

Chapter 4

Findings and Results

Phase 1 Cross-sectional survey

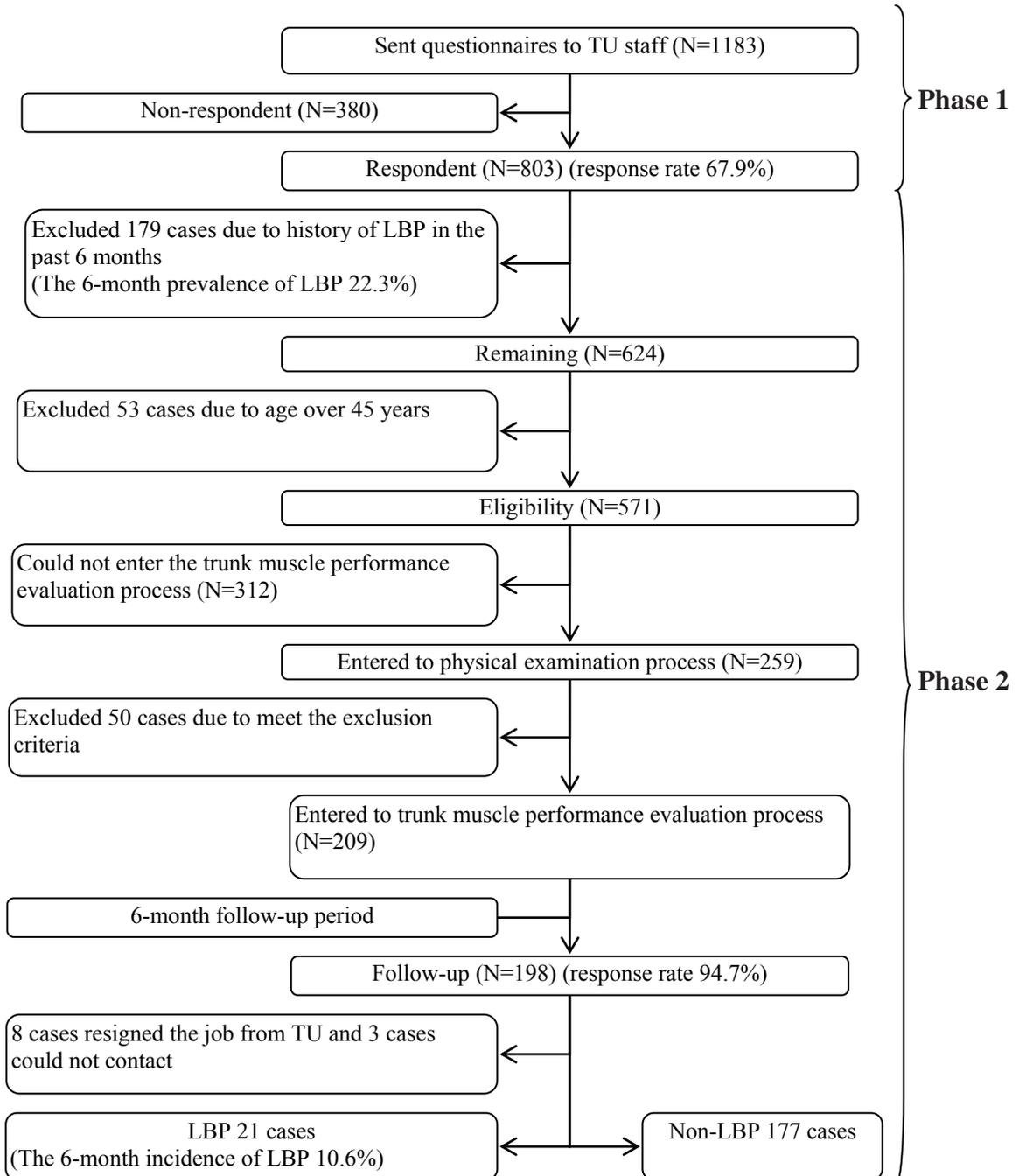


Figure 4.1 The diagram of the number of volunteers participating in this study

Figure 4.1 shows the number of volunteers participating in this study including inclusion and exclusion criteria. In the phase 1, researcher isolated groups of staff without LBP in the past 6 months by questionnaire.

