



Work Ability in Fibromyalgia: An Update in the 21st Century



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Abstract: Background: Fibromyalgia (FM) is characterized by persistent widespread pain, increased pain sensitivity and tenderness. People with FM also report activity limitations and impaired work ability.

Objective: This article aims to compile the findings of recently published research on work ability in people with fibromyalgia, and to present how work ability is influenced by various aspects.

Methods: A systematic search of the literature published from the year 2000 and onwards was conducted. Thirtyfour articles were included in the review.

Result: Symptom severity was found to influence work ability in people with FM. Physically demanding jobs and work tasks were especially troublesome and were reported to constitute higher risks of work disability. Working people with FM seemed to hold a careful balancing act to manage the risk of overload where well-functioning strategies such as making a career change, working part-time, and developing personal skills were necessary for managing work, in the short- and long term. The support of management and colleagues enabled people with FM to manage the risk of overload at work. Treatment studies evaluating work disability as outcome in FM are scarce. None of the included studies presented any effects on measures of sick-leave or work disability compared with a control group.

Conclusion: More studies of treatment effects on outcomes related to work ability in people with FM, and more longitudinal studies to explore long-term effects of symptoms on work ability and sick leave, are needed in order to be able to plan evidence based rehabilitation to improve or maintain work ability in people with FM.

Keywords: Work, pain, disability, fibromyalgia, longitudinal studies, rehabilitation.

1. INTRODUCTION

Disability is a complex concept which reflects the biopsychosocial interaction between a person and the context in which he or she lives [1]. One of the most common reasons for disability and sick leave in Sweden are musculoskeletal disorders, including fibromyalgia (FM) [2, 3] which hence entail large costs for the individual as well as for society [4-6]. People with fibromyalgia (FM) are challenged by symptoms such as chronic pain, fatigue, sleep disturbance and emotional distress [7-9], impaired physical capacity [10-13] and report consequences on their activities of daily life and difficulties in fulfilling their life roles [14-16] including impaired ability to work [17-19].

FM has been defined by the American College of Rheumatology (ACR) 1990 criteria for FM which include a history of widespread pain for at least three months and pain on manual palpation in 11 of 18 tender points [7]. Suggestions for revision of the diagnostic criteria for FM have been

presented in 2010 [20], 2011 [21], 2014 [22], and 2016 [23]. FM, as classified by the ACR 1990 criteria, affects approximately 1-3 % of the general population, is more prevalent in older ages [24, 25], and is six times more common in women than in men [8]. The prevalence of FM is quite similar in most parts of the world [8, 26-29]. The prognosis of FM is not well studied, however, long-term follow-up of patients with FM indicates that fluctuations in symptoms are common over time but that complete remission is rare [30, 31].

The pathogenesis of FM is not entirely understood but FM is described as the upper end of a continuum of chronic pain and tenderness [32] and regional pain conditions are risk factors for developing FM [33]. Environmental exposure to factors such as certain types of infections, trauma, stress [33], or a heavy physical workload [34] may play a role in the development and maintenance of pain in FM and a familial component has also been suggested [35]. Approximately 10-30% of patients with rheumatic disorders also meet criteria for FM and it has been suggested that rheumatic disease may contribute in triggering the development of FM [36].

The muscle function in FM has been shown to be altered displaying structural changes in muscle fibres [37], altered neuromuscular control mechanisms [38], impaired blood

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circulation [39], and disturbances in regulation of growth and energy metabolism [40]. Women with FM have been shown to be less physically active than healthy women, especially concerning physical activity of moderate to high intensity [41]. The relationship between pain and muscle weakness in FM is not entirely understood but may to some degree be explained by exercise-induced pain [39]. Pain is an obstacle for patients to engage in exercise of higher intensity [42] and could also raise fear avoidance beliefs about physical activity which may lead to a vicious circle of inactivity and disability [43].

The concept of work ability has no absolute definition and many ways of interpretation [44]. It is considered to be relational and is described as a balance between personal resources and work demands [45, 46]. Work ability is multi-dimensional and includes physical, mental, and social dimensions. It is also influenced by environmental factors and changes over time [46-48]. There are many ways of assessing work ability, for example by various self-reported questionnaires, by clinical assessment, by interview, or by work status, where measures vary depending on the purpose of the investigation. In Sweden, the legal concept of work ability is closely related to the Swedish sickness insurance with a distinct connection to disease, based on diagnosis according to ICD-10 [49], function, and activity [50]. In epidemiological studies, work ability is commonly assessed by work status where the population is categorized into working, and non-working people, where the working people are considered as being able to work and the nonworking who receive some kind of disability benefits are generally considered as not being able to work.

The degree of employment in FM has been found to vary geographically, with a range from 34% to 77% in different studies, the wide range relating to differences in the social benefit systems and labor markets of different countries as well as in varying definitions of work [17]. A recently published epidemiological survey of people with FM in Spain found that 11% were on sick-leave, and 23% had permanent work disability pension due to FM [51]. Similarly, a community survey of Australians with FM found that 35% received financial support relating to work disability due to FM [52]. In line with this, recent studies of work disability in North America have found disability rates of 30% in Canadian patients with FM [53], and 35% in patients with FM in the USA [54].

