Chapter 5

EFFECT OF JOB DEMAND AND CONTROL ON WORK-RELATED MUSCULOSKELETAL DISORDERS

Work-related musculoskeletal disorders (WMSDs) have increased significantly in the past decades and are among the most critical work-related health problems worldwide. These disorders contribute significantly to the development of work-related disabilities, sickness absenteeism, underutilisation of potential, health care utilisation, and compensation, thereby affecting the quality of life and increasing costs to the organisations (Wilson et al., 2008; Amell and Kumar, 2001; Janwantanakul et al., 2010). WMSDs have been reported in both blue-collar and white-collar workers (Herr et al., 2015; Canjuga et al., 2010; Benavides et al., 2000). In the case of WMSDs, prevention is the best strategy as there is no highly effective treatment. The first step in preventing WMSDs is to identify the associated risk factors. While a high physical workload is a well-established risk factor for WMSDs, adverse psychosocial work conditions can also be a possible risk factor.

The relationship between psychosocial factors and upper extremity disorders (MSDs in the neck and shoulders) has been reported in several studies (Bergqvist et al., 1995; Feveile et al., 2002; Bongers et al., 2006; Johnston et al., 2009; Hauke et al., 2011; Kraatz et al., 2013; Lamy et al., 2014; Chen et al., 2018). However, there is not enough empirical evidence regarding the validity of the JDC model to predict WMSDs.

The objective of the present work is to find the relationship between psychosocial work factors and self-reported WMSDs, and psychological stress in the workplace for middle-level managers of an Indian organisation. The following hypotheses were tested for the purpose.

H1: There is a significant effect of workload on WMSDs.

H2: There is a significant effect of job control on WMSDs.

H3: There is a significant effect of age on WMSDs.

H4: There is a significant effect of workload on psychological stress.

H5: There is a significant effect of job control on psychological stress.

H6: There is a significant effect of age on psychological stress.

5.1. SEM MODEL

Based on the hypothesis, an initial SEM model was developed. SEM is used to study the direct and indirect effect of exogenous variables on endogenous variables. IBM AMOS (Trial version 21.0 from IBM Corp., Armonk, NY, USA) was used for this purpose. This path analysis model was used to determine the effect of workload and job control on WMSDs and psychological stress. The hypothesised model is shown in Figure 5.1.

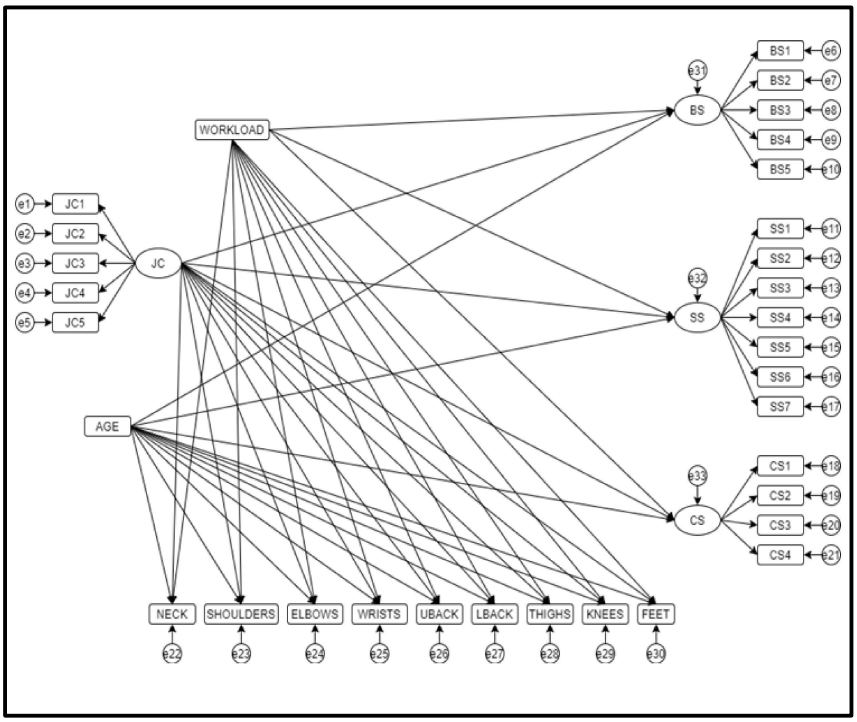

Figure 5.1: Hypothetical Path Analysis Model

The assumption in the model shown in Figure 5.1 is that workload and job control are exogenous variables. At the same time, behavioural stress, somatic stress, cognitive stress and WMSDs are endogenous variables.