Table 4.1 Characteristics of the participants (N = 803)

Characteristics	Number (%)
Age (mean = 36.9 years, SD = 8.5 years)	
<30 years	185 (24.8)
31-40 years	326 (43.7)
> 40 years	235 (31.5)
Gender	
Male	229 (29.3)
Female	554 (70.8)
Nutritional status	
Underweight (BMI <18.5 m / kg ²)	127 (16.3)
Normal (BMI 19-22.9 m / kg ²)	319 (41.0)
Obesity (BMI > 23 m / kg ²)	332 (42.7)
Education	
Lower than Bachelor's degree	165 (20.9)
Bachelor's degree	346 (43.9)
Higher than Bachelor's degree	278 (35.2)
Marital status	
Single	389 (49.5)
Married	367 (46.7)
Separated/ divorced	30 (3.8)
History of disease	
No	679 (87.5)
Yes	97 (12.5)
Current smoking	
No	741 (94.3)
Yes	4 (5.7)
Current alcohol consumption	
No	566 (72.2)
Yes	218 (27.8)

Researcher contacted the Division of Personnel for the database lists of Thammasat University staff located in the Rangsit Campus. There were 1,183 questionnaires sent to all of the staff through the official messenger. The survey period was from October to December 2008. The questionnaires were returned by 803 university staff (response rate of 67.9%). The mean age was 36.9 (SD= 8.5) years. According to the self-reported LBP by the questionnaire in this study, the 6-month prevalence of LBP was 22.3% (95%CI: 19.4%-25.2%). As shown in Table 4.1, there were 554 females (70.8%) and 229 males (29.3%). There were 332 participants (42.7%) who were obese, body mass index (BMI) more than 23 kg/m². Three hundred and forty six (43.9%) was graduated from Bachelor's degree. There were only 45

(5.7%) and 218 (27.8%) who were current smokers and alcohol consumers respectively.

Table 4.2 Work-related Characteristics of the participants (N = 803)

Characteristics	Number (%)
Work category	
Academic staff	172 (26.8)
Supporting staff	470 (73.2)
Employment status	
Government officials	250 (32.4)
Other employments	521 (67.6)
Activity at work in 1 day	
Sitting	482 (65.3)
Standing/ walking	84 (11.4)
Awkward/ bending	120 (16.3)
Heavy work load	52 (7.1)
Levels of habitual physical activity	
Sedentary	609 (75.8)
Active	121 (15.1)
Athletic	73 (9.1)
Number of years of work experience: median (interquartile range)	7 (3-14)
Total hours worked per week: median (interquartile range)	40 (40-40)

Table 4.2 shows the work-related characteristics of the study population. Most of responders worked as the supportive staff (73.2%) while 250 (32.4%) worked as government officials. There were 482 (65.3%) work in sitting position during day. There were 609 (75.8%) who were classified as sedentary level according to habitual physical activity level.

Table 4.3 The 6-month prevalence of self-reported LBP stratified by demographic and work-related characteristics (N = 803)

Factors	Total	6-month prevalence		Odds ratio	(95%CI)	p-value*
		n	%			
Age						0.358
18-30 years	185	36	19.5	1.00	-	
31-62 years	561	129	23.0	1.24	(0.8, 1.9)	
Gender						0.091
Male	229	61	26.6	1.00	-	
Female	554	116	20.9	0.73	(0.5, 1.1)	
Nutritional status						0.084
Non-obese (BMI \leq 22.9 kg/m ²)	446	91	20.4	1.00	-	
Obese (BMI > 23 kg/m ²)	332	86	25.9	1.36	(1.0, 1.9)	
Education level						0.116
Lower than Bachelor's degree	165	45	27.3	1.00	-	
Bachelor's and higher degree	624	133	21.3	0.72	(0.5, 1.1)	
Marital status						0.172
Single	389	79	20.3	1.00	-	
Married/ separated/ divorced	397	97	24.4	1.27	(0.9, 1.8)	
Current smoking						0.273
No	741	163	22.0	1.00	-	
Yes	45	13	28.9	1.44	(0.7, 2.9)	
Current alcohol consumption						0.253
No	566	121	21.4	1.00	-	
Yes	218	55	25.2	1.24	(0.8, 1.8)	
Work category						1.000
Academic staff	172	38	22.1	1.00	-	
Supportive staff	470	106	22.6	1.03	(0.7, 1.6)	
Employment status						0.855
Government officer	250	58	23.2	1.00	-	
Other employments	521	117	22.6	0.97	(0.7, 1.4)	
Activity at work in a day						0.049
Sitting	482	97	20.1	1.00	-	
Standing/Walking	84	17	20.2	1.01	(0.5, 1.8)	
Awkward/Bending	120	35	29.2	1.63	(1.0, 2.6)	
Heavy physical work	52	16	32.7	1.93	(1.0, 3.7)	
Habitual Physical Activity level						0.186
Sedentary	609	136	22.3	1.00	-	
Active	121	32	26.4	1.25	(0.8, 2.0)	
Athletic	73	11	15.1	0.62	(0.3, 1.2)	

