

Employee Temperament As A Predictor of Workstress among Plant Turnaround Workers

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Abstract--- *Temperaments can play either a strong or a weak role in work stress. This study aims to examine the effects of the four temperament on work-related stress among plant turnaround maintenance employees. Temperament was assessed by the Temperament Inventory (TI) and work stress was assessed using questions relevant to the plant turnaround maintenance work environment. Structural equation modelling was used to test the hypotheses. Findings revealed that whereas a sanguine temperament played a defensive effect on stress, whilst choleric and phlegmatic temperaments are both susceptible to more stress. However, melancholic temperament, alternatively, showed hyper-adaptive effect in stressful situations. The results of this study suggest that it would be beneficial for employees with choleric and phlegmatic temperament to be identified due to their high susceptibility as they are likely to suffer high levels of stress. This study argues that understanding, identifying and recognizing individual genetic disposition and dispositional-related stressors by management and colleagues would help to improve the delivery of collegial and organizational level support.*

Keywords--- *Temperament, Stress, Turnaround Maintenance.*

I. INTRODUCTION

It goes without saying that stress is a routine phenomenon of modern life. Severe fatigue during long periods of work can result in personal as well as social costs. It could be said that many workers who find themselves in such an employment situation experience extreme stress and burnout. This extreme type of stress is characterised by emotional exhaustion and is described as a feeling of being tired and helpless as a result of the work situation [1]. Great body of research on exhaustion and tension mirrors the increasing awareness of the mounting prevalence of stress and its potentially harmful effect on the well-being of individuals [2][3][4][5][6].

Of course, it is important to examine to what extent genetic disposition can be called a predictor of stress. Temperament is largely hereditary in nature and is posited to contribute more to human behaviour in general than environment in the formation of personality [4]. In the work setting, a melancholic temperament has been found to possess a work-oriented trait [6], while a sanguine temperament exhibits form of hyper-adaptive traits [3]. However, individual employees in the same work environment may show different work stress and such differences might derive from their different levels of stress as a result of their varied genetic dispositions in temperament.

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Recognizing and understanding temperament and its effect on work stress would, therefore, it is instrumental in improving well-being.

The fundamental reason for this study is rooted in the fact that work-related stress remains one of the biggest causes of burnout among employees worldwide. The argument is reinforced by the recognition of burnout as an “occupational phenomenon” by the World Health Organization (WHO) in May 2019. World Health Organization defined burnout as a consequence of workplace stress that has been allowed to fester, and such a condition can “...influence health situations...” that may require a visit to health facilities on consultations with health professions [7].

Intrinsically, an empirical research is needed to better understand the role disposition plays in stress levels because previous research found some individuals are more prone to stress than others even in the same workspace[8][9]. In spite of its importance, studies of temperament have less focus occupational well-being research in highly stressful and hectic work environment [10]. Most of the current studies were carried out in the health care work settings and their results have produced contradictory findings, particularly with respect to the relationship between sanguine and stress and choleric temperament and work-related stress respectively [3][9]. Therefore, research in different work environments is necessary to bridge the gap in the existing literature before conclusive assumptions can be made.

In other to bridge the gap identified, the study posed the following research questions:

1. What role does temperament play in work-related stress?
2. Which temperament plays a protective role in stress?
3. Which temperament is vulnerable to stress?

In line with the research questions, the main objective of this study was to examine the influence of temperament on work-related stress among plant turnaround maintenance (TAM) employees in a temporary work environment in Malaysia. This paper, in fact, argues that temperament has either a defensive/invulnerable effect or a defenceless/impregnable effect on stress and that different temperaments can produce high level or low levels of stress.

II. LITERATURE REVIEW

A plant turnaround maintenance (TAM) project is a temporary endeavour undertaken to produce a specific objective [11]. The temporary nature of such a project indicates a definite beginning and end. Most TAM employees assert that working on such projects increases stress by as much as 70 to 80% compared to any normal work environment. This is largely due to the fact that a normal work population of 500 can increase to over 2000 during a TAM, the additional workforce being hired on a temporary basis. Indeed, the overcrowding, congestion, miscommunication and misinformation, coupled with working continuously for 24 hours on a 6 to 12-hour shift basis naturally intensifies levels of fatigue and stress among the workers. This is compounded by most of the workers not knowing each other and not being familiar with the plants. All of these factors mean that the unique characteristics of a TAM work environment make it a very fertile ground to examine stress.