This article aims to compile the findings of recently published research on work ability in persons with fibromyalgia, and to present how disease related symptoms influence work ability, how work itself influences work ability, and how personal- and environmental factors influence work ability.

2. METHODS

A literature review was conducted in October 2016, in PubMed, Scopus, CINAHL, PEDro, and Cochrane. The search terms used were: [fibromyalgia AND "work ability"] and [fibromyalgia AND "work disability"]. Articles published from the year 2000 and onwards, were written in English, and were available in full text, were included. The relevance of articles that were generated from the search was firstly assessed by their title. The articles that were deemed

to be of relevance based on their titles were then assessed again by reading the abstracts. By searching the list of references of the articles generated from the literature search, other articles of relevance for the review were also included.

3. RESULTS

The literature search in PubMed identified 15 articles and 42 articles respectively when using the two sets of search terms stated above. When searching the other databases, no additional articles of relevance were found. After assessment and selection of relevant articles, a total of 34 articles were included in this review.

3.1. How Disease Related Symptoms Influence Work Ability in People with FM

A longitudinal pilot study of 94 young women who were newly diagnosed with FM in the USA and Sweden investigated the impact of FM symptoms on work ability and found that employment loss was a rapid process for many women within the first year after being diagnosed with FM [55]. The results showed that the percentage of women being employed had decreased from 60% at time of diagnosis to 41% at the one year follow up. Symptom severity was found to be a predictor for employment loss [55]. In line with this, a recently published retrospective community pilot survey of 287 Australians with FM found that the rate of full-time workers decreased from 54% at time of diagnosis to 16% at the time of the survey [52]. However, many respondents reported a reduction or cessation in their work ability in the time period between symptom onset and the time of diagnosis. The authors highlight the early impact of FM symptoms on work ability and stress that early recognition and management of symptoms could prevent future loss of work ability [52]. A case-control study comparing work disability in outpatients with FM with other outpatients found that work loss due to disease was significantly more common in people with FM (46.8%) than in the control group (14.1%). The authors concluded that FM is associated with work disability and emphasized the need for investigation of causes for work loss [56].

When comparing the work productivity between workers with FM and workers without a musculoskeletal pain condition, work productivity loss was found to be significantly greater in workers with FM than in pain free workers [57]. The work productivity loss was represented by the percentage of work time missed due to health in the past 7 days, *i.e.* absenteeism, which was three times higher in FM workers, and as the percentage of impairment while at work due to health in the past 7 days, *i.e.* presenteeism, which constituted 45% of the working time of workers with FM [57]. When comparing costs for productivity loss and health benefits between employees with FM and employees with osteoarthritis from the employer perspective, authors found that FM and osteoarthritis pose similar burdens of costs productivity loss and health benefits on employers [58].

When comparing the health status between working, and nonworking women with FM, symptom ratings of pain and fatigue as well as activity limitations have been found to be less severe in working than in nonworking women with FM [59, 60]. In line with this, working women with

FM have reported a better health status than nonworking women with FM in symptoms of pain and fatigue, health related quality of life, and disease specific health status [61]. In the same study, pain intensity was found to be the only independent explanatory factor for work, where less pain meant greater chance of working [61]. When comparing aspects of health and work between working, unemployed, and work disabled (i.e. receiving disability benefits) patients with FM, the work disabled group was found to report more severe symptoms than the other two groups for all measures [53]. Another study compared workers with FM with and without temporary work disability and found less severe symptom ratings, better physical function in physical tests and less activity limitations in the group of workers with no temporary work disability [62]. Investigations of the impact of FM severity on productivity loss and health economic costs in France and Germany found that FM severity was significantly associated with productivity loss [9] and that FM meant substantial costs related to loss of productivity, which increased with the severity of FM symptoms [63].

Longitudinal analysis of health status over time in working and nonworking women with FM found that baseline measures of health were significantly better in working women with FM compared with nonworking women with FM. The difference in health status between groups was maintained over time (4 years) [64]. Another longitudinal epidemiological study of patients with FM found that work disability was predicted by activity limitations and lower ratings of health related quality of life [54].

3.1.1. The Patient's Own Perspective – Qualitative Interview Studies

Qualitative interview studies have described how work ability in women with FM is influenced by symptoms such as pain, fatigue, stress, and impaired physical capacity [65-67]. In a Swedish qualitative focus group study, women with FM described their impaired physical capacity and an increased need for rest as being hindrances for managing physical work demands and subsequently for maintaining their work role [65]. In line with this, a recently published qualitative study on work related experiences of women with FM in Sweden described how women with FM perceived their bodies as obstacles to working, relating to symptoms of pain, fatigue, and lack of energy [68]. The women also described feelings of worry about an unsure future working life, fear of not being able to continue working and sorrow over losing an important part of their lives when not being able to work as before [68].

3.2. How Work Related Aspects Influence Work Ability in People with FM

The physical and psychosocial work environment is of great importance for work ability in the general population [69] and has also been found to have a great impact on work ability in people with FM. A review published in 2005 concluded that the type of work tasks, the ability to influence one's work situation, as well as the physical and psychosocial work environment all were important factors for work ability in people with FM [17]. When comparing working

women with FM and nonworking women with FM, the social support received by colleagues and employers has been found to be of greater importance for work ability than symptom severity [59].