* The p-values were based on the Fisher's exact test

Table 4.3 presents the 6-month prevalence of LBP stratified by personal and work-related characteristics. The 6-month prevalence of LBP in this study was 22.3% (95%CI: 19.4%-25.2%). The prevalence of LBP was higher in the age group of more than 30 years (23.0%). The prevalence of LBP was 26.6% and 20.9% among male and female respectively. The prevalence of LBP was higher in the lower than Bachelor's degree graduation (27.3%). Concerning activity at work in a day, there

was an increasing trend of the prevalence of (p-value=0.049). The prevalence increases from 20.1%, following by 20.2%, 29.2% and 32.7% in participants who have most activity at work in a day as sitting, standing, awkward/bending and heavy physical work respectively. The prevalence was highest as 26.4%, following by 22.3% and 15.1% in participants who had physical activity as active level, sedentary level and athletic level respectively.

Table 4.4 Risk factors of self-reported LBP among university staff by multivariate analysis (N = 803)

Factors	N	Crude OR	Adjusted OR	(95%CI)	p-value*
Gender					0.167 [†]
Male	229	1	1.00	-	
Female	554	0.73	0.75	(0.5, 1.1)	0.164 [‡]
Nutritional status					0.501 [†]
Non-obese (BMI ≤ 22.9 kg/m ²)	446	1	1.00	-	
Obese (BMI > 23 kg/m ²)	332	1.36	1.14	(0.8, 1.7)	0.500 [‡]
Education level					0.521 [†]
Lower than Bachelor's degree	165	1	1.00	-	
Bachelor's and higher degree	624	0.72	0.85	(0.5, 1.4)	0.519 [‡]
Marital status					0.660 [†]
Single	389	1	1.00	-	
Married/ separated/ divorced	397	1.27	1.09	(0.8, 1.6)	0.660 [‡]
Most activity at work in a day					0.199 [†]
Sitting	482	1	1.00	-	
Standing/Walking	84	1.01	0.94	(0.5, 1.7)	0.849 [‡]
Awkward/Bending	120	1.63	1.47	(0.9, 2.4)	0.109 [‡]
Heavy physical work	52	1.92	1.77	(0.9, 3.5)	0.109 [‡]
Habitual Physical Activity level					0.062 [†]
Sedentary	609	1	1.00	-	
Active	121	1.25	1.13	(0.7, 1.8)	0.627 [‡]
Athletic	73	0.62	0.44	(0.2, 0.9)	0.041 [‡]

*The p-values were based on; [†]: the likelihood ratio test (LRT), [‡]: the Wald chi-squared test

By multiple logistic regression analysis as shown in Table 4.4, the habitual physical activity level was an independent risk that significantly associated with the LBP (p-value=0.062 by LRT) after adjusted for gender, nutritional level, education, marital status, activity at work in a day. Concerning the habitual physical activity

level, the group of athletic level had significantly protective effect on the LBP with the odds ratio of 0.44 (95%CI: 0.2-0.9) compared to the sedentary level. Concerning activity at work in a day, there was an increasing trend of having LBP but not reach statistical significant level (p-value=0.199 by LRT). The magnitude of having LBP increased from odds ratio of 0.94, following by 1.47, and 1.77 in participants who have activity at work in a day as standing, awkward/bending and heavy physical work compared to sitting respectively.

Table 4.5 Comparison of the psychosocial factors between participants with and without LBP (N = 803)

Psychosocial conditions	LBP (N = 179)	non-LBP (N = 423)	p-value*
	Median (Inq range)	Median (Inq range)	
Depression	4 (1-5)	2 (0-4)	0.001
Disstress	5 (3-7)	3 (2-5)	0.001
Satisfaction in the current job	7 (5-8)	7 (5-8)	0.057
Receiving help from colleagues	6 (5-8)	7 (5-8)	0.067
The ability to control their own work	8 (7-8)	8 (7-9)	0.021

* The p-values were based on the Mann-Whitney test, Inq: interquartile

In addition, the comparison of psychosocial conditions between LBP and non-LBP group was shown in Table 4.5. Depression and disstress as well as the low ability to control their own work were statistically significant associated with LBP (p-value <0.001). The satisfaction of the current job and received less help from colleagues were lower in the LBP than in the non-LBP group (p-value = 0.057, p-value = 0.067 respectively).

