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Psychosocial Risk Factors in the Development of LBP

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1. Introduction

Low back pain (LBP) is the most prevalent and expensive musculoskeletal problem worldwide. As many as eight in every ten adults experience LBP at some point in their lifetime (Dionne et al., 2001). An episode of LBP usually lasts a few days in most people, unfortunately in some individuals, the pain deteriorates and persists for an extended period of time; to a point where it considerably limits daily activities including work and leisure (Truchon & Fillion, 2000). Substantial economic burden is incurred due to sickness absence, with loss of productivity and healthcare costs relating to treatment for these chronic or recurrent LBP patients. It was estimated that the total healthcare expenses incurred by LBP patients costs \$91 billion in the US (Luo et al., 2004).

LBP is a complex multifactorial phenomenon. The complexity of LBP may be viewed as the multiple biomechanical, psychosocial and individual factors which are closely-interacting with each other (National Institute of Occupational Safety and Health, 1997). Although the etiologic mechanisms for LBP are still poorly understood, many reviews and studies have concluded that the ergonomic work factors are most common LBP risk factors. They include lifting, forceful movement, whole body vibration, and awkward postures (Cohen et al., 2010, Vandergrift et al., 2012; Punnett et al., 2005). Increasing evidence exists that suggests psychosocial phenomena are also linked to low back problems, although to date the evidence for these is less conclusive. Understanding the importance of the psychosocial pathway in the development of LBP lies not only in the advancement of knowledge in the phenomenon, but also in designing preventive interventions. Five plausible explanations have been suggested to account for associations between work-related psychosocial factors and musculoskeletal symptoms (National Institute of Occupational Safety and Health, 1997).

2. Psychosocial factor

A psychosocial factor “may be defined as a measurement that potentially relates psychological phenomena to the social environment and to the pathophysiological changes” (Hemingway & Marmot, 1999). The concept of psychosocial factors includes a vast array of conditions that fall within three separate domains (National Institute of Occupational Safety and Health, 1997): (1) factors associated with the job and work environment, (2) factors associated with outside of work environment (3) characteristics of the individual.

Included in the domain of job and work environment include various aspects of job content, for example, perceived workload, monotonous work, low job control, low job satisfaction, limited social support (Truchon, 2001). Outside of work environment parameters typically include factors associated with demands and responsibilities in family situation and leisure time, and social/familial relationship and support. Finally, individual factors are generally of two types corresponding to: (1) sociodemographic factors, for example, age, social class, culture, educational status; life style (smoking) and (2) psychological factors, for example, affective variables (anxiety and depression), personality traits, cognitive variables (fear avoidance and life satisfaction) and coping strategies (catastrophizing) (Pincus et al., 2002a; Truchon, 2001).

It is important to note, however, that the linkages between psychosocial factors and LBP are complex and influenced by a multitude of conditions. Psychosocial factors may exert effect alone or combine in clusters, and may act at different stages of LBP. In particular, both personal and situational characteristics may lead to differences in the way individuals exposed to the same situation may perceive and/or react to the situation (Burton & Erg, 1997; National Institute of Occupational Safety and Health, 1997).

2.1 Psychosocial work characteristics

Psychosocial factors related to job and work environment are characterized by high perceived workload, monotonous work, low job control, low job satisfaction, and limited social support. A number of reviews have shown varying levels of associations between measures of work-related psychosocial factors and self-reported back pain (Bongers et al., 1993; Davis & Heaney, 2000; Hartvigsen et al., 2004; Hoogendoorn et al., 2000; National Institute of Occupational Safety and Health, 1997; Ramond et al., 2011).