Previous heavy manual labor has been found to predict work disability in people with FM [18]. In line with this, a recent cross-sectional study of Canadian patients with FM found that work disability was associated with previous employment in physically demanding jobs [53]. When comparing physical exertion at work between women with FM and healthy women, women with FM were found to display an elevated physical exertion at work compared with healthy women [13]. The mean ratings of perceived exertion at work reflected moderately strenuous to strenuous physical exertion at work [13], levels that have previously been reported to be a risk factor for long-term sickness absence in healthcare workers of the general population [70]. However, when investigating temporary work disability in workers with FM, another study found associations between sedentary work and temporary work disability [62].

3.2.1. The Patient's Own Perspective – Qualitative Interview Studies

Interview studies have also indicated that work ability in women with FM is influenced by physical as well as psychosocial work related aspects. Adjustments of work hours and work tasks have been described to enable women with FM to continue working [67]. Changes in the Swedish labor market and the restructuring of organizations have been described to negatively influence the ability to work in women with FM in that work demands have changed and possibilities for influencing ones work situation have decreased [66]. Working women with FM have described how physical work demands such as lengthy static work and the lifting and carrying of heavy objects could worsen their symptoms and negatively affect their ability to work. Also psychosocial work aspects such as time pressure and low ability to control ones work were described as hinders for continued work [65].

A favorable psychosocial work environment has also been found to promote sustainable work in a focus group study interviewing working women with FM in Sweden [71]. The support of management and colleagues meant opportunities for adjustments of work schedules and work tasks and possibilities for receiving help, which enabled the participants to manage the risk of overload at work [71].

A recent qualitative interview study explored the everyday disclosure risks that women with FM face at work, and their responses to those risks [72]. The women described concerns of being stigmatized, accused of malingering or laziness or impairments not being taken seriously if their illness was to be disclosed at work [72].

Characteristics of suitable work for persons with fibromyalgia have been presented based on patient interviews [73]. The authors conclude that suitable work is paced in such a way that one can perform the job well and with satisfaction while keeping energy for home and free time and having acknowledgement and help from management and colleagues [73].

3.3. How Contextual Aspects Influence Work Ability in People with FM

3.3.1. Personal and Environmental Aspects

When comparing working, and nonworking people with FM, the working group has been found to be more highly educated than the nonworking group [74]. Further, in the working group (n= 861) 66 % had modified their work environment due to FM, and 33 % had changed occupation in order to maintain their working life [74].

3.3.2. The Patient's Own Perspective – Qualitative Interview Studies

The meaning of work and values placed on work has been described to be of importance for staying at work in people with FM [66, 71, 75]. The meaning of work has been described to be pragmatic in some aspects, for example in earning a living. Other aspects have related more to self-actualization, work as part of one's identity and receiving recognition and work satisfaction as well as social inclusion and acceptance on a group level as well as in society.

Working women with FM have also described managing working life as walking a tightrope or performing a careful balancing act while constantly facing the risk of overload from work [71, 76]. In keeping this balance, the women developed and used a variety of well-functioning strategies to maintain or improve their work ability [71, 76]. Physical activity has been described both as a short-term strategy for alleviating symptoms and an important long-term strategy for maintaining or building stamina to cope with work [71, 76]. Another successful strategy has been described as making a career change or to change jobs when work demands were too high, in order to avoid overload and be able to maintain a working life. The career changes often meant leaving a physically strenuous or stressful job [71, 75]. Working part-time to make time for recovery also appeared to be a successful strategy for maintaining working life [71] as well as planning, prioritizing and taking pauses during the work day [71, 76]. Being knowledgeable and to develop personal qualities and skills required when exposed to physical and psychosocial work demands are other examples of useful strategies to maintain a sustainable working life [71, 76].

The support from health care services has been described in interviews with women with FM as promoting their ability to manage work [71, 75]. Women with FM have also expressed a need for early rehabilitation interventions in their experiences of moving back and forth between full work ability and disability where a lack of early rehabilitation interventions was typical [67]. Having needs and rights recognized by the Social Insurance Agency has also been described to be critical for some women with FM to keep working in that it meant being provided with financial aid for reduced work hours which gave the opportunity for recovery in the long term, reducing the risk of overload at work [71]. The social support from family members and motivational support from friends has also been described as facilitating in the struggle of maintaining working life for women with FM [71, 76]. The support from family members has been described as for example expressing their understanding and taking over household chores [71].

3.4. Effects of Treatment on Work Disability in FM

Studies evaluating work disability as outcome in FM are scarce. One study compared two multidisciplinary rehabilitation programmes for FM, one programme being specifically designed for FM and the other being a non-specific musculoskeletal rehabilitation programme. The results showed that no programme was superior to the other in preventing future work disability within a six-year follow up [77]. One uncontrolled study of a multidisciplinary treatment program in 94 Spanish patients with FM found that approximately half of the patients returned to work and maintained their work at follow-up after 12 months [78]. When comparing return to work after rehabilitation in people with chronic musculoskeletal disorders relating to occupational disability, a subsample of people with FM were found to return to work and retain work significantly less than other subgroups at one year follow up [79]. A recently published RCT study investigated the effects of a person-centered program of resistance exercise in women with FM and found that, besides improvements in muscle strength, pain intensity, and disease specific health status, self-reported occupational disability (PDI occupation) also improved significantly [80, 81].

