence of two job resources of managerial and team support. Compared to Quintana et al (2021) job stress scale which considered only job fear in their structural model, the proposed model considered specific stressors for IT organizations. Kondratowicz et al (2020) extended the job esteem scale analyze the stress in terms of job and life satisfaction post Covid, but the scale is only qualitative. Piotrowski et al (2021) analyzed the impact of stress using mix of sense of stress questionnaire scale and resilience scale. But this scale is generic and did not target specific stressors. Comparing all these scales, the proposed job stress scale address specific work stressor and it is quantitative. The proposed scale is also validated against standard stress benchmark of PSS-10. To my knowledge, there has no existing job stress scale post COVID which are compared against benchmark stress scale.

6.0 Conclusion

A new job stress scale is proposed in this work to analyze the impact of pandemic and work from home induced stress factors for IT employees. The job scale is modelled as fuzzy function based on 15 item questionnaire response in three categories of work anxiety, conflict in teams and work life imbalances. Reliability of the scale is proved using test-retest analysis. The correlation of new job stress scale with PSS-10 scores proves a stronger association between the proposed

job stress scale and PSS-10 scores. Also the association was stronger for employment levels of manager and female employees. Testing the effectiveness of the scale for larger population and across different industries is in scope of future work.

7.0 References

[1] Sahibzada, Umar and Khawaja, Fawad and Latif, and Khan, Bilal and Ullah, Mohsin. (2017): An Empirical Investigation into the Linkage of Self-Efficacy, Job Stress and Internal Service Quality. *International Journal of Business Studies Review.*

[2] Hamouche S. (2020): Covid-19 and employees' mental health: stressors, moderators and agenda for organizational actions. *Emerald Open Research*, 2, 15.

[3] Zhou, T., Xu, C., Wang, C. et al. (2022): Burnout and well-being of healthcare workers in the post-pandemic period of Covid-19: a perspective from the job demands-resources model. *BMC Health Serv Res* 22, 284.

[4] Abhishek Shukla and Rajeev Srivastava |Derek Eldridge (Reviewing Editor) (2016): Development of short questionnaire to measure an extended set of role expectation conflict, coworker support and work-life balance: The new job stressscale, *Cogent Business & Management*, 3:1,

[5] Van Vegchel N, de Jonge J, Landsbergis PA. (2005): Occupational stress in (inter)action: the interplay between job demands and job resources. *J Organ Behav*; 26(5) : 535–60.

[6] Muller AE, Hafstad EV, Himmels JPW, et al. (2020): The mental health impact of the covid-19 pandemic on healthcare workers, and interventions to help them: a rapid systematic review. *Psychiatry Res*; 293:113441.