

Original Article

The effect of the body mechanic behaviors on the low back pain

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ABSTRACT

Background & Aim: Low back pain (LBP) has developed as a major public health problem in the western industrialized societies, and the socio-economic burden of this problem has a huge dimension. The aim of this study was to investigate the effect of body mechanics behavior on LBP of workers.

Methods & Materials: Descriptive study includes convenience sample of 290 workers who work at car production industry. The research data were collected using: (1) The worker's socio-demographic data form, (2) the body mechanics behaviors form, and (3) Oswestry Disability Index (ODI) by the researchers.

Results: About 90% of the workers are male, 74.8% of them are married, and 36.9% of them are high school graduates. In about 48.3% of the workers the pain recurrence was very mild, in 24.8% of them was moderate, and in 10.3% of them was mild and did not varied much. A significant difference has been determined between ODI classification and paying attention to the position of spine, while lifting something ($P < 0.01$), paying attention to the position of head, shoulder and back, while walking ($P < 0.05$), paying attention to suitable sitting position ($P < 0.05$).

Conclusion: Workers LBP complaints varied. Complaints were found "minimally disability" to "crippled" on ODI classification. It is clear that body mechanic behaviors of the workers have an influence on ODI.

Introduction

Multifactorial "work-related" diseases are often more common than occupational diseases and therefore deserve adequate attention by the health services. Low back pain (LBP) is one of the work-related diseases, which deserve particular attention (1). LBP has developed as a major public health problem in the western industrialized societies, and the socio-economic burden of this problem has a huge dimension. On an average, 37% of the LBP cases occur due to work-related constructs. This situation is changing between 12% and 38% in woman, and between 31% and 45% in men. Although LBP is not a cause of

death, its incidence is quite high and it is an important disease burden for the society. According to the World Health Organization, 800,000 Disability Adjusted Life Years are lost because of the LBP problem in the world (2).

One-third of the work loss occurring due to work accidents and occupational diseases is happening because of these disease groups (3). In the European Low Back Pain Prevention Guide (2004), it was reported that the work absence ratios are high because of the temporary or chronic LBP. In the study made by Bakirci et al. (2007) which examined the LBP problems of textile production workers, two of each three workers are seeing their work as the cause for their LBP problem (4). This health issue is mainly considered to be a problem of the industrialized countries, but data coming from the developing countries is showing that it has a similar

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prevalence rate in the developing countries as well (5). Oksuz (2006), determined the prevalence of lifetime LBP as 44.1% in Turkey (6). Due to the inefficient diagnostic systems in Turkey and the lack of national-wide monitoring, the information about this issue is not sufficient. Nevertheless, the local research findings point out occupational muscle-skeleton diseases being an important health issue (7).

Occupational muscle skeleton system diseases are occurring as a result of the complex process, which is characterized by the influences of many factors and their interactions. It can just be related to the occupation or it may also be independent of the occupation being related to other factors such as; age, gender, smoking status, anthropometrical measures, structural anomalies etc. In the new approaches, it is considered that the physical, organizational and social constructs at the workplace, physical and social aspects of private life and the physical and psychosocial properties of the person may also have an influence on this process (8). Having a desk job, working in the same position for a long period of time, not having ergonomic tables or chairs, and the difficulty of working with a computer are all factors causing LBP (9, 10).

The skeleton and muscle system of an individual has the moving ability and power, muscles have the ability to create energy, perceive the environment and if necessary, they have the ability to protect themselves (11). As you know, action is an essential factor of life and it has an important role on the continuation of physiological and psychological functions. Right action, can be maintained in the best way by an appropriate body mechanic and position adjustments. While wrong action or immobility is causing functional loss and disabilities in the body systems, right action will help the body to gain dynamism. It is not important to have strong muscles. The important thing is how these muscles are used, how the right action is acquired, how to get a straight standing look and to know how these muscles are used in various actions. The scientific field, which teaches the muscle, bone, joint and nerves forming the human body working with other systems is called body mechanic (12, 13).