4. DISCUSSION

4.1. How Disease Related Symptoms Influence Work Ability in People with FM

The results of this review presents a number of cross-sectional studies which have found significantly more severe symptoms in nonworking people with FM than in working people with FM. Further, qualitative interview studies describe how people with FM perceive their symptoms and bodily weakness as obstacles for working. The results imply that more severe symptoms compromise the ability to work. However, being at work does not necessarily mean having good health [82]. Sickness presence at work is common [83, 84] and circumstances related to work organizations or labor market changes could force people into working despite ill health.

Sick-leave has been reported to be associated with premature death in both women and men in the general population [85] as well as in musculoskeletal disorders [86], implying that working would be more beneficial for staying healthy. However, the only longitudinal study of health status in FM comparing working, and nonworking women finds no protective health effects of being at work, although the working women maintained a better health status over time [64]. More longitudinal studies are needed to explore long-term effects of work and sick leave in people with FM.

4.2. How Work Related Aspects Influence Work Ability in People with FM

The results of this review show that the physical and psychosocial work environment influence work ability in people with FM. Most findings point towards that physically demanding jobs and work tasks are troublesome and constitute higher risks of work disability. This is in line with research on work disability in the general population which finds exposure to high physical workloads to be a risk factor for work disability [87, 88] also found in musculoskeletal pain

conditions [89, 90]. When investigating the perceived physical exertion at work in women with FM, one study reported that the mean ratings of perceived exertion at work reflected moderately strenuous to strenuous physical exertion at work [13], levels that have been reported to be a risk factor for long-term sickness absence in healthcare workers of the general population [70] as well as a prognostic factor for longer sickness absence in people with musculoskeletal disorders [91].

A favorable psychosocial work environment was also found to be important for the ability to work in quantitative studies as well as in qualitative interview studies. Qualitative studies describe how the support of management and colleagues allows for adjustments of work schedules and work tasks and possibilities for receiving help, which enables people with FM to manage the risk of overload at work. One interview study described how women with FM used strategies to handle the risk of their pain condition being uncovered at work, which indicates feelings of insecurity and lack of support in the work place for people with FM [72]. When people with FM were asked to describe characteristics of suitable work, one important aspect was described as having acknowledgement and support from management as well as from colleagues [73], which further emphasizes the importance of the psychosocial work environment for work ability in people with FM.

4.3. How Contextual Aspects Influence Work Ability in People with FM

Working people with FM seem to hold a careful balancing act where well-functioning strategies are necessary for managing work, in the short- and long term, without risking overload. This can be understood against the background of impaired physical capacity [10-12] and activity limitations in people with FM [14, 16]. The balancing act also seems to reflect the multidimensional complexity of work ability, which has been described as a balance between the individual's physical and mental capacity, social functioning, knowledge and skills, values, attitudes, motivation and work satisfaction, in relation to physical and mental work demands, the work environment and work community [46].

The findings of this review suggest that one strategy for maintaining working life with FM is to make a career change or to change jobs when work demands are too high, in order to avoid overload and be able to continue work life. The career changes often meant leaving a physically strenuous or stressful job [71]. To make a career change as a means of maintaining work life has also been described as a successful strategy in people with chronic musculoskeletal pain [75]. Thus, mobility in the labor market could be a solution for sustainable work for some people with FM. However, the importance of knowledge about the sick-listed person's resources in relation to the labor market and the work place has been emphasized in a report on sick-leave and return to work in people with musculoskeletal and mental disorders [92]. The report suggests measures to facilitate job-mobility to be included in intervention programs to reduce long-term sick leave in some sick-listed people while others would be expected to benefit more from work place adjustments to be able to return to their previous job [92].

Another successful strategy for maintaining work life with FM seems to be working part-time to make time for recovery. The opportunity to shorten the working day has also been reported to be associated with better self-assessed work ability in women in the general population working in different occupational sectors in Sweden [93]. However, one must keep in mind that strategies are developed within a specific context and are largely dependent on specific work situations and the possibilities for influencing one's work situation. These are conditions that are largely dependent on the management, the colleagues and the organization at work.

4.4. Effects of Treatment on Work Disability in FM

At present, there is not enough evidence on how rehabilitation best should be planned to improve or maintain work ability in people with fibromyalgia, since studies evaluating work disability as outcome in FM are scarce. Only a few treatment studies were found in the literature search, out of which none presented any effects on measures of sick-leave or work disability compared with a control group. However, one of the studies found significant improvements in self-assessed occupational disability following a 15 week program of person-centred resistance exercise which the authors argued could contribute to future return to work or decreased risk for future sick-leave. However, no significant changes in actual sick-leave were found [80]. One retrospective survey reported early impairments of work ability in people with FM, in the time period between symptom onset and time of diagnosis, and call for early recognition and management of symptoms which they argue could prevent future loss of work ability in people with FM [52].

