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Construction and validation of work stress scale in Kerala context

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Abstract
Organizational researchers are interested in the measurement of psychological variables which affect the productivity of organizations. There are many methods available to assess psychological variables using the principles of psychometrics. Work stress is an important psychological variable which is largely studied by different researchers. While searching an instrument to measure stress of an employee working in different organizations, the absence of suitable instrument with limited number of items were noticed. By adopting method suggested by Edwards (1957), Seema (n.d) and factor analysis, a scale with 21 item one-dimensional "work stress scale (G)" was developed. The reliability of the scale was established by finding out the Cronbach Alpha and distributing the items among subject experts the face validity also established. The sum total of the items constitutes the work stress of an employee.

Keywords: employees, measurement, one-dimensional, scale development, work stress

Introduction
Stress in the workplace is a growing concern in the current state of a competing economy. It is a dynamic condition of an individual which produce different physical and psychological consequences. Every individual have to face stress daily because it happens every day and everywhere. Robbins (1999) [10] defined stress is "a dynamic state of an individual which includes a challenging opportunity and a demand or a resource related his or her requirements, and at the same times the consequence is uncertain as well as important to him or her". When an individual faces the stress at work place, the stress may be called as work stress.

Rollinson (2005) [11] defined workplace stress as the condition of an individual which emerge from the working environment that is different from normal working condition of him/ her. Even though some sort of stress is needed for an individual to perform well in an organization, excessive stress may cause negative consequences, both on individual as well as organization. Lecic-Tosevski, Vukoviv, and Stepanovic (2011) [7] marked that stressors are dynamic in nature which change according to individual characteristics and environment. It implies that, every one experience stress in work life but varies from individual to individual based on the unique characteristics of them. In addition to individual/personal characteristics, social and environmental factors play an important role in moderating the stress on individual.

There are several definitions of stress, just as there are several theories of stress which explain the causes, process and consequences of stress. One of the most fundamental perspectives on psychological stress is Lazarus's transactional model (Holroyd & Lazarus, 1982) [4]. This model defines stress as arising from the appraisal that particular environmental demands are about to tax individual resources, thus threatening well-being. Another theoretical model is Person–Environment Fit (P–E fit) perspective which emerged from the work of Lewin (1951) [8]. The theory describes stress in terms of similarity among people want and what they receive, as well as a similarity between their abilities and the demands placed upon them. Lack of mismatch creates stress in people. A similar model to Person–Environment Fit (P–E fit) perspective is Conservation of Resources (COR) developed by Hobfoll (2001) [3] in which both approaches examine the interaction of the person and the environment. A somewhat different approach is the Demands-Control model (Karasek, 1979) [5] which focuses on the two psychosocial job characteristics of job demands and job control. An interesting new approach that attempts explain the stress is the Job Demands-Resources Model (JD-R) which is developed from the work of Demerouti, Bakker, Nachreiner and Schaufeli (2001) [1]. The JD-R model takes cues from earlier approaches and categorizes psychosocial factors into the global categories of job demands and job resources to realize how these may influence different factors that related to stress in an organization.

Development and Planning of the scale
Excessive stress may negatively affect the performance of individual employees as well as the productivity of an organization. To address the negative effects of work stress on the productivity or performance of the organization, it is important to know the factors behind stress at work. The organizations have to take necessary steps to address the stress in the work place. There are different methods to know the factors behind work stress and the level of work stress but, each has its own merits and demerits. While searching the literature very limited numbers of instruments are available and those available are not adequate to assess the work stress

of subjects of the study. While searching appropriate measure, literally no scale in Malayalam language which can measure particularly the work stress of industrial employees working in Kerala. Keeping these in mind the investigator decided to develop a scale in Malayalam language with Likert scale agreement format by including all the factors which determine the stress of an individual employee.

Preparation of items

For the preparation of items, a detailed study of existing literature about the selected factor is needed. The investigator found that there are different models which explain the process of stress and uncover the relationship between different organizational variables and stress at work. All the models explain stress at work through different perspectives. Therefore, investigator analyzed each model and selected the most recently developed theory of Palmer, Cooper and Thomas (2004), which explains the phenomenon stress in an organization by pointing different potential hazards that may trigger stress in a work place. The theoretical model explains the influence of different organizational factors such as work demands, control, support, relationship, role and change on the stress of individual employees.