The model was tested for goodness-of-fit to check if the data fits the proposed Path Analysis Model. The proposed model had CMIN/DF(χ2/df) = 2.006, RMSEA = .069, GFI = 0.763, TLI = 0.771, and CFI = 0.811. These values suggested the goodness of fit of the model (Hu and Bentler, 1999), as shown in Table 5.2.

Table 5.1: Non-significant paths in the model

Path			*T*	*P*
B_S	<---	WORKLOAD	-0.266	0.79
S_S	<---	WORKLOAD	0.583	0.56
CS	<---	WORKLOAD	-0.139	0.889
BS	<---	AGE	0.491	0.623
SS	<---	AGE	1.086	0.278
CS	<---	AGE	0.532	0.595
NECK	<---	WORKLOAD	1.031	0.303
SHOULDERS	<---	WORKLOAD	1.138	0.255
ELBOWS	<---	WORKLOAD	0.649	0.516
WRISTS	<---	WORKLOAD	0.132	0.895
UBACK	<---	WORKLOAD	1.462	0.144
LBACK	<---	WORKLOAD	-0.332	0.74
THIGHS	<---	WORKLOAD	-0.343	0.731
KNEES	<---	WORKLOAD	0.047	0.962
FEET	<---	WORKLOAD	-0.467	0.64
ELBOWS	<---	JC	1.836	0.059
NECK	<---	AGE	1.781	0.075
SHOULDERS	<---	AGE	1.509	0.131
ELBOWS	<---	AGE	0.973	0.331
LBACK	<---	AGE	1.393	0.164
THIGHS	<---	AGE	0.836	0.403
FEET	<---	AGE	1.306	0.192

Significance value (*p*), critical ratio (*t*), and the direct effect of exogenous variables on endogenous variables (*B*) were calculated for all 36 paths for the hypothesised path analysis model (Figure 5.1). In this model, paths with a value of $p > 0.05$ and critical ratio (*t*) outside the range -1.96 and +1.96 were considered non-

significant paths. Accordingly, 23 paths out of 36 were non-significant, as shown in Table 5.1. The model shown in Figure 5.1 was modified by showing all the non-significant paths by the dotted lines in Figure 5.2.