CONCLUSION

Symptom severity influences work ability in people with FM and more longitudinal studies are needed to explore long-term effects of symptoms on work ability and sick leave. Physically demanding jobs and work tasks are especially troublesome and constitute higher risks of work disability. The support of management and colleagues enable people with FM to manage the risk of overload at work. Working people with FM seem to hold a careful balancing act to manage the risk of overload where well-functioning strategies such as making a career change, working part-time, and developing personal skills were necessary for managing work, in the short- and long term. Studies evaluating treatment effects on work disability in FM are scarce. None of the included studies presented any effects on measures of sick-leave or work disability compared with a control group. More studies of treatment effects on outcomes related to work ability in people with FM are needed in order to be able to plan evidence based rehabilitation to improve or maintain work ability in people with FM.

We would also like to acknowledge that such measures as the support of employers and colleagues, changing careers, and prolonged sick leave may be difficult to implement widely even in wealthy countries with fair welfare policies, and with very generous employers. Good prospective quantitative controlled studies examining the impact of such strategies are essential in this area.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REFERENCES

- [1] World Health Organization. ICF: International Classification of Functioning, Disability and Health. Geneva: WHO2001.
- [2] Kivimäki M, Ferrie JE, Hagberg J, *et al.* Diagnosis-specific sick leave as a risk marker for disability pension in a Swedish population. *J Epidemiol Community Health* 2007; 61(10): 915-20.
- [3] The Social Insurance Agency. Social Insurance Report 2011; 4.
- [4] Annemans L, Lay KL, Taib C. Societal and patient burden of fibromyalgia syndrome. *Pharmacoeconomics* 2009; 27(7): 547-59.
- [5] Fjell Y, Alexanderson K, Karlqvist L, Bildt C. Self-reported musculoskeletal pain and working conditions among employees in the Swedish public sector. *Work: A Journal of Prevention, Assessment and Rehabilitation* 2007; 28(1): 33-46.
- [6] Persson J, Bernfort L, Wählin C, Öberg B, Ekberg K. Costs of production loss and primary health care interventions for return-to-work of sick-listed workers in Sweden. *Disabil Rehabil* 2014(0):1-6.
- [7] Wolfe F, Smythe HA, Yunus MB, *et al.* The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the Multicenter Criteria Committee. *Arthritis Rheum* 1990 Feb; 33: 160-72.
- [8] Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. *Arthritis Rheum* 1995 Jan; 38: 19-28.
- [9] Perrot S, Winkelmann A, Dukes E, *et al.* Characteristics of patients with fibromyalgia in France and Germany. *Int J Clin Pract* 2010; 64(8): 1100-8.
- [10] Góes SM, Leite N, Shay BL, Homann D, Stefanello JM, Rodacki AL. Functional capacity, muscle strength and falls in women with fibromyalgia. *Clinical Biomech* 2012; 27(6): 578-83.
- [11] Henriksen M, Lund H, Christensen R, *et al.* Relationships between the fibromyalgia impact questionnaire, tender point count, and muscle strength in female patients with fibromyalgia: a cohort study. *Arthritis Care and Research* 2009; 61(6): 732-9.
- [12] Mannerkorpi K, Burchardt CS, Bjelle A. Physical performance characteristics of women with fibromyalgia. *Arthritis Care Res* 1994; 7: 123-9.
- [13] Palstam A, Larsson A, Bjersing J, *et al.* Perceived Exertion at Work in Women with Fibromyalgia: Explanatory Factors and Comparison with Healthy Women. *J Rehabil Med* 2014; 46(8): 773-80.
- [14] Jones J, Rutledge DN, Jones KD, Matallana L, Rooks DS. Self-assessed physical function levels of women with fibromyalgia: a national survey. *Women's Health Issues* 2008; 18(5): 406-12.
- [15] Henriksson C, Burckhardt C. Impact of fibromyalgia on everyday life: a study of women in the USA and Sweden. *Disabil Rehabil* 1996; 18(5): 241-8.
- [16] Henriksson C, Grundmark I, Bengtsson A, Ek AC. Living with fibromyalgia. Consequences for everyday life. *Clin J Pain* 1992; 8: 138-44.
- [17] Henriksson CM, Liedberg GM, Gerdle B. Women with fibromyalgia: Work and rehabilitation. *Disabil Rehabil* 2005; 27(12): 685-95.