Bongers et al. (1993) reviewed 46 articles published between 1973 and 1992, in which some evidence for an association between low back disorders and monotonous work was found. Evidence shows that there is a contradictory relationship between low back disorders and work demands while the evidence for a relationship between poor social support and low back disorders is mixed. In a similar vein, among the 13 studies published between 1973 and 1994 reviewed by NIOSH (National Institute of Occupational Safety and Health, 1997) found mixed evidence for an association between monotonous work and back disorders and contradicting evidence for an association between back disorders and job dissatisfaction. Weak evidence is found in the association between social support and back disorders while the relationship between low job control and back disorders has limited evidence. However, significant association was found between back disorders and perceptions of intensified workload (National Institute of Occupational Safety and Health, 1997). It is important to note that potential covariates were controlled in most studies that have been reviewed by NIOSH. Davis & Heaney (2000) reviewed 66 articles that were published before 1999. They concluded that there seems to be a consistent relationship between low job satisfaction and job stress with the development of LBP in those better quality studies. Likewise, Hoogendoorn et al. (2000), after reviewing 11 cohort and two case-control studies, concluded that there was strong evidence for low job satisfaction and low social support in the workplace as risk factor for back pain.

On the contrary, Hartvigsen et al. (2004), after critically assessing 40 epidemiological literature published between 1990 and 2002, found moderate to strong evidence for no association between LBP and consequences of LBP and perception of work, organizational aspects of work, social support and stress at work. The major strengths in this review are the inclusion of prospective cohort studies and that both the level and the strength of evidence are reported. Similarly, a recent study by Clays et al. (2007), in a longitudinal study of 2556 middle-aged workers, found a non-significant association between LBP and low decision latitude, high job insecurity, feeling stressed at work after adjusted individual and physical risks. The major flaw in this study is a large drop out rate, which may probably lead to selection bias.

Despite the findings were inconsistent, some authors (Bongers et al., 1993; National Institute of Occupational Safety and Health, 1997) suggest that intensified workload, monotonous work, low job satisfaction, low social support, low job control, and job stress may be associated with LBP or low back disorders. However, the possible effect of gender has not been evaluated in most of these epidemiological studies. There are only few reviews and studies that have analyzed female group and male group separately or have investigated the psychosocial risk factors among women only.

In a cross-sectional study by Josephson et al. (1998) of 269 female nursing personnel, found insufficient social support had the highest risk for care seeking behavior for low back pain, as assessed by physical examination and blinded interviews after confounder adjustments for age and smoking. Barnekow-Bergkvist (1998) defined, in a 18-year study of 425 Swedish students, an outcome as self-report of low back symptoms. The students had psychosocial assessment which included psychosocial stress at work, sociodemographic factors and stress, and individual attributes. Among the women, low back problems were related to monotonous work. The strength of this study is that it analyzed the influence of physical workload, psychosocial stress, and sociodemographic and individual factors together. However, those who worked less than 16 hours/week were excluded (women > men), the results of the analyses of associations between work-related risk factors and low back problem of women may be underestimated.

In contrast, Vingard et al. (2000), in a study of 1193 working women and 925 working men, found monotonous work and low job satisfaction had very limited influence in women when compared to men, after adjustment for lifestyle, and physical loads in leisure time and sport activities. They explained that possibly women are more satisfied with their work situation or have lower expectations than men. In a similar vein, Hoffman et al. (2004) reviewed 14 studies regarding gender differences in the effect of risk factors on back complaints and found that psychosocial work factors are shown to be important, but to a lesser extent in women when compared to men.

In a recent systematic review, Ramond et al. (2011) examined 23 prospective studies to review the evidence for psychosocial risk factors and LBP outcome in primary care, in which 16 psychosocial factors were included in the analysis. The review found that social support was not associated with LBP whilst job satisfaction was mostly not associated with LBP, and LBP requiring compensation was shown to be a predictive factor for negative LBP outcome. A longitudinal study by Vandergrift et al. (2012) investigated the relationship between physical and psychosocial risk factors for LBP among 1181 workers of automobile

manufacturing company. An association was found between the psychosocial risk factors of low job control and high job demand and the development of LBP only in workers with high physical exposures.