Phase 2 Cohort study

After questionnaire surveyed 803 Thammasat University staff (Rangsit Center) in Phase 1 found that 179 cases were excluded from the study because of history of LBP and 53 cases that aged over 45 were also excluded according to exclusion criteria. There were 571 participants eligibility for the study. There was 259 of 571 (45.4%) accepted the telephone invitation and participated in the trunk muscle performance evaluation. Fifty cases were excluded because found some musculoskeletal abnormality including leg length difference exceeded 1 centimeter, abnormal spinal curve, had history of disease or disorders that may be dangerous to trunk muscle performance tests including heart disease, high blood pressure, had history of LBP or spinal surgery. Finally, two hundred and nine participants entered to the trunk muscle performance tests for cases with characteristics as shown in Table 4.6.

Table 4.6 Characteristics of the cohort population (N = 209)

Characteristics	Number	(%)
Age (mean = 33.0 years, SD = 6.3 years)		
<30 years	78	(41.9)
31-40 years	82	(44.1)
> 40 years	26	(14.0)
Gender		
Male	27	(14.4)
Female	161	(85.6)
Nutritional status		
Underweight (BMI <18.5 m/ kg ²)	36	(19.8)
Normal (BMI 19-22.9 m/ kg ²)	82	(45.1)
Obesity (BMI> 23 m/ kg ²)	64	(35.2)
Education		
Lower than Bachelor's degree	37	(19.7)
Bachelor's degree	113	(60.1)
Higher than Bachelor's degree	38	(20.2)
Marital status		
Single	112	(59.9)
Married	68	(36.4)
Separated/ divorced	7	(3.7)
History of underlying disease		
No	162	(86.6)
Yes	25	(13.4)
Current smoking		
No	184	(98.4)
Yes	3	(1.6)
Current alcohol consumption		
No	140	(74.9)
Yes	47	(25.1)

Table 4.7 showed the 6-month incidence of self-reported LBP stratified by history taking and physical examination for screening spinal abnormality. The 6-month incidence of LBP associated with prone lying paravertebral muscle spasm and abnormal legs and back flexibility with magnitude of odds 1.20, 1.44 and 1.44 respectively.

Table 4.7 The 6-month incidence of self-reported LBP stratified by history taking and physical examination for screening spinal abnormality (N = 198)

Inspection	Characteristics	Total	6-month incidence		Odds ratio	(95%CI)	p-value*
			n	%			
History taking	Sleep position						0.315
	Supine lying	63	9	14.3	1.00	-	
	Prone lying	6	1	16.7	1.20	(0.0, 12.7)	
	Side lying	128	11	8.6	0.56	(0.2, 1.6)	
	Bed surface						0.800
	Regular firm	140	16	11.4	1.00	-	
	Soft, very inconsistent	57	5	8.8	0.75	(0.2, 2.3)	
	The serious accident						1.000
	Never	157	17	10.8	1.00	-	
Ever	41	4	9.8	0.89	(0.2, 3.0)		
Observation	Body built						1.000
	Hyposthenic	26	3	11.5	1.00	-	
	Sthenic	155	17	11.0	0.94	(0.2, 5.4)	
	Hypersthenic	15	1	6.7	0.55	(0.0, 7.7)	
	Spinal alignment: posterior view						1.000
	Normal	145	15	10.3	1.00	-	
Twist / tilt	50	5	10.0	0.96	(0.3, 3.0)		
Palpation	Paravertebral muscle tension						0.770
	Normal	37	3	8.1	1.00	-	
	Abnormal	154	17	11.0	1.41	(0.4, 7.9)	
Range of motion	Trunk flexion						0.339
	Normal (≥ 6 cm.)	68	16	12.3	1.00	-	
	Abnormal (<6 cm.)	130	5	7.4	0.57	(0.2, 1.7)	
	Trunk extension						0.747
	Normal (≥ 1 cm.)	30	19	11.3	1.00	-	
	Abnormal (<1 cm.)	168	2	6.7	0.56	(0.1, 2.5)	
	Trunk lateral flexion						0.365
	Not different	103	13	12.6	1.00	-	
	Different than 1 cm.	95	8	8.4	0.64	(0.2, 1.8)	
The flexibility (Sit-and-reach)	Legs and back						0.771
	Normal (≥ 20 cm.)	37	18	11.3	1.00	-	
	Abnormal (<20 cm.)	160	3	8.1	1.44	(0.4, 8.0)	

* The p-values were based on the Fisher's Exact test

The participants were followed up for 6-month for the occurrence of LBP by a questionnaire that was sent directly to participants, there were 198 returned questionnaires (94.7%). There were 8 of participant quited from current job from Thammsat University during 6-month follow-up and other 3 participants lose of contact. There was 21 cases from 198 answered "ever" to the question number 1 and "yes" in the question number 2 to identify LBP occurrence, thus the 6-month incidence of LBP in this study was 10.6% (95%CI: 6.3%, 15.0%).