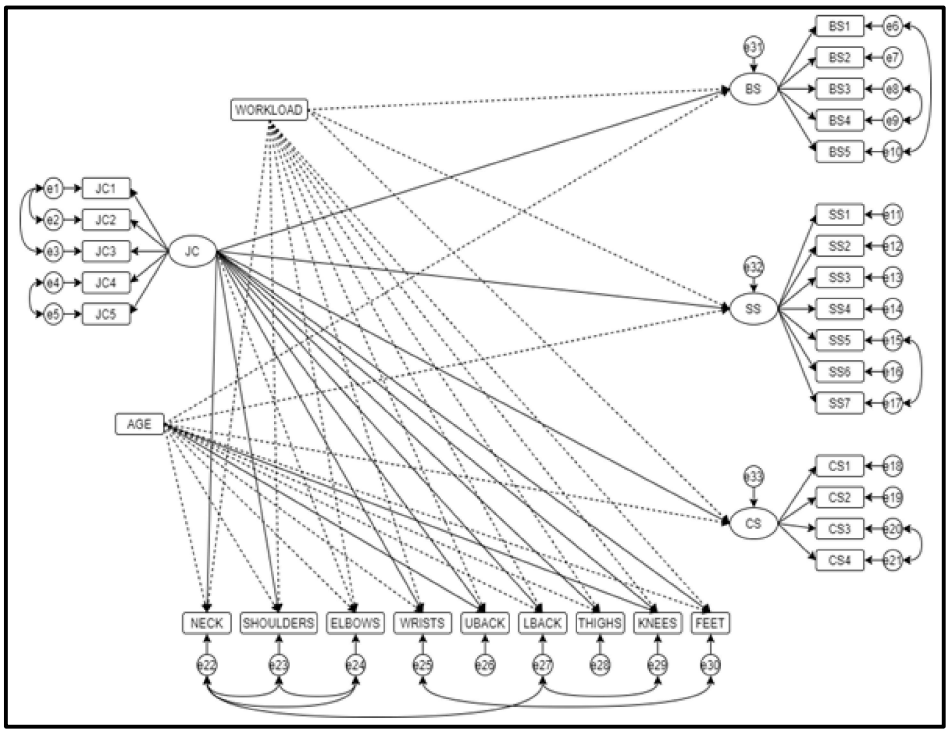

Figure 5.2: Non-significant paths in the model

A modified path analysis model, as shown in Figure 5.3, was obtained after removing the non-significant paths. The goodness-of-fit of the modified model was tested with values shown in Table 5.2. This is clear from Table 5.2 that the modified model had improved goodness-of-fit over the initial model and was thus selected as the final model.

Table 5.2: Model fit Indices

	CMIN/DF(χ2/df)	**RMSEA**	**TLI**	**CFI**
significance value (Hu and Bentler, 1999)	< 3.000	< 0.070	> 0.900	> 0.900
Initial Model	2.006	0.069	0.791	0.881
Modified model	1.469	0.047	0.901	0.905

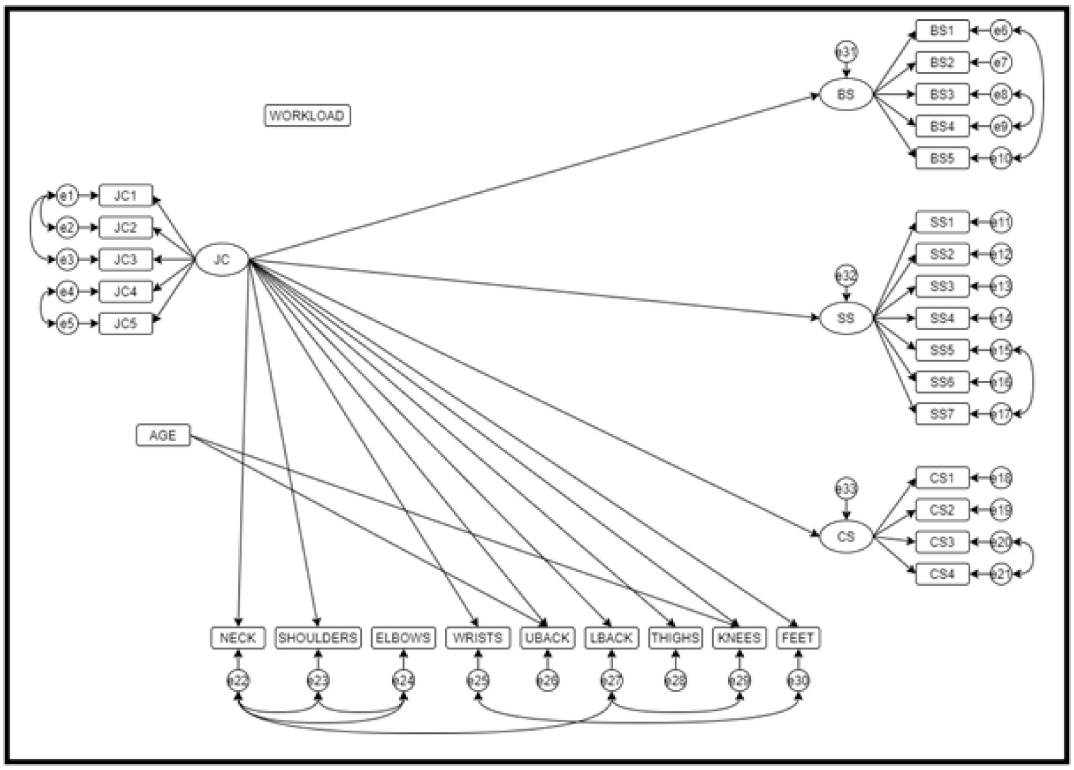

Figure 5.3: Final Model

After identifying the final model, the effect of workload, job control and age on WMSDs and psychological stress was determined.