After reviewing and discussion with experts in the field, the investigator thought of constructing a scale to measure an employee's stress with minimum number of statements. Based on this idea, the investigator decided to construct a one-dimensional scale consists of minimum of 20-30 items with 5 point Likert frequency format (Never to Always) anchors. Initially the investigator prepared 50 items in regional language (Malayalam) and the same was distributed to experts in the field of psychology such as Professors, Associate Professors and Senior Research scholars to get comments and suggestions for improvement. After receiving comments and suggestions some items were deleted, edited and re written. Then the items were scrutinized for language aspects by Malayalam language experts. Based on the expert's evaluations, some items were dropped, modified and even added. This resulted in deletion of 12 items from the initial scale and the final draft scale consisted of 38 items.

Try Out

To know how will be the target group receive, perceive, interpret and respond to each item in the scale; it was administered among 55 employees from different organizations located in Kerala. All most all respondents reported that they have no difficulty in dealing with items/statements in the scale.

Method

Participants

Participants of this study consist of 297 employees from different organizations working in the state of Kerala. All participants belongs Kerala and speaks Malayalam language.

Instruments

1. Work Stress Scale: Work Stress Scale consists of 38 items in Malayalam language with 5 point Likert type response category (Never to Always) was used to gather responses from the participants. The items was prepared in such a way that it can be answered any person without any difficulty. The responses were marked in the right side of each item/statement. Instructions were clearly printed in the top of the scale in regional language.
2. Personal Data Sheet: Personal Data sheet was used to collect information like sex, age, educational qualification, marital status, income etc.

Procedure

The investigator directly met the authorities of each organization and discussed the purpose, objectives and importance of the study. After receiving the permission, with the help of supervisors, investigator directly contacted with each of the subjects and explained the purpose, objectives and relevance of the study and requested their whole hearted cooperation for the study. In addition to the instructions in the scale, the investigator gave oral instructions to the participants so that the responses would be better. After completion of the scale, it was collected back and checked for omission. The scale was scored/coded as per the previously prepared scoring key and entered into a spread sheet for further statistical analysis.

Results and Discussion

The objective of the study was to construct and standardize a valid scale for measuring general work stress of industrial employees. Researchers are having different opinion related in selecting a valid item from a pool of items. There are different statistical techniques to select an item, establishing its psychometric properties etc. The investigator has used 't' value and Point Biserial Correlation as indices of variability of an item to include in the final scale.

Item Analysis

The responses of the participants who were responded for all the items in the draft scale were entered into a spread sheet. Then the total score on work stress was calculated by adding the responses of all items in the scale. After this responses of the participants were arranged in ascending order based on their total work stress score. Then the total participants were categorized into low scores (Lower 27%) and high scores (Upper 27%). After this, 't' test was performed to know the discriminating power of each items in the scale. Instead of 't' test, corrected item-total correlation (Point Biserial Correlation) and factor loading of each items in the scale (Factor analysis) also calculated. The criterions for each method needed to include an item in the final scale are- If discriminating power greater than 2.58 (t value) as proposed by Edwards (1957) [2], an item achieve corrected item-total correlation of.25 or above (Seema, n.d), and item loading.45 or above will be include in the final scale. The details of the computations done are given in the following tables and discussed.

Table 1: Mean, SD and 't' value item total correlation of items in the work stress (G) scale by lower and higher scores