It could be said that the diversity of the workforce means that individual differences are visibly manifested, especially individual genetic dispositions which are more apparent in a stressful work environment. Temperament is well-suited to be measured in relation to stress in a TAM environment because, according to Nebylitsy[12] and Strelau[13], the functional implication of temperament can be established when individuals are challenged with excessive circumstances or difficulties. A pioneering study by Pavlov [14] revealed that behavior under extreme circumstances is contingent on individual differences in temperament. This was supported by later studies [15][16] in power plants, where operators were characterized as having a weak nervous system evidenced in a high number of mistakes, a lack of self-discipline and withdrawal reactions. Since then researchers have established a high possibility of behavioral disturbance due to differences in temperament, interrelating with predisposing environmental situations [17]. It is, therefore, important to examine the effects of temperament on stress in the unique environment represented by the TAM.

2.1 Temperament

Temperament is founded on disposition and partially environmental in origin. Research in both children and adults found that temperament is largely formed by a mixture of shared genetic influences and non-shared environmental factors. However, shared environmental influences seems to contribute lesser degree than non-shared environmental aspects [18]. Following such results, this study uses the term temperament to refer to aspects of individual genetic predisposition that are not culturally influenced. Temperament refers to the steady characteristic of a person which is innate and does not suffer alteration during a person's life [19].

Data on temperament is usually collected through observation, interviews, and self-reported questionnaires. Temperament experts [20][21][22][23] agree that personal reports of an individual's temperament are the most accurate, because it is unclear whether perceived differences are due to dispositional or environmental influences [24][25]. Temperament was assessed by the full version of the Temperament Inventory (TI) [26] on a Likert evaluating the four temperaments. This scale was chosen because of its ease of understanding and administration and largely because it was designed for non-psychotic or normal population.

Temperament can be grouped into four types based on the original concept of temperament from Cruise et al.,[26];

1. *Sanguinetemperament*: sociable, accommodating, avoids aggression and gets along with others. This person is a social being and of all the temperaments, they bring life and energy with their presence as their cheerfulness and humour brightens everyone's life.
2. *Cholerictemperament*: passionate and enthusiastic individuals. These are tough-minded people who do not change their minds even if they are wrong. They present ideas in a forceful manner and take delight in making others feel inferior. They use people to motivate themselves and take control of them. They are head-strong with a strong determination for success at any cost, sometimes resulting in overload and burnout. The choleric is the most powerful temperament.
3. *Melancholictemperament*: describes reserved and impulse control individual with task- and goal-directed traits, such as processing issues before reacting, postponing satisfaction, doing things by the book, very meticulous

and organized. This person is a loner and emotionally guarded who approaches very few people for acquaintance and does not want to be approached. They seldom initiate discussions, especially if their feelings are involved and they are selective about whom to socialise with.

4. *Phlegmatic temperament*: calm and detached and goes through life doing as little as possible. They are quiet by nature and it is very difficult to know what they are thinking. The phlegmatic is a “toner” temperament; “peace at all costs” is their motto. They also have the most stable temperament. They accept only moderate control over their behaviour, and this is the most stubborn of all the temperaments. They also believe they know what everyone is doing, whether they are wrong or right.

2.2 Conceptual framework and Hypotheses Development

It is argued that temperament influences individual behaviour and as such impacts stress, since it plays a role in effective performance [4]. For instance, a person with melancholic tendencies is determined, in control, thorough and plans well. Such a person is likely to accomplish tasks on time [6]. That is, individuals with temperament associated with a strong focus, commitment and perseverance usually perform better than those who do not.

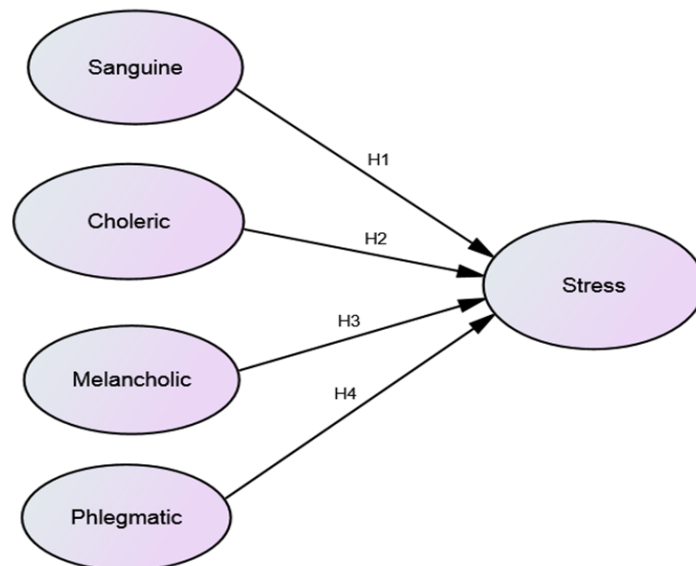


Figure 1: Proposed model

Based on the above theoretical connections and conceptualisation, the following hypotheses are proposed;

H₁: A sanguine temperament will play a protective role against work stress

H₂: A choleric temperament will play a vulnerable role in work stress

H₃: A melancholic temperament will play a protective role against work stress.