Eriksen et al. (2004) reported the negative effects of bending, stretching, standing still for a long time, carrying heavy weights, sitting, pushing and pulling alike body mechanic actions on the LBP (14). Moreover, in many studies made in this field, occupations which require working with repeated actions have an influence on the complaints of the workers about LBP (15-17). In a study by Gervais (2003), in order to prevent the muscle-skeleton system problems occurring, while the workers are carrying out functions such as carrying, shifting, pushing, and working with mechanical tools; they should be told in what position they can do these activities in the best way and it was also emphasized that the warm up and stretching exercise activities are quite important before starting to work (18). Kuruoglu et al. (2005), conducted a study for the evaluation of the work-life and health status of the workers working in physically-based occupations in the constructions sites and found that the muscle pain and tiredness complaints seen in 34% of the workers may be prevented by using various exercise techniques and doing physical exercises (19).

This research, considering all of these reasons, was made in order to examine the effects of body mechanic behaviors of the workers on the LBP seen while working.

Methods

This descriptive study was carried out between the dates of November 1, 2008 and January 1, 2009 in a car production factory in Izmir city. The universe of descriptive research was workers who work at car production industry. The sample of the study was workers who applied to sick bay because of LBP during the last 1 year and has still been working at the company (n: 334). The questionnaire was given to 334 workers and of these workers, 290 (86.8%) responded.

The research data were collected using: (1) the socio-demographic data form, (2) the body mechanics behaviors form; and (3) the Oswestry Disability Index (ODI) by the researchers. The socio-demographic data form included 17 questions about socio-demographic characteristics of workers. The body mechanics behaviors form

was prepared by researchers according to literature (17, 20). Its included 10 statements related to workers' behaviors of body mechanics.

The ODI is a self-completed questionnaire by the patient that examines perceived levels of disability in 10 everyday activities of daily living to assign a subjective score of level of function (21). Turkish reliability and validity were also committed by Yakut et al. (2004) (22). The Turkish version ODI's internal consistency was found 0.91 and test-retest reliability was found 0.93 by Yakut et al. (2004). The questionnaire consists of 10 items addressing different aspects of function such as; pain intensity, personal care (washing, dressing, etc.), lifting, walking, sitting, standing, sleeping, and social life, traveling, and changing degree of pain. Each part includes six options ranked from 0 to 5. The total scores could range from 0 (highest level of function) to 50 (lowest level of function). To accommodate patients who did not respond to every section, a percentage disability was calculated on the basis of the total possible points. Upon adding up all of the points, the total score was divided by 50 and multiplied by 100 to calculate the percentage disability. ODI classification is: 0–20% minimal disability, 21–40% moderate disability, 41–60% severely disability, 61–80% crippled, and 81–100% bedridden.

The Statistical Package for The Social Sciences (SPSS for Windows) was used to analyze the data. Mean, percent, and Chi-square test were used to analyze the data.

Permission was granted for research by the Ethical Committee of Nursing Faculty. Participant workers were orally informed about the aim of the study. Participants were told that they could withdraw from the research whenever they wished and their identity would be kept strictly. Written consent was obtained from Yakup et al. for the instrument. We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Results

Findings about the socio-demographic properties of the workers are included in table 1. Mean age of the workers is 35.29 ± 0.66 . About 90% of

the workers are male, 74.8% of them are married, and 36.9% of them are high school graduates.

Table 1. Socio-demographic characteristics of the workers (n: 290)

Socio-demographic characteristics	N	%
Age group (years)		
16–25	55	19.0
26–35	91	31.4
36–45	97	33.4
>46	47	16.2
Gender		
Female	29	10.0
Male	261	90.0
Marital status		
Married	217	74.8
Single	73	25.2
Educational status		
Elementary school	34	11.8
Middle school	70	24.1
High school	94	36.9
Faculty/College	79	27.2
Smoking status		
Never smoked	112	38.6
Smoker	115	39.7
Gave up smoking	63	21.7
Total	290	100.0

About 55.9% of the workers are stating that they have LBP for 1–10 years, and 84.8% of them are stating that they had no LBP before their work life. About 62.1% of the workers reported that they have to work in the same position for more than one hour during their work period. Findings about the body mechanic behaviors are listed in table 2.

When ODI was examined; 48.3% of the workers pain occurrence was very mild, in 24.8% of them was moderate, and in 10.3% of them was mild and did not varied much.

About 71.7% of the workers stated that their washing and dressing styles have not changed because of the pain, 48.6% of them stated they lift heavy weights without extra pain, 61.7% of them stated they have no pain on walking, 49.0% of them stated they can sit on a chair as long as they like, 50.0% of them stated stand as long as they want without pain, 58.6% of them stated they get no pain in bed, 37.2% of them stated that their pain is rapidly getting better when defining the pain change degree, 71.4% of them stated their social life is normal and gives them no pain, and 49.3% of them stated they have no pain while travelling.