Table 4.8 presents the 6-month incidence of LBP stratified by personal and work-related characteristics. The 6-month incidence of LBP in this study was 10.6% (95%CI: 6.3%, 15.0%). The highest incidence of LBP was found in the age group of 31-45 years (11.4%). The incidence of LBP was higher in males (15.0%) than females (9.2%). For educational level, there was 19.4% of incidence of LBP in the staff who had educated from lower than Bachelor's degree (p-value=0.050). The incidence of LBP was 16.4% and 5.7% among married/separated/divorced and single staff respectively (p-value=0.024). Concerning activity at work in a day, the incidence of LBP were from 8.4%, following by 11.1%, 0.0% and 25.0% in participants who have activity at work in a day as sitting, standing, awkward/bending and heavy physical work respectively (p-value=0.072). The incidence was highest as 12.3%, following by 6.3% and 0.0% in participants who had habitual physical activity as sedentary level, active level and athletic level respectively.

Table 4.9 presents the comparison of the characteristics of the Isokinetic Biodex™ System-3 between LBP and non-LBP groups after 6-month follow-up. Although there was no significant difference in the characteristics of Isokinetic Biodex™ System-3 between groups, the peak torque/body weight in extension direction for all three test speed in the LBP group was lower than the non-LBP group. Moreover, the extension/flexion ratio for test speed 90°/second and 120°/second in LBP group was lower than non-LBP group.

Table 4.8 The 6-month incidence of self-reported LBP stratified by demographic and work-related characteristics (N = 198)

Factors	Total	6-month incidence		Odds ratio	(95%CI)	p- value*
	N	n	%			
Age						0.438
21-30	72	5	6.9	1.00	-	
31-45	105	12	11.4	1.73	(0.5, 6.5)	
Gender						0.430
Male	20	3	15.0	1.00	-	
Female	159	15	9.4	0.59	(0.1, 3.5)	
Nutritional status						0.112
Non-obese (BMI \leq 22.9 kg/m ²)	113	8	7.1	1.00	-	
Obese (BMI $>$ 23 kg/m ²)	60	9	15.0	2.32	(0.7, 7.3)	
Education level						0.050
Lower than Bachelor's degree	34	7	20.6	1.00	-	
Bachelor's and higher degree	145	11	7.6	0.32	(0.1, 1.1)	
Marital status						0.024
Single	105	6	5.7	1.00	-	
Married/ Separated/Divorced	73	12	16.4	3.25	(1.1, 11.0)	
Current smoking						0.275
No	175	17	9.7	1.00	-	
Yes	3	1	33.3	4.65	(0.1, 92.3)	
Current alcohol consumption						1.000
No	137	14	10.2	1.00	-	
Yes	41	4	9.8	0.95	(0.2, 3.3)	
Work category						1.000
Academic staff	10	0	0.0	1.00	-	
Supportive staff	120	10	8.3	1.00	(0.1, 47.3)	
Employment status						0.740
Government official	29	2	6.9	1.00	-	
Other employments	138	15	10.9	1.65	(0.3, 15.6)	
Activity at work in a day						0.092
Sitting	119	10	8.4	1.00	-	
Standing/Walking	18	2	11.1	1.36	(0.1, 7.3)	
Awkward/Bending	21	0	0.0	0.47	(0.0, 3.6)	
Heavy physical work	12	3	25.0	3.63	(0.5, 17.8)	
Habitual Physical Activity level						0.273
Sedentary	130	16	12.3	1.00	-	
Active	32	2	6.3	0.48	(0.1, 2.2)	
Athletic	18	0	0.0	0.37	(0.0, 2.7)	

* The p-values were based on the Fisher's Exact test

Table 4.9 Comparison the characteristics of the Isokinetic Biodex™ System-3 between LBP and non-LBP groups after 6-month follow-up period (N = 198)