5.2. RESULTS

Out of 210 participants, 65% of employees reported pain in at least one body part, and 60% reported psychological stress. Figures 5.4 (A) and (B) show the prevalence of WMSDs and psychological stress in the sample of the present study. Pain in the neck, shoulder, lower back, upper back, and knee are dominating ones among the MLMs of the case. Such kinds of WMSDs are important and must be studied to determine policies that give employees an open and disorder-free environment. For this purpose, the path analysis model used in the study determined the effect of workload, job control and age on these self-reported WMSDs and psychological stress. These results are shown in Table 5.3.

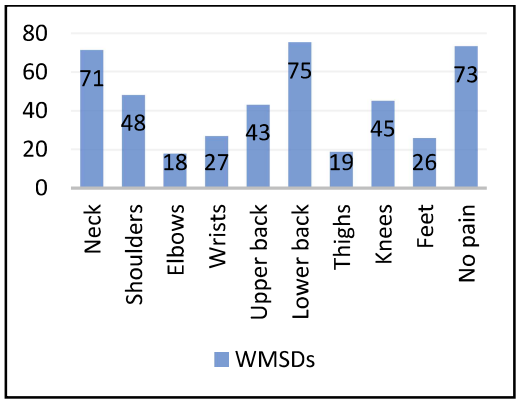

Figure 5.4(A): Frequency of WMSDs

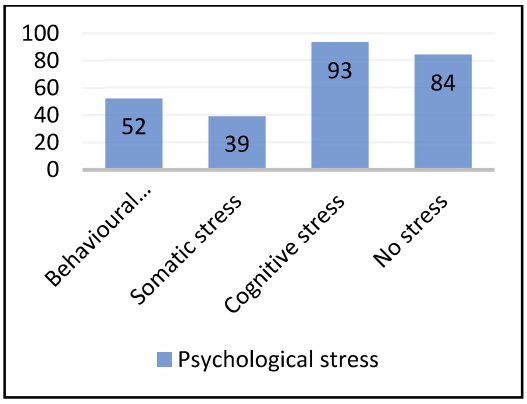

Figure 5.4 (B): Frequency of psychological stress

Figure 5.4: Frequency of WMSDs and psychological stress

Table 5.3: Direct, indirect and total effects

Exogenous variables	Endogenous variables	Direct effect (significance value)	Indirect effect	Total effect
Job Control	Behavioural Stress	-0.40 (= 0.002)	-	-0.40
	Somatic Stress	-0.65 (< 0.001)	-	-0.65
	Cognitive Stress	-0.62 (< 0.001)	-	-0.62
	Neck Pain	-0.34 (= 0.002)	-	-0.34
	Shoulder Pain	-0.40 (= 0.009)	-	-0.40
	Wrist Pain	-0.35 (= 0.002)	-	-0.35
	Upper Back Pain	-0.34 (= 0.003)	-	-0.34
	Lower Back Pain	-0.33 (= 0.004)	-	-0.33
	Thigh Pain	-0.32 (= 0.004)	-	-0.32
	Knee Pain	-0.53 (< 0.001)	-	-0.53
	Feet Pain	-0.32 (= 0.004)	-	-0.32
Age	Upper Back Pain	0.16 (= 0.023)	-	0.16
	Knee Pain	0.23 (< 0.001)	-	0.23

The final path analysis model showed no significant relationship between workload and WMSDs in the neck, shoulder, elbows, wrists, upper back, lower back, thighs, knee, and feet. Job control significantly affected pain in the neck (-0.34),

shoulders (-0.40), wrists (-0.35), upper back (-0.34), lower back (-0.33), thighs (-0.32), knees (-0.53), and feet (-0.32). Job control had no significant effect on pain in the elbows (Figure 5.3). Age does not have a significant relationship with pain in the neck, shoulders, elbows, thighs, lower back, and feet. However, the path between age and pain in the upper back (0.16) and age and knee (0.23) were significant.

The workload had no significant effect on behavioural, somatic, and cognitive stress; thus, the null hypothesis is rejected. These results do not support the job demand-control theory, which states that job demands significantly affect psychological stress.