Table 2. Distribution of the body mechanic behaviors of the workers (N: 290)

Body mechanic behaviors	N	%
Balancing the body weight equally to each foot while lifting up an object		
Always	105	36.2
Usually	113	39.0
Often	57	19.7
Sometimes	13	4.5
Never	2	0.7
Paying attention the position of spine while lifting something		
Always	89	30.7
Usually	108	37.2
Often	58	20.0
Sometimes	23	7.9
Never	12	4.1
Getting closer to the object while lifting up the object which is on the floor		
Always	127	43.8
Usually	11	38.3
Often	41	14.1
Sometimes	10	3.4
Never	1	0.3
Bending the knees while lifting an object from the floor		
Always	129	44.5
Usually	82	28.3
Often	54	18.6
Sometimes	20	6.9
Never	5	1.7
Paying attention not to carry an object above the shoulder line		
Always	120	41.4
Usually	104	35.9
Often	41	14.1
Sometimes	17	5.9
Never	8	2.8
Balancing the body weight equally on each foot while walking		
Always	140	48.1
Usually	111	38.3
Often	28	9.7
Sometimes	6	2.1
Never	5	1.7
Paying attention the position of head, shoulder and back while walking		
Always	59	20.3
Usually	97	33.4
Often	75	25.9
Sometimes	39	13.4
Never	20	6.9
Paying attention suitable sitting position		
Always	56	19.3
Usually	97	33.4
Often	93	32.1
Sometimes	36	12.4
Never	8	2.8
Putting both feet to the ground while sitting		
Always	105	36.2
Usually	108	37.2
Often	60	20.7
Sometimes	16	5.5
Never	1	0.3
Balancing the body weight equally on each foot while standing		
Always	104	35.9
Usually	121	41.7
Often	48	16.6
Sometimes	13	4.5
Never	4	1.4
Total	290	100.0

Table 3. Relationship between the body mechanic behaviors of the workers and ODI classification