Items	Group	N	Mean	SD	't' value	Corrected Item-Total Correlation	Items	Group	N	Mean	SD	't' value	Corrected Item-Total Correlation
Item 1	Low	80	1.30	0.463	8.25	.454	Item 20	Low	80	1.61	0.807	18.80	.636
	High	80	2.75	1.488				High	80	4.18	0.911		
Item 2	Low	80	3.08	1.933	0.09*	-.268*	Item 21	Low	80	1.59	0.689	8.46	.462
	High	80	3.05	1.698				High	80	3.06	1.381		
Item 3	Low	80	2.57	1.482	6.50	.366	Item 22	Low	80	3.52	1.458	1.58*	.067*
	High	80	3.95	1.179				High	80	3.84	1.037		
Item 4	Low	80	2.42	1.081	2.54	.086*	Item 23	Low	80	1.23	0.422	10.82	.497
	High	80	2.92	1.412				High	80	2.99	1.382		
Item 5	Low	80	2.08	1.385	9.46	.482	Item 24	Low	80	1.87	1.334	7.99	.433
	High	80	4.05	1.242				High	80	3.39	1.037		
Item 6	Low	80	1.52	0.749	8.32	.396	Item 25	Low	80	2.13	1.244	2.27	.067*
	High	80	2.69	1.001				High	80	1.72	0.968		
Item 7	Low	80	1.96	1.043	5.14	.183*	Item 26	Low	80	2.28	1.260	9.81	.484
	High	80	2.92	1.300				High	80	4.01	0.948		
Item 8	Low	80	3.44	1.118	2.70	-.196*	Item 27	Low	80	2.61	1.137	3.78	.164
	High	80	2.91	1.343				High	80	3.34	1.292		
Item 9	Low	80	1.56	1.059	15.98	.540	Item 28	Low	80	2.52	1.175	4.37	.174
	High	80	4.32	1.123				High	80	3.31	1.109		
Item 10	Low	80	3.46	1.559	4.41	.237	Item 29	Low	80	4.09	1.179	0.29*	-.027*
	High	80	4.35	0.915				High	80	4.15	1.459		
Item 11	Low	80	2.18	1.071	0.324*	-.129*	Item 30	Low	80	2.22	0.996	14.24	.619
	High	80	2.40	6.020				High	80	4.26	0.807		
Item 12	Low	80	2.49	1.624	7.97	.339	Item 31	Low	80	2.43	0.929	9.47	.484
	High	80	4.30	1.205				High	80	4.00	1.147		
Item 13	Low	80	1.41	0.519	15.34	.590	Item 32	Low	80	2.22	1.692	0.67*	-.138*
	High	80	3.68	1.209				High	80	2.06	1.118		
Item 14	Low	80	2.10	1.438	10.74	.563	Item 33	Low	80	1.78	0.872	2.78	.111*
	High	80	4.20	0.986				High	80	2.34	1.534		
Item 15	Low	80	1.94	1.054	16.91	.650	Item 34	Low	80	1.49	0.696	11.79	.493
	High	80	4.56	0.898				High	80	3.14	1.028		
Item 16	Low	80	1.52	0.695	21.54	.726	Item 35	Low	80	1.10	.411	8.55	.373
	High	80	4.31	0.922				High	80	2.16	1.024		
Item 17	Low	80	1.52	0.959	20.87	.734	Item 36	Low	80	1.37	0.771	7.78	.339
	High	80	4.40	0.773				High	80	2.44	0.953		
Item 18	Low	80	2.41	1.276	8.26	.398	Item 37	Low	80	1.18	0.636	10.11	.437
	High	80	4.14	1.366				High	80	2.64	1.117		
Item 19	Low	80	3.92	1.357	3.27	-.174*	Item 38	Low	80	1.68	1.150	2.37	.082*
	High	80	3.20	1.427				High	80	2.15	1.323		

* items which does not satisfy the criterion.

Table 1 gives the discriminating power and item total correlation (point biserial correlation) of each item in the scale. From table 1, it can be seen that all the 38 items in the work stress scale significantly discriminate the low and high scorers in scale. All the calculated 't' values were above 2.58 ($p<.01$) except the items 2 (0.09), 11 (0.324), 22 (1.58), 29(0.29) and 32 (0.67). Therefore, the items which do not satisfy the criterions were deleted.

The table also shows the result of point biserial correlation. There were 12 items which do not satisfy the criterion of item selection. The items include- 2 (-.268), 4 (.086), 7 (.183), 8 (-.196), 11 (-.129), 19 (-.174), 22 (.067), 25 (.067), 29 (-.027), 32 (-.138), 33(.111) and 38 (.082). From the table, it is seen that, in addition to this there are seven items which did not satisfy the criteria of 2.58 (t value). The items include- 4, 7, 8, 19, 29, 33 and 38. Hence, total 12 items were removed from 38 item draft scale and the remaining 26 items were analyzed for factor structure by principal component method and varimax rotation with Kaiser Normalization. The details of the factor analysis is in the table 2 and table 3.

Table 2: Exploratory factor analysis of work stress scale

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.060	30.998	30.998	8.060	30.998	30.998
2	2.746	10.561	41.559			
3	2.423	9.321	50.880			
4	2.227	8.566	59.447			
5	1.502	5.777	65.224			

6	1.298	4.993	70.217			
7	1.026	3.946	74.162			
8	.959	3.687	77.849			
9	.861	3.311	81.160			
10	.775	2.982	84.142			
11	.754	2.899	87.041			
12	.584	2.247	89.288			
13	.434	1.670	90.958			
14	.402	1.547	92.505			
15	.356	1.368	93.873			
16	.320	1.231	95.104			
17	.286	1.099	96.203			
18	.225	.865	97.067			
19	.182	.700	97.768			
20	.151	.580	98.347			
21	.131	.504	98.852			
22	.089	.341	99.192			
23	.074	.286	99.479			
24	.055	.212	99.690			
25	.043	.166	99.856			
26	.037	.144	100.000			