2.2 Psychosocial role (outside of work)

The main focus in the relationship between psychosocial factors and LBP has chiefly been work related in most studies. However, there is increasing awareness that psychosocial factors which are unrelated to work, may also play an important role in the development of LBP. These psychosocial factors are characterized by family or social or emotional support, leisure time activity or social contact and participation, spousal relationship and housework satisfaction. Only a few prospective studies have addressed individual and outside of work environmental psychosocial factors.

Yip et al. (2004), studying 417 middle-aged women in a case control study, found an association between psychosocial stress related to housework and LBP after adjusted for working status and source of recruitment. However, no association was found between self reported poor relationship with cohabitants, housework satisfaction, living alone and the risk of LBP. Likewise, a cross sectional longitudinal study by Barnekow-Bergkvist (1998) described earlier found no association between physical activity at leisure time and low back symptoms.

Similarly, Hoogendoorn et al.'s review (2000), as described above, also included assessment of psychosocial factors in private life such as family support, presence of a close friend or neighbour, social contact, social participation, emotional support and concluded that insufficient evidence was found for an effect of psychosocial factors in private life because the data were very limited.

However, Brulin et al. (1998) conducted a cross sectional study of 361 women in a Swedish home care service and found having children at home decreased the risk of low back complaints (OR 0.5), even after age adjusted. It was argued that having children in the family can protect against social isolation, and that social isolation was found to increase the risk of low back pain (Frymoyer & Cats-Baril, 1987). The strength of this study lies in its combined focus on sociodemographic, physical and psychosocial factors at work and physical activity during leisure time. This study is based on a single occupation therefore the sample may not be representative of the general population. Likewise, Thorbjornsson et al. (1998), in a longitudinal study over 24 years, found that social relationship satisfaction has a long-term effect on LBP among 252 women and 232men.

2.3 Individual characteristics

Since the complexity of LBP may be represented by the interactive effect of psychosocial, biomechanical and individual factors (Chany et al., 2006), a better understanding in individual factors may elucidate the complex reactions. These individual factors are characterized by history of previous low back pain or disorder, age, gender, socioeconomic characteristics, smoking habit, psychological or emotional distress, personality trait, cognitive appraisals and coping strategies.

2.3.1 History of previous low back pain/disorder

A previous pain/injury history to the lower back is consistently a strong risk factor for future reports of LBP in the work environment (Dempsey et al., 1997; National Institute of Occupational Safety and Health, 1997). In women during/after pregnancy, there is strong evidence for the risk of developing LBP in those who had previous LBP and previous lumbopelvic pain during or after pregnancy (Wu et al., 2004).

2.3.2 Age

Age has been suggested to play a role in the development of LBP in a review by Dempsey et al. (1997). The review found that the occurrence of LBP increases with increasing age up to about 50 to 60 years of age in several community-based studies, after which there seems to be a decline. Several biological plausibility of the role of age in LBP exist, in that accumulated work-related spinal damage including microtrauma, natural degeneration of the spine, and decreased spinal load bearing capacity. With regards to LBP during pregnancy, Wu et al.'s review (2004) found the evidence for maternal age was conflicting. In the review, nine studies suggested a higher risk in younger women, two studies suggested a higher risk for older women, and 12 had no effect.

2.3.3 Gender

The risk of LBP is higher among women as consistently shown in community-based surveys, with odds ratios varying between 1.30 to 1.57 (Houtman et al., 1994; Skovron et al., 1994). The risk of back pain increases by twofold for women with back pain history and increases for women who have been pregnant before (Ostgaard & Andersson, 1991). Women are expected to suffer from more lower back pain because of their wider pelvis, the stress of hormonal changes, and childbirth (Meisler, 2003). Retrospective studies showed that 10-25% of women with chronic LBP report the first symptom of back pain during pregnancy (Biering-Sorensen, 1983; Svensson et al., 1990). During pregnancy, 50%-80% of women experience some degree of pregnancy-related low back pain (PLBP) and pelvic girdle pain (PPGP). Women who have previously had pelvic pain during pregnancy experience a relapse during 85% of a subsequent pregnancy (Mens et al., 1996). The pain symptoms often impact on daily activities, sleep and sometimes lead to work absenteeism and even chronic disability. A study shows lower quality of life during pregnancy among women with back problems (Olsson & Nilsson-Wikmar, 2004). Among these women who are affected by LBP, pain sometimes becomes chronic or recurrent (Larsen et al., 1999; Ostgaard et al., 1997).