- [18] White KP, Speechley M, Harth M, Ostbye T. Comparing self-reported function and work disability in 100 community cases of fibromyalgia syndrome versus controls in London, Ontario: The London fibromyalgia epidemiology study. *Arthritis Rheum* 1999; 42(1):76-83.
- [19] Wolfe F, Anderson J, Harkness D, *et al.* Work and disability status of persons with fibromyalgia. *J Rheumatol* 1997; 24(6): 1171-8.
- [20] Wolfe F, Clauw DJ, Fitzcharles MA, *et al.* The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care Res* 2010; 62(5): 600-10.
- [21] Wolfe F, Clauw DJ, Fitzcharles M-A, *et al.* Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR Preliminary Diagnostic Criteria for Fibromyalgia. *J Rheumatol* 2011; 38(6): 1113-22.
- [22] Bennett R, Friend R, Marcus D, *et al.* Criteria for the diagnosis of fibromyalgia: Validation of the modified 2010 preliminary ACR criteria and the development of alternative criteria. *Arthritis Care Res* 2014 ;66(9):1364-73
- [23] Wolfe F, Clauw DJ, Fitzcharles M-A, *et al.*, editors. 2016 Revisions to the 2010/2011 fibromyalgia diagnostic criteria. *Seminars in Arthritis and Rheumatism*; 2016: Elsevier.
- [24] Gran JT. The epidemiology of chronic generalized musculoskeletal pain. *Best Pract Res Clin Rheumatol* [review] 2003; 17(4):547-61.
- [25] Lindell L, Bergman S, Petersson IF, Jacobsson LTH, Herrström P. Prevalence of fibromyalgia and chronic widespread pain. *Scand J Prim Health Care* 2000; 18:149-53.
- [26] Branco JC, Bannwarth B, Failde I, *et al.*, editors. Prevalence of fibromyalgia: a survey in five European countries. *Seminars in Arthritis and Rheumatism*; 2010: Elsevier.
- [27] Haq SA, Darmawan J, Islam MN, *et al.* Prevalence of rheumatic diseases and associated outcomes in rural and urban communities in Bangladesh: a COPCORD study. *J Rheumatol* 2005;32(2):348-53.
- [28] Farooqi A, Gibson T. Prevalence of the major rheumatic disorders in the adult population of north Pakistan. *J Rheumatol* 1998; 37(5):491-5.
- [29] Wolfe F. The Epidemiology of Fibromyalgia. *J Musculoskeletal Pain* 1993; 1(3-4): 137-48.
- [30] White KP, Harth M. Classification, epidemiology, and natural history of fibromyalgia. *Curr Pain Headache Rep* 2001; 5(4):320-9.
- [31] Bengtsson A, Bäckman E, Lindblom B, Skogh T. Long term follow-up of fibromyalgia patients: Clinical symptoms, muscular function, laboratory tests-An eight year comparison study. *J Musculoskeletal pain* 1994;2(2):67-80.
- [32] Wolfe F. The relation between tender points and fibromyalgia symptom variables: evidence that fibromyalgia is not a discrete disorder in the clinic. *Annals Rheumatic Dis* 1997; 56(4): 268-71.
- [33] Clauw DJ. Fibromyalgia: A Clinical Review. *JAMA*. 2014; 311(15):1547-55.
- [34] Larsson B, Balogh I. Is there a relationship between fibromyalgia syndrome and work conditions? *J Musculoskel Pain* 2005;13(4):5-14.
- [35] Arnold LM, Hudson JI, Hess EV, *et al.* Family study of fibromyalgia. *Arthritis Rheum*. 2004; 50(3):944-52.
- [36] Phillips K, Clauw DJ. Review: Central pain mechanisms in the rheumatic diseases: Future directions. *Arthritis Rheum*. 2013; 65(2):291-302.
- [37] Bengtsson A. The muscle in fibromyalgia. *J Rheumatol* 2002; 41(7):721-4.
- [38] Gerdle B, Grönlund C, Karlsson SJ, Holtermann A, Roelvelde K. Altered neuromuscular control mechanisms of the trapezius muscle in fibromyalgia. *BMC Musculoskelet Disord* 2010;11(1):42.
- [39] Elvin A, Siösteen AK, Nilsson A, Kosek E. Decreased muscle blood flow in fibromyalgia patients during standardised muscle exercise: a contrast media enhanced colour Doppler study. *Eur J Pain*. 2006; 10(2):137-144.
- [40] Bennett RM. Adult growth hormone deficiency in patients with fibromyalgia. *Curr Rheumatol Rep*. 2002; 4(4):306-12.
- [41] McLoughlin MJ, Colbert LH, Stegner AJ, Cook DB. Are women with fibromyalgia less physically active than healthy women. *Med Sci Sports Exerc* 2011;43(5):905-12.
- [42] van Santen M, Bolwijn P, Verstappen F, *et al.* A randomized clinical trial comparing fitness and biofeedback training versus basic treatment in patients with fibromyalgia. *J Rheumatol* 2002; 29(3):575-81.
- [43] Leeuw M, Goossens ME, Linton SJ, Crombez G, Boersma K, Vlaeyen JW. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *J Behav Med* 2007; 30(1):77-94.