Movement	Variables	Test Speed (°/ sec)	LBP (N = 21)		Non-LBP (N = 177)		Mean Difference**	SE	(95% CI)	p- value*	
			Mean	SD	Mean	SD					
Extension	Peak torque / body weight (%)	60	313.6	88.6	326.9	85.1	13.22	20.4	(-28.8, 55.2)	0.522	
		90	309.7	106	319	91.8	9.39	24.1	(-40.4, 59.2)	0.701	
		120	285.7	103.8	302.9	95.8	17.21	23.8	(-31.9, 66.3)	0.476	
	Work / body weight (%)	60	391.7	134.1	379.6	121.6	-12.07	30.7	(-75.3, 51.2)	0.697	
		90	360.2	150.2	345.1	124.8	-15.04	34.1	(-85.5, 55.4)	0.663	
		120	301.1	160	294.2	137.4	-6.9	36.4	(-82.1, 68.3)	0.851	
	Average power (Watts)	60	106.3	50.5	95.4	43.1	-10.93	11.5	(-34.7, 12.8)	0.351	
		90	136.2	78.6	119.5	57.3	-16.76	17.7	(-53.4, 19.9)	0.354	
		120	137.4	96.1	123.7	71.9	-13.74	21.7	(-58.6, 31.1)	0.532	
	Work first third (Joules)	60	212.5	93.5	205.9	151.6	-6.59	23.4	(-54.1, 40.9)	0.779	
		90	179.1	102.3	153.3	76.8	-25.77	23	(-73.5, 21.9)	0.275	
		120	131.2	91.8	118.8	68.9	-12.38	20.7	(-55.2, 30.4)	0.556	
	Work last third (Joules)	60	216.8	92.3	204	126.5	-12.77	22.3	(-58.3, 32.7)	0.571	
		90	209.9	101.1	184.6	79.2	-25.31	22.9	(-72.6, 22.0)	0.28	
		120	171.4	106.5	156.9	83.2	-14.53	24.1	(-64.3, 35.3)	0.552	
	Flexion	Peak torque / body weight (%)	60	154.6	44.7	161.6	39.7	7.03	10.2	(-14.0, 28.1)	0.497
			90	154.6	55.3	156.7	46	2.12	12.5	(-23.8, 28.0)	0.867
			120	159.2	72.6	152.2	45.7	-7.03	16.2	(-40.6, 26.6)	0.669
Work / body weight (%)		60	163.2	71.2	162.3	50.1	-0.9	16	(-34.0, 32.2)	0.956	
		90	144.2	79.4	149.6	50.8	5.39	17.7	(-31.4, 42.2)	0.764	
		120	125.1	85.2	123.5	56.4	-1.6	19.1	(-41.1, 37.9)	0.934	
Average power (Watts)		60	46.1	26.4	42.1	19.5	-3.93	5.9	(-16.2, 8.4)	0.515	
		90	57.7	42.5	54.6	27.1	-3.15	9.5	(-22.8, 16.5)	0.743	
		120	60.7	55.9	55.1	34.5	-5.62	12.5	(-31.5, 20.3)	0.657	
Work first third (Joules)		60	95.2	53.3	87.3	39.5	-7.91	12	(-32.7, 16.9)	0.517	
		90	83.1	58.3	79.7	38.1	-3.37	13	(-30.4, 23.7)	0.798	
		120	72.4	61.2	65.8	38.4	-6.57	13.7	(-34.9, 21.8)	0.635	
Work last third (Joules)		60	87.1	48.3	82.2	35.4	-4.92	10.9	(-27.4, 17.6)	0.655	
		90	80.2	53	77.4	35	-2.89	11.9	(-27.5, 21.7)	0.81	
		120	68.7	57	63.6	36.4	-5.06	12.7	(-31.5, 21.3)	0.695	
Extension/ Flexion ratio		60	2.1	0.4	2	0.5	-0.01	0.1	(-0.2, 0.2)	0.929	
		90	2	0.4	2.1	0.6	0.06	0.1	(-0.1, 0.2)	0.489	
		120	1.9	0.4	2.1	0.9	0.17	0.1	(-0.1, 0.4)	0.131	

* The p-values were based on the Unpaired t-test, **Mean difference = mean of non-LBP group - mean of LBP group

Table 4.10 The 6- month incidence of self-reported LBP stratified by Sorensen Test and spinal stability test after 6-month follow-up period (N = 198)

Evaluation	6-month incidence		Odds ratio	(95%CI)	p-value*
	Number	%			
Sorensen test					
<60 seconds	4	13.8	1.00	-	0.583
60-120 seconds	10	8.62	0.61	(0.2 ,2.1)	
> 120 seconds	7	11.9	0.88	(0.2 ,3.3)	
Spinal stability test					
Level 1	1	10	1.00	-	0.922
Level 2	8	10.3	1.06	(0.1 ,9.5)	
Level 3	7	8.97	0.91	(0.1 ,8.3)	
Level 4	5	13.2	1.45	(0.1 ,14.1)	

*The p-values were based on the Fisher's Exact test

Table 4.10 shows the comparison of of back muscle endurance test (Sorensen Test) and spinal stability test (Stability test) between LBP and non-LBP groups after 6-month follow-up period , there was no significant difference between LBP and non-LBP groups. Notice that the 6-month incidence of LBP was highest as 13.8% in participants who performed back muscle endurance test less than 60 second.