Body mechanic behaviors	Severity of ODI								χ^2	P-value
	0–20% “minimal disability”		21–40% “moderate disability”		41–60% “severely disability”		61–80% “crippled”			
	N	(%)	N	(%)	N	(%)	N	(%)		
Loading the weight on two sides equally										
Always	50	47.6	45	42.9	6	5.7	4	3.8	20.086	0.650
Usually	43	38.1	50	44.2	17	15.0	3	2.7		
Often	15	26.3	30	52.6	11	19.3	1	1.8		
Sometimes	4	30.8	4	30.8	3	23.0	2	15.4		
Never	1	50.0	1	50.0	-	-	-	-		
Assessing position of weight, not trying to lift too heavy a weight alone										
Always	46	51.7	35	39.3	6	6.7	2	2.2	34.948	0.000*
Usually	37	34.3	53	49.1	16	14.8	2	1.9		
Often	21	36.2	27	46.6	9	15.5	1	1.7		
Sometimes	6	26.1	9	39.1	6	26.1	2	8.7		
Never	3	25.0	6	50.0	-	-	3	25.0		
Coming close to the object to be moved (moves center of gravity closer to object)										
Always	61	48.0	54	42.5	10	7.9	2	1.6	22.436	0.033**
Usually	34	30.6	54	48.6	17	15.3	6	5.4		
Often	17	41.5	14	34.1	8	19.5	2	4.9		
Sometimes	-	-	8	80.0	2	20.0	-	-		
Never	1	100.0	-	-	-	-	-	-		
Flexing the knees at a perpendicular angle dependent on the position of the hip										
Always	57	44.2	55	42.6	13	10.1	4	3.1	9.071	0.697
Usually	29	35.4	39	47.6	10	12.2	4	4.9		
Often	21	38.9	22	40.7	10	18.5	1	1.9		
Sometimes	4	20.0	11	55.0	4	20.0	1	5.0		
Never	2	40.0	3	60.0	-	-	-	-		
Holding the object close to head and under the shoulders										
Always	55	45.8	53	44.2	11	9.2	1	0.8	16.146	0.185
Usually	34	32.7	50	48.1	16	15.4	4	3.8		
Often	15	36.6	16	39.0	8	19.5	2	4.9		
Sometimes	5	29.4	8	47.1	2	11.8	2	11.8		
Never	4	50.0	3	37.5	-	-	1	12.5		
Placing feet apart and one foot slightly in front										
Always	57	40.7	65	46.4	12	8.6	6	4.3	7.363	0.833
Usually	42	37.8	49	44.1	17	15.3	3	2.7		
Often	11	39.3	11	39.3	5	17.9	1	3.6		
Sometimes	1	16.7	3	50.0	2	33.3	-	-		
Never	2	40.0	2	40.0	1	20.0	-	-		
Pulling in abdomen, hip and chin (at 90 angle to body)										
Always	34	57.6	20	33.9	4	6.8	1	1.7	25.346	0.013**
Usually	37	38.1	44	45.4	11	11.3	5	5.2		
Often	31	41.3	34	45.3	9	12.0	1	1.3		
Sometimes	7	17.9	22	56.4	9	23.1	1	2.6		
Never	4	20.0	10	50.0	4	20.0	2	10.0		
Supporting spine and thighs with chair										
Always	30	53.6	21	37.5	3	5.4	2	3.6	24.364	0.018**
Usually	45	46.4	38	39.2	12	12.4	2	2.1		
Often	30	32.3	46	49.5	12	12.9	5	5.4		
Sometimes	7	19.4	21	58.3	8	22.2	-	-		
Never	1	12.5	4	50.0	2	25.0	1	12.5		
Contacting soles of the feet on floor exactly										
Always	50	48.1	43	41.3	8	7.7	3	2.9	14.878	0.248
Usually	42	38.9	46	42.6	16	14.8	4	3.7		
Often	18	30.0	29	48.3	10	16.7	3	5.0		
Sometimes	2	12.5	11	68.8	3	18.8	-	-		
Never	-	-	1	100.0	-	-	-	-		
Loading body weight on legs equally										
Always	54	51.9	39	37.5	8	7.7	3	2.9	20.430	0.059
Usually	42	34.7	58	47.9	18	14.9	3	2.5		
Often	15	31.3	24	50.0	6	12.5	3	6.3		
Sometimes	2	15.4	6	46.2	4	30.8	1	7.7		
Never	-	-	3	75.0	1	25.0	-	-		

ODI: Oswestry Disability Index. *P < 0.01, **P < 0.05

There were statistically significant results between ODI classification and paying attention the position of the spine while lifting something ($\chi^2 = 34.948$; $P < 0.01$), paying attention the position of head, shoulder and back, while walking (χ^2 : 25.346; $P < 0.05$), paying attention suitable sitting position (χ^2 : 24.364; $P < 0.05$) (Table 3).

Discussion

The sample of the study is formed by 11% of the workers in the factory and this group is a group of workers who had LBP complaints in the recent year and went to a health institution for this problem. Indeed, when the literature is examined; complaints about the muscle-skeleton system are being made by 50% of the workers around the world as well (23).

Workers in our study are mostly between the ages of 36 and 45 and their age mean is 35.29 ± 0.66 . In the study by Aslan et al. (2004) in two factories in Ankara; they determined that the majority of the workers were in the 40–49 age group (24). In the study made by Guo et al. (2004), high LBP prevalence was reported in both groups between the ages of 45–64 (25). With the studies that are showing low back complaints are increasing with age (26), there are also studies, which are showing there is no connection between age and the prevalence of LBP (16).

In our study, most of the workers are male. In a nation-wide one-year prevalence study made in Taiwan toward the muscle skeleton system complaints showed that there were LBP complaints in 18% of the male workers and 20% of the female workers (25). Likewise, in many other studies, the prevalence of LBP was found higher in male compared to female (4, 27-29). In our study, most of the sample is formed by male due to the occupational branch. In literature, it is reported that low educational status increases the prevalence of low back disabilities (7, 30). In our study, 36.9% of the workers are high school graduates. Due to working with a group having a high educational status, it is thought that the prevalence of the LBP complaints will be much lower.

The smoking habits of workers are; 40.0% smokers, 38.3% never smoked, and 21.7% gave up smoking. In the literature, it is reported that smoking status has an increasing effect on the

LBP complaints. In the study made by Nagasu et al. (2007), which they carried out with the employees of a catering firm, they determined that there is a strong relationship between smoking status and LBP complaints (31). This study makes us think that lesser the people smoke lesser the LBP complaints they have.