- [44] Lederer V, Loisel P, Rivard M, Champagne F. Exploring the diversity of conceptualizations of work (dis)ability: a scoping review of published definitions. *J Occup Rehabil*. 2014; 24(2): 242-67.
- [45] Ilmarinen J. Work ability—a comprehensive concept for occupational health research and prevention. *Scand J Work Environ Health*. 2009 Jan;35(1):1-5.
- [46] Ilmarinen JE. Aging workers. *J. Occup. Environ Med*. 2001; 58(8): 546-552.
- [47] Ilmarinen J. Multidimensional work ability model. Helsinki: Finnish Institute of Occupational Health; [updated 19.09.2014]; Available from: http://www.ttl.fi/en/health/wai/multidimensional_work_ability_model/pages/default.aspx.
- [48] Lindberg P. The work ability continuum: Epidemiological studies of factors promoting sustainable work ability. Stockholm: Karolinska Institute; 2006.
- [49] World Health Organization. International Classification of Diseases and Related Health Problems (ICD) 10 system. 1993; Available from: <http://apps.who.int/classifications/icd10/browse/2015/en>.
- [50] Hedborg A, Odmark P, Ljunghall B. Gränslandet mellan sjukdom och arbete. Arbetsförmåga/Medicinska förutsättningar för arbete/Försörjningsförmåga (Swedish). In: Regeringskansliet, editor. Stockholm: Statens Offentliga Utredningar; 2009. p. 1-373.
- [51] Collado A, Gomez E, Coscolla R, *et al*. Work, family and social environment in patients with Fibromyalgia in Spain: an epidemiological study: EPIFFAC study. *BMC Health Serv Res* 2014;14(1):513.
- [52] Guymer E, Littlejohn G, Brand C, Kwiatek R. Fibromyalgia onset has high impact on work ability in Australians. *Internal medicine journal*. 2016.
- [53] Fitzcharles M-A, Ste-Marie PA, Rampakakis E, Sampalis JS, Shir Y. Disability in Fibromyalgia Associates with Symptom Severity and Occupation Characteristics. *J Rheumatol* 2016; 43(5):931-6.
- [54] Wolfe F, Walitt BT, Katz RS, Häuser W. Social security work disability and its predictors in patients with fibromyalgia. *Arthritis Care Res* 2014; 66(9):1354-63.
- [55] Burckhardt CS, Liedberg GM, Henriksson CM, Kendall S. The impact of fibromyalgia on employment status of newly-diagnosed young women: a pilot study. *J Musculoskeletal Pain* 2005; 13(2):31-41.
- [56] Al-Allaf AW. Work disability and health system utilization in patients with fibromyalgia syndrome. *JCR: J Clin Rheumatol* 2007; 13(4):199-201.
- [57] McDonald M, daCosta DiBonaventura M, Ullman S. Musculoskeletal pain in the workforce: the effects of back, arthritis, and fibromyalgia pain on quality of life and work productivity. *J Occup Environ Med* 2011; 53(7): 765-70.
- [58] Kleinman N, Harnett J, Melkonian A, Lynch W, Kaplan-Machlis B, Silverman SL. Burden of fibromyalgia and comparisons with osteoarthritis in the workforce. *J. Occup. Environ. Med* 2009;51(12):1384-93.
- [59] Liedberg G, Björk M. Symptoms of subordinated importance in fibromyalgia when differentiating working from non-working women. *Work: A Journal of Prevention, Assessment and Rehabilitation*. 2013.
- [60] Reisine S, Fifield J, Walsh SJ, Feinn R. Do employment and family work affect the health status of women with fibromyalgia? *J Rheumatol*. 2003 Sep;30(9):2045-53.
- [61] Palstam A, Bjersing JL, Mannerkorpi K. Which aspects of health differ between working and nonworking women with fibromyalgia? A cross-sectional study of work status and health. *BMC Public Health* 2012;12(1):1076.
- [62] Rivera J, Esteve-Vives J, Vallejo MA, Rejas J. Factors associated with temporary work disability in patients with fibromyalgia. *Rheumatol Int* 2010;1-7.
- [63] Winkelmann A, Perrot S, Schaefer C, *et al*. Impact of fibromyalgia severity on health economic costs. *Appl Health Econ Health Policy* 2011; 9(2): 125-36.
- [64] Reisine S, Fifield J, Walsh S, Forrest DD. Employment and health status changes among women with fibromyalgia: a five-year study. *Arthritis Rheum* 2008; 59(12):1735-41.
- [65] Mannerkorpi K, Gard G. Hinders for continued work among persons with fibromyalgia. *BMC Musculoskelet Disord* 2012 Jun 11;13(1):96.
- [66] Liedberg GM, Henriksson CM. Factors of importance for work disability in women with fibromyalgia: An interview study. *Arthritis Care Res* 2002; 47(3):266-74.
- [67] Sallinen M, Kukkurainen ML, Peltokallio L, Mikkelsen M. Women's narratives on experiences of work ability and functioning in fibromyalgia. *Musculoskelet Care* 2010; 8(1):18-26.
- [68] Juuso P, Skär L, Sundin K, Söderberg S. The Workplace Experiences of Women with Fibromyalgia. *Musculoskelet Care* 2016; 14(2):69-76.
- [69] Støver M, Pape K, Johnsen R, *et al*. Work environment and disability pension—an 18-year follow-up study in a Norwegian working population. *Scandinavian Journal of Public Health*. 2013:1403494813486965.
- [70] Andersen L, Clausen T, Persson R, Holtermann A. Dose-response relation between perceived physical exertion during healthcare work and risk of long-term sickness absence. *Scandinavian Journal of Work, Environment and Health*. 2012.
- [71] Palstam A, Gard G, Mannerkorpi K. Factors promoting sustainable work in women with fibromyalgia. *Disabil. Rehabil* 2013; 35(19):1622-9.
- [72] Oldfield M, MacEachen E, Kirsh B, MacNeill M. Impromptu everyday disclosure dances: how women with fibromyalgia respond to disclosure risks at work. *Disabil Rehabil* 2016; 38(15):1442-53.
- [73] Bossema ER, Kool MB, Cornet D, *et al*. Characteristics of suitable work from the perspective of patients with fibromyalgia. *J Rheumatol* 2012; 51(2):311-8.
- [74] Rakovski C, Zettel-Watson L, Rutledge D. Association of employment and working conditions with physical and mental health symptoms for people with fibromyalgia. *Disabil. Rehabil* 2012; 34(15):1277-83.
- [75] de Vries H, Brouwer S, Groothoff J, Geertzen J, Reneman M. Staying at work with chronic nonspecific musculoskeletal pain: a qualitative study of workers' experiences. *BMC Musculoskelet Disord* 2011;12(1):126.
- [76] Lofgren M, Ekholm J, Ohman A. 'A constant struggle': successful strategies of women in work despite fibromyalgia. *Disabil Rehabil*. 2006 Apr 15; 28(7):447-55.
- [77] Suoyrjö H, Oksanen T, Hinkka K, *et al*. A comparison of two multidisciplinary inpatient rehabilitation programmes for fibromyalgia: A register linkage study on work disability. *J Rehabil Med* 2009; 41(1):66-72.
- [78] Torres X, Collado A, Arias A, *et al*. Pain locus of control predicts return to work among Spanish fibromyalgia patients after completion of a multidisciplinary pain program. *Gen Hosp Psychiatry* 2009; 31(2):137-45.
- [79] Howard KJ, Mayer TG, Neblett R, Perez Y, Cohen H, Gatchel RJ. Fibromyalgia syndrome in chronic disabling occupational musculoskeletal disorders: prevalence, risk factors, and posttreatment outcomes. *J. Occup. Environ. Med* 2010; 52(12):1186-91.
- [80] Palstam A, Larsson A, Löfgren M, *et al*. Decrease of fear avoidance beliefs following person-centered progressive resistance exercise contributes to reduced pain disability in women with fibromyalgia: secondary exploratory analyses from a randomized controlled trial. *Arthritis Res Ther* 2016;18(1):116.
- [81] Larsson A, Palstam A, Löfgren M, *et al*. Resistance exercise improves muscle strength, health status and pain intensity in fibromyalgia—a randomized controlled trial. *Arthritis Res Ther* 2015;17(1):1-15.
- [82] Marmot M, Feeney A, Shipley M, North F, Syme S. Sickness absence as a measure of health status and functioning: from the UK Whitehall II study. *J Epidemiol Community Health*. 1995;49(2):124-30.
- [83] Engström LG, Janson S. Predictors of work presence—Sickness absence in a salutogenic perspective. *Work: A Journal of Prevention, Assessment and Rehabilitation*. 2009; 33(3):287-95.
- [84] Krantz G, Ostergren PO. Common symptoms in middle aged women: their relation to employment status, psychosocial work conditions and social support in a Swedish setting. *J Epidemiol Community Health* 2000; 54(3): 192-9.
- [85] Björkenstam E, Weitoft GR, Lindholm C, Björkenstam C, Alexanderson K, Mittendorfer-Rutz E. Associations between number of sick-leave days and future all-cause and cause-specific mortality: A population-based cohort study. *BMC Public Health* 2014; 14(1): 733.
- [86] Jansson C, Mittendorfer-Rutz E, Alexanderson K. Sickness absence because of musculoskeletal diagnoses and risk of all-cause and