2.3.4 Socioeconomic characteristics

It was found that low back symptoms were consistently more common among the women in the highest socioeconomic class (professionals, managers, and salaried employees) (Barnekow-Bergkvist et al., 1998). Likewise, Papageorgiou et al. (1997) found significant associations between LBP and higher social class and perceived inadequacy of income in a prospective population-based cohort study of 1412 working adults, the association was more marked in women. It was argued that higher stress levels among women in high and middle socioeconomic classes because of the combination of work-related stress and stress related to responsibilities for the family (Lundberg, 1999).

2.3.5 Smoking

Smoking is suggested to be a risk factor for low back disorders. NIOSH's review (National Institute of Occupational Safety and Health, 1997) found that the evidence is conflicting as smoking history has a positive relationship with low back pain, sciatica or intervertebral herniated disc in some studies whereas in others the relationship was negative. Josephson et al. (1998) described earlier found no association between smoking and LBP among female nursing personnel. Whereas McaGregor et al. (2004), investigation of 1064 women in a case control study, found smoking was associated with LBP.

Several explanations for the association have been proposed (Dempsey et al., 1997; National Institute of Occupational Safety and Health, 1997). It is speculated that back pain is caused by coughing associated with smoking which increases intradiscal pressure, leading to disc bulging and herniation. Another explanation postulated is nicotine's effect in diminishing blood flow to vertebral body and thus impacting discal metabolism and reducing mineral content of bone causing microfractures. However, it has been pointed out that a number of confounding risk factors have been linked with smoking, including lower economic class, education level, occupational exposure to heavy work, and psychosocial and life style factors (Dempsey et al., 1997).

2.3.6 Psychological/emotional distress

Given that psychological or emotional distress such as anxiety and depression may arise from work environment, they may also result from non-work environment. Strong evidence suggests that high comorbidity between psychological distress and pain, in particular among chronic pain patients (Gatchel & Gardea, 1999). The comorbid presentation of pain and depression is observed in as many as 50% of patients who suffer from chronic pain conditions (Gallagher, 2003). Similarly, in a recent review by Ramond et al, (2011), as described earlier, the association between negative LBP outcome and depression and psychological distress were found.

A sex-specific effect of anxiety on pain report is apparent. There is a significant association between anxiety and pain report in men but not in women. However, among women, depression, catastrophizing, anxiety sensitivity, stress, low energy and pain reports were significantly associated (Korovessis, 2010; Robinson et al., 2005).

Variability in psychological distress has been linked to LBP in women. Quint et al. (1998) in a case control study found that women had higher levels of psychological distress than men in a group of hospitalized patients with LBP. Clays et al. (2007), in the study of Belstress workers described above, found feeling depressed increased the relative risk for LBP in 30% women. However, Robinson et al. (2005), in a cross sectional study of 53 chronic LBP patients, found significant relationships between anxiety and the induced pain for men but not for women.

Some authors have reported other psychological variables to be related to LBP such as stressful life events and deficit in emotional awareness. Yip et al. (2004), as described above, found an association between stressful life event in the past 12 months and LBP with adjustments. However, Skillgate et al. (2007) failed to support this relationship and found no association between LBP and two or more life events or critical life changes experienced

during the preceding 5 years. When women and men were analyzed separately, no systemic differences were observed regarding the estimated ORs of LBP.

Mehling et al. (2005), in a cross sectional study of 1180 transit operators, found alexithymia (deficit in emotional awareness) was associated with higher odds of LBP after controlled for demographic, behavioral and physical and psychosocial factors (OR=2.0, 95% CI 1.31-3.0). The association was stronger in women (OR=4.35) than in men (OR=1.83) with the factor 'difficult to identifying feelings' showing the strongest association. However, the authors pointed out that the study is limited by not controlling for depression or somatization, both factors are associated with alexithymia and LBP.