Table 4.11 Comparison of the psychosocial factors between participants with and without LBP LBP after 6-month follow-up (N=198)

Psychosocial factors	LBP (N = 21)		Non-LBP (N = 177)		p-value*
	Median	(Inq range)	Median	(Inq range)	
Depression	3	(0-5)	2	(0-4)	0.305
Disstress	4	(3-7)	3	(2-5)	0.157
Satisfaction in the current job	6	(5-9)	7	(5-8)	0.603
Receiving help from colleagues	5	(4-8)	7	(5-8)	0.031
The ability to control thier own work	8	(7-9)	8	(7-9)	0.858

* The p-values were based on the Mann-Whitney test, Inq: interquartile

Table 4.11 shows the comparison of the psychosocial conditions between LBP and non-LBP groups, the result showed that receiving help from colleagues was only one factor which reached the statistical significant different between LBP and non-LBP groups (p-value=0.031).

4.3 Discussion

This study was one of field study conducted in the community setting as the university environment in Thailand. The university staff composed of staff who had a mixed variety working styles whereas other studies were focus on particular types of work styles as office workers (Janwantanakul, Pensri, Jiamjarasrangsi, & Sinsongsook, 2009; Spyropoulos, et al., 2007), nurse (Yip, 2001), hospital staff (Karahan, Kav, Abbasoglu, & Dogan, 2009), or industrial worker (Mazloum, Nozad, & Kumashiro, 2006). The Thammasat University annual report (2006) showed that government officer, supportive officers, contributed to 47.7%, 74.3%, respectively (*Annual Report Thammasat University 2007*, 2007). The 6-month prevalence of self-reported LBP in this study was 22.3% (95%CI: 19.4%-25.2%), which was lower than the reports of prevalence of LBP from other studies (Cassidy, Carroll, & Cote, 1998; Ozguler, et al., 2000). This could be explained by different definition used in the studies (Burton, Clarke, McClune, & Tillotson, 1996; Griffith, et al., 2007; Ozguler, et al., 2000) and different types of works among participants. However, selection bias may contribute in this study since the response rate is rather low as 67.9%. Only the Rangsit campus of Thammasat University was selected to survey in this study. Generalizability of the study result to the university environment is, therefore, limited by only one university setting and low response rate. For Thai survey, there have not been reported the 6-month prevalence of LBP in the university staff. However, there had been reported 27.2% of prevalence of LBP in the clothes factory worker (Intakochasarn, 2006) that higher than the prevalence in our study. It could be different because of the working style between studies; the factorial workers may have more work load than the university staff.

4.3.1 Phase 1 Cross-sectional survey

Most of epidemiological studies usually reported 12-month prevalence of LBP (Bejia, et al., 2005; Janwantanakul, et al., 2009; Karahan, et al., 2009; Omokhodion, Umar, & Ogunnowo, 2000; Ozguler, et al., 2000; Spyropoulos, et al., 2007; Walker,

Muller, & Grant, 2004) but the result may be affected by recalled bias. Therefore, the 6-month period prevalence of LBP was chosen in this study in order to reduce recalled bias.

According to multivariate analysis, habitual physical activity level was the only independent factor associated with the LBP (p -value=0.062 by LRT) after adjusted for gender, nutritional level, education, marital status, and activity at work in a day as shown in Table 4.4. Staff who had habitual physical activity as athletic level appeared to have a protective effect compared to sedentary level with an odds ratio of 0.44 (95%CI: 0.2-0.9). Habitual physical activity as athletic level in this study could be interpreted to participants who usually played sport during their leisure time which was reported by participants. Moreover, the athletic level was concerning to the intensity, type, and duration of sport playing. In our study, habitual activity was measured by the questionnaire, the actual energy expenditure within certain types of sport could not be estimated directly. However, a review study suggested that usual physical exercises in a LBP may prevent future recurrences or chronicity (Vuori, 2001). There was strong evidence suggesting that endurance training including running, swimming, cycling or aerobic training could prevent LBP (Krismer & van Tulder, 2007).