H₄: A phlegmatic temperament will play a vulnerable role in work stress

III. METHODOLOGY / MATERIALS

Twenty-four (24) PETRONAS petrochemical plants were identified within the petrochemical zones of Malaysia [27]. At the time of data gathering, only fourteen (14) plants were undergoing turnaround maintenance. Thirteen

plants consented to take part in the study. The estimated population of all the plants was 21,000 and 373 subjects were sampled based the recommendation of Krejcie and Morgan. Due to the specialized/expert nature of TAM and also heterogeneity/diversity of the workforce, stratified sampling was adopted to obtain a representative sample of all subjects. After the stratification, respondents were then randomly selected from each stratum.

3.1 Sample and Procedure

The sampled respondents for the current study was plant TAM workers who were employed in 13 different petrochemical plants in Malaysia. The sample was randomly selected from 13 plants in East and West Malaysia. About 500 questionnaires were sent with a cover letter to plants that had ongoing TAM activities. Of the 500 questionnaires distributed, 320 were completed and returned, with a response rate of 60%.

3.2 Measures

Measures of temperament: Temperament was measured by the Temperament Inventory developed by Cruis et al.,[26]. In this measure, temperament has both strengths and weaknesses, offering a simple explanation for the complexity of individual differences. Each of the four temperaments represents a cluster of traits observable in one's everyday behaviour. According to these authors, the four-temperament seems, from a psychometric view, one of the most comprehensive concepts of disposition in presently, while the four-category approach is ideal for exploring personality among normal (nonpsychotic) population [26]. For the purposes of the present study, it was assumed that the TAM workers are both normal and nonpsychotic.

Measures of stress: Questions related to the TAM work environment were developed to measure work-related stress: questions on role conflict, role ambiguity, and exhaustion/fatigue. Role conflict evaluates the frequency or degree to which the workers experienced or felt stress due to multiple demands of tasks assigned and expected to be carried out at the same time. Role ambiguity assesses clarity and uncertainty related to their job description or requirement enough to perform their tasks. Exhaustion/fatigue measures the extent to which the workers feels that his or her responsibilities, work situation, and decisions related to work are manageable or out of control.

IV. RESULTS AND FINDINGS

The respondents were predominantly male (67%), which is still typical of any engineering environment anywhere in the world at the time of this study [28]. The mean age was 3.28, meaning that most of the respondents were under 40. Approximately 65% held undergraduate degrees, which is not surprising given that employment at TAM involves specialised and expert-based maintenance activity. More than half (60%) of the respondents were in permanent positions, thus they were PETRONAS workers and 40% were contracted (outside labour) just for the maintenance event. About 44% of the respondents had more than 5 years' experience in TAMs.

4.1 Correlations

The means, standard deviations and relationships among the variables analysed are presented in Table 3. Three of the temperament traits were negatively and weakly correlated with stress. Notwithstanding the significant associations between the variables, no relationship among the study variables were thought to pose serious concerns about multicollinearity.

Table 1: Mean, standard deviation and correlation

Variable	Mean	SD	1	2	3	4	5
1 Stress			1				
2 Sanguine	2.53	0.91	0.011	1			
3 Choleric	3.52	0.89	-0.195**	0.258**	1		
4 Melancholic	3.59	0.93	-0.222**	0.165**	0.515**	1	
5 Phlegmatic	2.62	0.92	-0.198**	-0.099	0.200**	0.394**	1

Note: **correlation is significant at the 0.01 level (2-tailed)

4.2 Measure of reliability and validity

Table 2: Factor loading, composite reliability, average variance extracted and discriminant validity

	Variable	Items	Loading	CR	AVE	Discriminant validity				
						1	2	3	4	5
1	Choleric	C1 C2	0.793 0.640	0.701	0.519	0.721				
2	Sanguine	S1 S2	0.648 0.752	0.709	0.503	0.376	0.702			
3	Melancholic	M1 M2	0.782 0.720	0.722	0.565	0.713	0.237	0.752		
4	Phlegmatic	P1 P2	0.694 0.814	0.727	0.572	0.252	0.160	0.548	0.756	
5	Stress	ST1 ST2 ST3	0.603 0.634 0.602	0.715	0.506	-0.351	0.334	0.281	0.455	0.613