5.3. CONCLUSIONS

The present work explores the relationship between work-related factors on WMSDs and psychological stress in Indian middle management executives working at different managerial positions in a telecom organisation. Also, the effect of age on WMSDs and psychological stress was studied. Descriptive statistics showed that

1) more than half of the employees were suffering from pain in at least one part of the body,
2) neck and lower back pain were the most frequently reported problems in WMSDs, and
3) psychological stress was also reported by more than half of the respondents.

The workload had no significant effect on WMSDs. Thus, the null hypothesis "workload has a significant effect on WMSDs" is rejected. The results are not similar to the JDC model. Although some studies support the JDC model in predicting the WMSDs (Canjuga et al., 2010; Mehta and Parijat, 2012), there is still not enough empirical evidence of the relationship between WMSDs and workload. In their study on a Germany-based blue-collar and white-collar population, Herr et al. (2015) reported a significant effect of workload on MSDs in blue-collar workers. However, the same study

found no effect in white-collar workers. The present study focuses on employees working primarily in middle-level management. At this level and especially in telecom organisations, most office works relate to middle-level managers. Low physical activity due to low physical workload may lead to a non-significant relationship between workload and WMSDs. In such cases, physical activity or physically demanding work is more often associated with WMSDs than with office work with low physical activity. So, the study results provided more evidence that for MLMs, the validity of the JDC model was not supported to predict WMSDs.

Job control had a significant effect on pain in the neck, shoulders, wrists, upper back, lower back, thighs, knees, and feet. It was found that job control had a negative correlation with these WMSDs. The negative correlation between job control and pain in different body regions implies that high job control reduces pain. These results support the theory of the JDC model that increasing job control reduces not only the stress but also WMSDs in employees. Although the JDC model has been mainly used to explain psychological well-being, some studies used the JDC model to explain WMSDs (Canjuga et al., 2010; Herr et al., 2015; Jaiswal, 2016). Similar to the effect of workload, the effect of job control on WMSDs has a variation in different studies. Canjuga et al. (2010) and Mehta and Parijat (2012) reported a significant effect of job control on neck and shoulder pain. Most of the studies only focused on the WMSDs in the upper extremities in the case of office workers. The results of the present finding show that job control also has a significant relationship with WMSDs in lower extremities, even for employees working in an office type environment with low physical work.

No significant effect of age on pain in the neck, shoulders, elbows, thighs, lower back and feet were found. However, it was significantly related to upper back and knee pain in the lives of senior executives of the case. Deros et al. (2010) reported the

significant effect of age on upper back pain in Malaysian food manufacturing employees. The relationship between age and pain in the shoulders, neck, and lower back in blue-collar workers has been reported in several studies (Shariat et al., 2018; Heiden et al., 2013; Erick and Smith, 2011; Ramdan et al., 2018; Holmström and Engholm, 2003). It is evident from several studies that employees working in a physically demanding job for a long-time experience WMSDs early in their lives. This suggests a significant relationship between age and WMSDs in blue-collar workers. However, there is insufficient evidence for the relationship between age and WMSDs in MLMs. The present study's findings suggest a significant positive relationship between age and knee and back pain only in the case of MLMs working in office settings.

In the case of psychological stress, no significant relationship between workload and behavioural, somatic, and cognitive stress was found, and thus the null hypothesis is rejected. These results do not support the job demand-control theory. For the present case study, an increase or decrease in the employees' workload would not affect their psychological well-being. However, job control significantly affected behavioural, somatic, and cognitive stress. This is very similar to the theory of the JDC model that an increase in job control results in better psychological well-being and less occupational stress.

Similarly, the negative correlation between job control and psychological stress indicates that less stress will result due to high job control. A non-significant relationship between age and psychological stress was found. Thus, the null hypothesis is rejected in this case. Results of the present study partly support the JDC Model for both psychological stress and WMSDs.

As an MLM becomes aged, the upper back and knee pain is evident. Such WMSDs can be handled effectively by providing more control over the job, i.e., can

reduce the negative effect of increased age in employees. Also, job control reduces all other WMSDs. So, organisational policies should focus on providing job control as it improves the employees' physical well-being and can also help improve their work performance.