Table 3: Rotated component matrix of work stress scale

Component Matrix			
Component			
Item 16	.798	Item 31	.527
Item 17	.785	Item 24	.501
Item 30	.730	Item 6	.500
Item 20	.717	Item 37	.472
Item 15	.697	Item 18	.471
Item 13	.651	Item 12	.463
Item 9	.649	Item 21	.452
Item 34	.621	Item 3	.430
Item 5	.613	Item 36	.398*
Item 14	.609	Item 35	.350*
Item 23	.602	Item 10	.331*
Item 26	.572	Item 28	.240*
Item 1	.539	Item 27	.202*

* items which does not satisfy the criterion

The table 2 shows the result of exploratory factor analysis of work Stress Scale (one factor solution) and constitutes a total variance of 30.998. Table 3 shows the result of varimax rotation which reveals that items is clustered in one component (factors) ie work stress in general. The criterion for selecting an item was those items which have a factor loading.45 or above and therefore, 5 items deleted from the scale which do not satisfy the criteria. The items were 36, 35, 10, 28 and 27. Hence, it was decided to keep all the remaining items which satisfy the selection criteria. There were 21 items in the work stress (G) scale which measures the work stress of employees.

Reordering of the items

There were 38 items in the initial draft scale, and these item numbers were used throughout in the computational process. The serial number of the items in the just identified model was not continuous as in the drafted scale; therefore, the items in the final scale was re-numbered and arranged from item one (1) to twenty one (21). The initial item number and newly assigned serial number (final item number) Mean, Sd, and variance of each item are presented in table 5.

Table 4: Initial item number, Final item number, mean, SD and variance of each item in the work stress scale (G)

Initial Item Number	**Final Item Number**	**N**	**Mean**	**S.D**	**Variance**
Item 16	1	297	2.87	1.550	2.402
Item 17	2	297	3.19	1.437	2.066
Item 30	3	297	3.19	1.211	1.466
Item 20	4	297	3.10	1.396	1.949
Item 15	5	297	3.58	1.473	2.170
Item 13	6	297	2.30	1.381	1.908
Item 9	7	297	3.15	1.661	2.760
Item 34	8	297	2.10	1.101	1.213
Item 5	9	297	2.86	1.520	2.311
Item 14	10	297	3.59	1.438	2.067
Item 23	11	297	1.96	1.349	1.820
Item 26	12	297	3.42	1.376	1.893
Item 1	13	297	1.78	1.086	1.180
Item 31	14	297	3.05	1.129	1.275
Item 24	15	297	2.75	1.383	1.912
Item 6	16	297	1.80	.965	.932

Item 37	17	297	1.97	1.136	1.290
Item 18	18	297	3.23	1.402	1.966
Item 12	19	297	3.07	1.650	2.721
Item 21	20	297	2.47	1.450	1.101
Item 3	21	297	2.99	1.449	2.101

Table 5 represents the final order of the 21 items in the work stress scale (G). In addition to new arrangements, the mean score, SD, and the variance of the item selected also shown in the table.

Reliability and Validity

Reliability of work stress scale was measured using Cronbach Alpha which measure internal consistency of the scale. Internal consistency is the measure based on the correlation between different items on the same test and here Cronbach Alpha for the final test was found to be.91 which ensures that the constructed scale is reliable.

Validity of the scale was found by using the "Face validity" method. It was found based on the subjective ratings of different experts. The face validity of a test can be considered a healthy construct only when a reasonable level of agreement exists among raters. In the case of work stress scale (G), the raters found it as an adequate scale to measure work stress of the employees.

Scoring

Work stress scale (G) is a one-dimensional scale which gives an estimate of an individual employee's general stress. It is a five point Likert scale with response category as Never, Rarely, Sometimes, Ofte and Always. The scale consists of both positive and negative items. The negatively worded items are 16 and 21, and the remaining items are positively worded. A negative item is scored as follows: For a 'never' response score 1 is assigned and rarely =2, sometimes =3, often =4 and always = 5. The positive items are reverse scored. Sum of the scores of all items is an index of the individual employee's General work stress. High score indicate high stress and low scores indicate low stress for an individual employee.

Conclusion

The main aim of the study is to construct and standardize a scale that measures the work stress of employees working in different organizations in Kerala. Stress is a common phenomenon in an organization and influence the behavior of employees working in an organization. Therefore, construction of culture specific measure is important to understand the performance of the organizations. Initial search for such scale revealed that there is no standardized scale suitable to this population. Hence, the investigator planned to develop a one-dimensional scale with minimum number of items.

Initially, 50 items were written with a strong theoretical background. Then the items were scrutinized with the help of experts which resulted in the formation of 38 item draft scale. Item analysis was done and items were selected for the final scale by setting three criteria as 't' value 2.58 or above, point Biserial correlation.25 or above and factor loading.40 or above. This item selection process resulted a scale with 21 items. The psychometric properties of the instrument is seems to acceptable level.

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