4.3 Measurement Model

Several analyses were carried out to determine the model's reliability and validity. Table 2 shows the composite reliability for the variables under study. Composite reliability assesses of internal consistency comparable to the alpha coefficient [29] as evidenced in Table 2. Convergent validity is indicated when path coefficients from latent constructs to their corresponding manifest indicators are statistically significant. All the indicators loaded significantly for their corresponding factors, with standardised loadings from 0.602 to 0.793 (Table 2). These results, therefore, shows indication in support of the convergent validity of the variables [30]. To determine the discriminant validity, chi-square difference analysis was performed. It was concluded that there is enough indication for discriminant validity. Overall, these results lend credence to the reliability and validity of the variables. Before the influence of temperament on job stress could be determined, the structural components of the variables were analysed using SPSS AMOS. The outcomes for these analyses are given in Table 3. In line with the two-step method proposed by Anderson and Gerbing[30], the current study assessed a measurement model via confirmatory factor analysis (CFA) before to analysing the structural model relations. This measurement model was evaluated by means of the maximum likelihood technique. It revealed an excellent fit to the data, $\chi^2(34) = 1.318$, $p = 0.102$, Goodness of

Fit Index (GFI) = 0.973, Comparative Fit Index (CFI) = 0.986, Non-normed Fix Index (NNFI) = 0.977, Root Mean Square Residual (RMR) = 0.036, and Root Mean Square Error of Approximation (RMSEA) = 0.032.

Table 3: Summary of Model fit

Fit Indices	Recommended Value [31][32]	Results
χ^2/df	≤ 3.00	1.318
Goodness of fit index (GFI)	≥ 0.90	0.973
Adjusted Goodness of fit index (AGFI)	≥ 0.80	0.948
Root Mean square error of approximation (RMSEA)	≤ 0.80	0.032
Normed fit index (NFI)	≥ 0.90	0.944
Non-normed fit index (NNFI)	≥ 0.90	0.977
Comparative fit index (CFI)	≥ 0.90	0.986

4.4 Structural Equation Model Results

The structural model established in the current study is equal to the one shown in Figure1. Figure 2 presents the structural equation model outcomes. Findings indicate a significant association between three of the temperament dimensions and stress. Consequently, the results show that the lower or weaker the effect or presence of the temperament, the higher the stress level of the employees. These results supported three of the hypotheses of this study, establishing that the linkages between temperament and job stress are statistically significant, at least for hypotheses 1, 2 and 4. However, the results demonstrate that both the direct effects of melancholic on job stress was statistically insignificant, leading to the rejection of hypothesis 3.

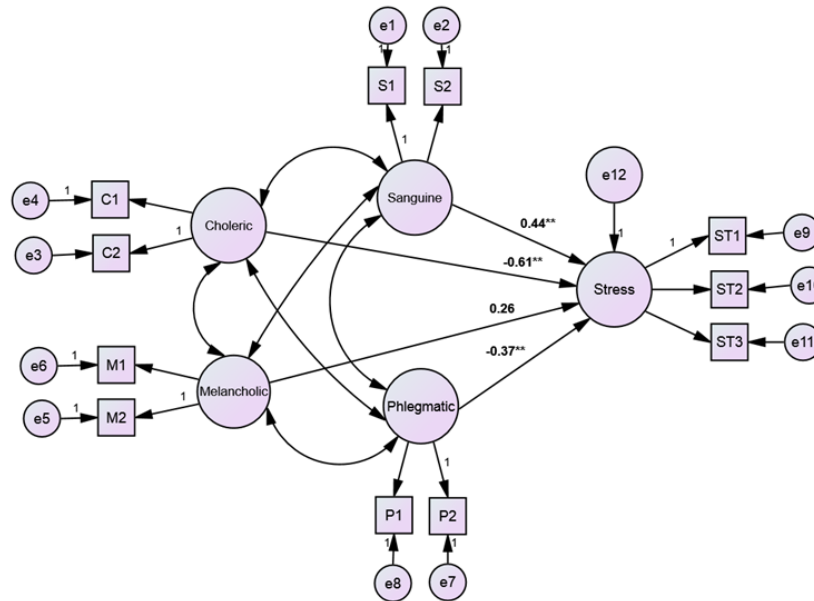


Figure 2: Structural model

Table 4: Hypotheses Results

Hypotheses	Path coefficient	P-Value	Results
H1 Sanguine → Stress	0.443	0.000	Supported
H2 Choleric → Stress	-0.612	0.002	Supported
H3 Melancholic → Stress	0.260	0.230	Not supported
H4 Phlegmatic → Stress	-0.373	0.009	Supported

Moreover, from Figure 2 it can be deduced that the coefficients of each temperament, sanguine, choleric and phlegmatic indicated significant effect in the projected path, which supports Hypotheses 1, 2 and 4. However, hypothesis 3 was not supported. The squared multiple correlation for overall job stress was 0.459. This meant that the stress of the 4 temperament dimensions jointly explained 46% of the variability of the overall job stress of the TAM workers. Indicating that this study presented a reasonably good model for measuring overall job stress among TAM workers.