- cause-specific mortality: a nationwide Swedish cohort study. *Pain* 2012; 153(5): 998-1005.
- [87] Bergström G, Bodin L, Bertilsson H, Jensen IB. Risk factors for new episodes of sick leave due to neck or back pain in a working population. A prospective study with an 18-month and a three-year follow-up. *Occup. Environ. Med* 2007; 64(4): 279-87.
- [88] Van Den Berg TIJ, Elders LAM, Burdorf A. The effects of work-related and individual factors on work ability: A systematic review. *Occup. Environ. Med* 2009; 15-8.
- [89] Holtermann A, Hansen JV, Burr H, Søgaard K. Prognostic factors for long-term sickness absence among employees with neck-shoulder and low-back pain. *Scand J Work Environ Health* 2010; 36(1): 34-41.
- [90] Kärkkäinen S, Pitkämäki J, Silventoinen K, *et al.* Disability pension due to musculoskeletal diagnoses: importance of work-related factors in a prospective cohort study of Finnish twins. *Scand J Work Environ Health* 2013; 39(4): 343-50.
- [91] Lötters F, Burdorf A. Prognostic factors for duration of sickness absence due to musculoskeletal disorders. *Clin J Pain* 2006; 22(2): 212-21.
- [92] Ekberg K, Wåhlin C, Persson J, Bernfort L, Öberg B. Is mobility in the labor market a solution to sustainable return to work for some sick listed persons? *J Occup Rehabil* 2011; 21(3): 355-65.
- [93] Johansson G, Hultin H, Möller J, Hallqvist J, Kjellberg K. The impact of adjustment latitude on self-assessed work ability in regard to gender and occupational type. *Scand J Occup Ther* 2012; 19(4):350-9.