2.3.7 Personality trait

While the presence of psychosocial factors may be characteristic of the job and work environment, the biomechanical response of the individual to these psychosocial stressors may be dependent on the individual's perceptions about stress (Chany et al., 2006). Personality is one of the factors that may provide more clues to individual responses.

A study found that personality traits have association with muscle recruitment patterns, which may lead to variations in spinal loading as the individual is under psychosocial stress (Marras et al., 2000). The hypothesis posits that job-matched personality traits allow the individual to generate the appropriate biomechanical response with reduction of spinal loading (Chany et al., 2006). Contrarily, job-mismatched personality traits may provoke psychosocial stress which increases the trunk muscle activities, in turn, causes an increase in the spinal loading.

Chany et al. (2006), in a laboratory-based study of 12 experienced and 12 novice materials handlers (3 females and 21 males), ages ranged from 19 to 33 years, investigated the long term effect of repetitive lifting on the spinal loading of workers with different personality types. They found that intuitors personality had higher shear spinal loading compared with sensor type, and that perceiver personality had higher compressive and shear forces compared with judgers personality trait.

They suggested explanations for the trends, in that a personality of intuitors prefers to learn new skills, repetitive lifting task seems less matched to the intuitors' preferences, which was the primary influence on how the intuitors coactivated their muscles to high levels resulting in high spinal loads. Perceivers enjoy variations in circumstances, whereas judgers prefer scheduled work plans, the task appears to be a better match for the judgers (Chany et al., 2006). They concluded that inherent personality characteristics may play a role in one's motor control strategies when performing a repetitive lifting task and that the perceived stress (of repetitive lifting) manifests itself by increases in muscle coactivity which results in higher spinal loading. The study was designed to assess the spinal loading during lifting, with the assumption that increased spinal loading is associated with LBP, therefore, these results cannot be used to determine in other work situations.

2.3.8 Cognitive appraisals and coping strategies

Cognitive variables are among the best predictors of LBP-related chronic disability (Truchon & Fillion, 2000), but not extensively documented at the early stage of LBP (Truchon, 2001).

Truchon's review found that there may be a link that exists between a negative cognitive appraisal, negative affective state (depression, anxiety or anger) that it generates, and passive coping strategies (avoid the threat). Negative cognitive appraisals include pain catastrophizing, blaming oneself or others, anticipation of negative consequences associated with the disease, inaccurate interpretations of the significance of the physical symptoms and the effectiveness of the medical treatments.

Studies have focused on how pain catastrophizing has influenced LBP (Grant et al., 2002; Robinson et al., 2005). Pain catastrophizing is defined as an 'overappraisal' of the negative aspects/consequences of an experience (Raak et al., 2002) wherein an individual has a tendency to focus on and exaggerate the threat value of painful stimuli and negatively evaluate one's ability to deal with pain. Grant et al. (2002) studied the associations among pain appraisals, coping strategies, personal characteristics, perceived spousal responses and daily changes in mood and pain in 88 chronic LBP women. They found that catastrophizing appraisals and praying and hoping coping strategies were associated with an increase in negative mood or pain. For chronic back pain patients, catastrophizing was associated with increased pain intensity, anxiety and depression levels, after controlling for pain (Grant et al., 2002).

Likewise, Robinson et al. (2005), in a cross sectional study of 53 chronic LBP patients, found significant relationships between pain catastrophizing measures and the induced pain for men but not for women. In a similar vein, there seems to be a link between pain catastrophizing and pain reporting. Crombez et al. (2002) found pain catastrophizing (as measured by the Pain Catastrophizing Scale) was related to overpredictions of pain in 37 patients with LBP during performance tests of toe touch in standing position and straight leg raise in supine position.