In a study of Isci and Esin (2009), which they carried out with the factory workers, when the admission of the workers to the sick bay were examined; it was determined that 49.5% of the complaints were related to the muscle skeleton system. 11.9% of these complaints are related to LBP, and 14.4% of them are related to herniated low back disk (32). LBP is one of the most important causes of functional disorders and disabilities; and it is the main reason behind the movement limitations in adults (33). In a study made of Buker et al. (2006), which has a theme of the analysis of the muscle-skeleton system problems in physicians, they reported that most of the physicians have complaints in their low back area and this area is followed, respectively, by neck, hand and hand wrist, foot and the shoulder area (34).

In the study made by Karamehmetoglu et al. (1993), while the patient group with the LBP for more than one year is 56.5% (35). On the other hand, in a study of Gur et al. (2000) the patient group with the LBP for more than 1 year was found as 82% (36). Likewise, in our study, more than half of the workers are stating that they have LBP in for 1–10 years, and 84.8% of them are stating that they had no LBP before their work life. Furthermore, if the other studies are examined, in a study of Karahan and Bayraktar (2004), which examined the body mechanic behaviors and LBP complaints in nurses, it was found that most of the nurses started to have LBP after they have started working (16). Indeed, in a study of Buker et al. (2006) it was determined that physicians started complaining about LBP after working for 7 years on average (34).

More than half of the workers reported that they have to work in the same position for more than 1 hour during their work period. It could be explained that sitting and standing in the same position related to the LBP complaints. Ratgoltz (1992), reported that sitting in the same position for a long period increases the prevalence of mechanic LBP (37). In the studies made by

Cavlak et al. (2002), it was found that dentists who have to work in the same position for a long time have vertebral disk disorders at most (38). Likewise, Buker et al. (2006) found that physicians are developing muscle skeleton system problems due to working in the same position for a longer period of time (34). In another study, statistically positive relationship was found between factors like frequently bending over, standing up for a longer period of time and the ODI scores Aslan et al. (2004) (24). The findings of our study are similar to the findings of other studies in the literature.

Isci and Esin (2009) determined that the LBP complaints of the workers are due to sitting for long periods and making small montages with their hands and these workers are often admitted to the infirmary because of low back, neck pain, and headache (32). Occupational risk factors have a very important role in the development of LBP and disability. Occupation groups, including work, which requires too much physical activity and lifting heavy things, bending over and exposing the body to vibration have a higher LBP incidence. Occupations which include lifting, pushing, pulling, bending over by turning and sudden pelvic moves are reported to be the ones with the highest LBP in incidence (39). Heavy industry workers, bus and truck drivers, and nurses are among the occupation groups with the high LBP incidence (40).

It was found that in most of the workers pain recurrence was very mild, in few workers the pain recurrence was moderate, and in others it did not varied much. In the literature, it was reported that the LBP is changing in accordance with the occupational groups. A study of Esen and Fıçlalı (2013), reported that LBP complaints of nurses ranked from moderate to severe pain (15).

Positive relations were found between body mechanic behaviors of the workers and the mean score of ODI. Cause of this could be because of the body mechanics behaviors of workers have effect on the degree of back pain. Karahan and Bayraktar (2004) reported that LBP complaints of the nurses started in situations such as lifting patients, lifting heavy things, working under heavy workload, standing for a long time period and doing heavy housework (16). Likewise, the study by

Isci and Esin (2009), found that body mechanics (constantly sitting, standing, pushing, pulling, lifting, etc.) of factory workers were effective on pain, thus health education and advisory services toward LBP were presented in that factory (32).

Conclusion

Workers LBP complaints are changeable. Complaints were found “minimally disability” to “crippled” on ODI classification. It is clear that body mechanic behaviors of the workers have an influence on ODI. Workers were found to be less careful about body mechanic behaviors while they working. These behaviors are; paying attention the position of the spine while lifting something, getting closer to object while lifting up, paying attention suitable sitting position while working.

In the light of our findings, organizing a planned educational program aiming to make the workers adopt the appropriate body mechanic behaviors is thought to be an effective method to decrease the LBP complaints. Moreover, it is also thought that making these educational programs as a routine activity by the workplace nurse later will decrease the LBP complaints to the minimum level.

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