The obese seem to have a higher prevalence of LBP than the non-obese did with an odds ratio of 1.14 (95%CI: 0.8-1.7) as shown in Table 4.4. In this study, we categorized nutritional status into 2 groups according to the classification of appropriate body-mass index for Asian population by the World Health Organization (WHO, 2004). Leboeuf-Yde in 1999 reported that underweight ($BMI < 20 \text{ kg/m}^2$) subjects consistently reported a lower prevalence of LBP (odds ratio = 1) than those higher in weight (Leboeuf-Yde, et al., 1999). In contrast, Spyropoulos in 2007 reported that there were significant differences in their lifetime LBP prevalence ($p < 0.001$) between individuals with $BMI \leq 25 \text{ kg/m}^2$ (56.2%) and those with $BMI \geq 25 \text{ kg/m}^2$ (70.3%) in office workers (Spyropoulos, et al., 2007). Moreover, Shiri in 2008 revealed that the associations were statistically significant between LBP and BMI of 35.0 kg/m^2 (Shiri, et al.,

2008). Notice that these studies used the different cut-of-point for BMI classification. It seems to be that people who have more BMI may have slightly more LBP trouble.

However, the activity at work in a day was not significantly associated with LBP in multivariate analysis, staff who had heavy physical work characteristic tended to associate with LBP compared to those who had sitting activity as most activity at work in a day with odds ratio of 1.77 (95%CI: 0.9-3.5). The sitting in this study was defined as working in sitting position more than 2 hours per day whereas the previous study (Janwantanakul, et al., 2009), which reported the association of working in sitting position more than 8 hours per day and 12-month prevalence of LBP in the office workers in Thailand (Janwantanakul, et al., 2009). The difference in mechanical load to the spine may be explained the cause of pain from different working posture. In sitting work posture, disc pressure at L3 is greater than standing position but this static loading and pressure is very low compared with that require to cause spinal damage. In contrast, LBP is more common in people with heavy physical work because there is much more axial load on vertebral disc (Waddell, 1998). This load may affect the narrowing disc space and degenerative change in the spine.

4.3.2 Phase 2 Cohort study

There are a limited number of longitudinal studies in Thailand about the incidence of LBP. This study was one of field studies focusing on participants with different job titles in developing countries. The purpose of Phase 2 cohort study was to evaluate the effect of trunk muscle performances on 6-month incidence of LBP in the university staff. There was a limitation to generalize the result to the university participants since only 36.6% (209 participants from the 571 eligible participants) of the participants without LBP entered this cohort study. However, the results of this study were consistent with other papers.

Our result found 6-month incidence of LBP was 10.6% (95%CI: 6.3%, 15.0%) in the university staff. The incidence 10.6% for LBP in the past 6 months is

comparable with 8% of 6-month incidence of LBP in studies of Saskatchewan adult population between the ages of 20 and 69 years (George, 2002). The follow-up period and population characteristic in both studies was different.

Our result was higher than 2.1% incidence of LBP in 12-month follow-up in the Iranian industrial workers (Ghaffari, Alipour, Farshad, Yensen, & Vingard, 2006). One reason for this difference was related to the outcome definition. We calculated the incidence of LBP by using self-reporting of new episodes of LBP whereas Ghaffari in 2006 reported LBP by leading to sickness absence. The 6-month incidence of 10.3% in our study was far from the 12-month incidence values reported in western studies; 18.1% (Waxman, Tennant, & Helliwell, 2000), 20-28% (Elders & Burdorf, 2004) and 17.2% (Cassidy, Cote, Carroll, & Kristman, 2005).

From descriptive analysis, among personal risk factor, the marital status as married/divorced or separated seem to be only one factor associated with 6-month incidence of LBP ($p=0.024$). Among the psychosocial risk factors, only receiving help from colleague was associated with 6-month incidence of LBP ($p=0.031$).

For trunk muscle performance evaluations, all of the Isokinetic trunk performance characteristics, time in Sorensen test and stability test were not associated with the 6-month incidence of LBP. However, notice that the 6-month incidence of LBP was highest as 13.8% in participants who performed back muscle endurance test less than 60 second. Similar to a previous study which indicated that odds ratio of new LBP was more than 3 times greater among the subjects with poor performance (<58 seconds) compared to those with medium (58-100 seconds) or good (110-240 seconds) performance (Alaranta, et al., 1995).

The major problems during study

Problems in this study found during research. After phase 1 initially we needed the sample size of 610 without LBP, only 209 participants underwent trunk muscle performances evaluation process. Unfortunately, the Isokinetic Biodex™ system-3 machine at Thammasat University that was the main equipment to measure primary

exposure was broken that can not fix within short period while this study had to finish within a specified time. The researcher tried to recruit more participant but we finally failed to recruit. So the result of this study had some limitation to generalize to university population. Moreover, this cohort failed to detected significant factor associated with LBP due to unexpected insufficient participant in the study. Considering the weakness in statistical power, we cannot exclude random error as contributing to our results. The authors therefore recommend additional research. Other studies with large sample sizes should be conducted for replication of results.