V. DISCUSSION

Sanguine disposition has been related to several positive qualities: being cheerful, high-spirited, sociable, funny, positive and self-assured; opinionated and expressive; energetic, a short sleeper, but untiring; and possesses leadership qualities. Yet, this disposition is also related to stubbornness, risky behaviour and an intrusive nature [33]. It could be suggested that the positive qualities of workers with a sanguine temperament may protect them against work stress and work situations that are undesirable and overwhelming. Sanguine disposition is connected to contentment, thoughtfulness, exuberance, grandiosity, optimism and a penchant for being around others always [34], as well as feeling calm and peaceful following stress [35]. In summary, it could be argued here that a sanguine temperament has a protective effect on stress.

A choleric temperament is both sceptical and critical; intellectual virtues. However, it is also grumpy, peevish, discontented, prone to impatience and altercations [33]. It goes without saying that employees with choleric disposition may be particularly vulnerable to fluctuations in the work setting and in interpersonal interactions, leading to hostility or tense emotional state towards superiors. Sakai et al. (2005) stated that a choleric disposition is vulnerable to job-related uncertainty. This temperament is similarly related with unconstructiveness, cynicism, tediousness, impatience and lack of desire for socialization, in addition to avoidance of being with others in daily life [34] and an aversion to feeling well and peaceful [35]. It is unsurprising that a choleric temperament is susceptible to workers' stress, basically having a negative influence on stress.

A phlegmatic temperament has been connected with such traits as apprehension, watchfulness, stiffness and over-sensitivity [33]. A phlegmatic disposition has also been recognized as having a high-risk factor for depressive indicators [36]. Again, it is expected that employees with phlegmatic temperament may experience high levels of stress. Sakai et al [3] found that a phlegmatic disposition is disposed to experience role conflict, role uncertainty, relational conflict and work overload. However, in contrast, the results of the present study were completely different. It could be argued that the workers sampled are used to TAM temporary employment. Further elucidation could be that employees with phlegmatic disposition may impose their worrisome nature on their co-workers and their colleagues maybe weary of such imposition and as such phlegmatic individuals may not have support from co-workers or personally perceive low levels of support than likely. Overall, the phlegmatic temperament is defenceless in stressful situations, thus phlegmatic has weak effect on stress.

A melancholic temperament is one which is certain to monotonous, reproach, non-assertive, delicate to condemnation, yet also self-disciplined. It is also reliable and most likely to work for others than be business owner [33]. In this study, there was a negative relationship between stress and a melancholic temperament. The role of a

melancholic temperament in role conflict and interpersonal conflict [3] has also been analysed, such a temperament has been revealed to be a hyper-adapted pattern to the workplace and, therefore, not susceptible to stress.

In conclusion, this study identified the influence of different temperament on work-related stress among TAM workers in the petrochemical industry in Malaysia, demonstrating the effects of the four different temperaments on work-related stress and suggesting deterrence approaches for job-related well-being.

Employees' understanding of their own individual dispositions will promote to self-support, and consciousness of and respite from work-related stress. Workplace evaluation and identification of temperament and acknowledgement of the effects of temperament on stress by individual employees and by co-workers and superiors will enable conducive environment and harmonization of individual temperament. The findings recommend explicitly that employees with choleric and phlegmatic dispositions ought to be recognized since they may have high levels job-related stress. Also, when lower staff with a choleric disposition operate in the same space, overseers could be able to decrease their stress levels by expounding the nature of the task and focusing on any huge discrepancies in workload among them and to manage any intragroup altercation. For employees with phlegmatic temperament, instituting and combining support from co-workers may decrease stress. It would be useful for management to extend supportive guidelines on stress coping strategies based on cognitive-behavioural therapeutic method that is grounded in employee's dispositional inclination. Furthermore, occupational counselling tailored to each dispositional predisposition and paying attention to temperament when tasks are created would support and provide better adjustment to work-related stress, consequently job-to-personality-fit and personality-to-environment-fit can be achieved.

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