Other coping strategy that exists may also have an effect on LBP. Busch (2005) interviewed 22 chronic LBP patients (15 women and 7 men) of working age in a rehabilitation clinic in Sweden and found that the majority of participants used disregarding strategy in response to chronic LBP. This disregarding strategy process developed from a psychological defense to a conscious coping strategy with changing pain-related behaviors. The change in pain-related behaviours of an increased sense of responsibility for pain and pain management helped rehabilitation of chronic LBP.

3. Conclusion

In an attempt to uncover a representative sample of publications that have investigated the psychosocial risk factors for developing LBP, there are some conclusions that may be drawn, although this is not a fully exhaustive review of publications. Most of the research has focused on LBP and psychosocial risk factors associated with work environment and much less in the area of factors associated with outside of work environment and individual characteristics. Women seem to have different psychosocial risk factors from men for the development of LBP.

The current state of knowledge suggests that psychosocial factors at work play an important role in the development of LBP, although the underlying mechanisms are not fully understood (Bongers et al., 1993; Hoogendoorn et al., 2000; National Institute of Occupational Safety and Health, 1997; Pincus et al., 2002b). It is unclear as to which

psychosocial factors are definitively related to LBP because of the inconsistency of the results. It seems that individual's reactions to psychosocial work characteristics, for example job dissatisfaction and job stress, are more consistently related to LBP than are the psychosocial work characteristics themselves, for example work demand, low job control, low social support (Davis & Heaney, 2000). However, low job control and high work demand are associated with LBP in people with increased physical exposures (Vandergrift et al., 2012).

The inconsistent results in the studies may be attributed by some methodological problems in the majority of studies. Earlier studies involved working population of specific occupation and were not population based therefore limits the generalizability of the results. In an extensive review by Davis et al. (2000), two major methodological limitations were revealed in the critique of 66 articles pertaining to psychosocial work factors and LBP. First, very few studies had adequately controlled the potential confounding effect of biomechanical factors. Second, there is a paucity of high quality measures of both psychosocial work characteristics and biomechanical demands. Another major limitation includes insufficient prospective study designs rendering weak causal inferences. Thus, it is argued that psychological distress may simply be a consequence of chronic LBP without etiologic role in the development of low back disorder, or it may play a role in the etiology of LBP. Furthermore, there is random error in the operationalization of LBP and psychosocial variables due to the use of non-standardized questionnaires.

It is therefore important to consider the multitude of psychosocial factors and physiologic factors that are intertwined and ultimately produce the back pain experience. Understanding the complex and the interactive processes involved in LBP will not only help to predict those who develop LBP and chronic disability, as well as to develop more effective treatments for LBP patients, but also to design better epidemiological and intervention studies by the inclusion of potential psychosocial covariates.

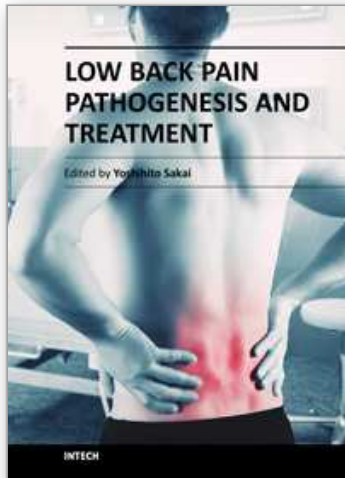
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Low Back Pain Pathogenesis and Treatment

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Low back pain is a common disorder which affects the lumbar spine, and is associated with substantial morbidity for about 80% of the general population at some stages during their lives. Although low back pain usually is a self-limiting disorder that improves spontaneously over time, the etiology of low back pain is generally unknown and the diagnostic label, "non-specific low back pain", is frequently given. This book contains reviews and original articles with emphasis on pathogenesis and treatment of low back pain except for the rehabilitative aspect. Consisting of three sections, the first section of the book has a focus on pathogenesis of low back pain, while the second and third sections are on the treatment including conservative and surgical procedure, respectively.

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