

A strategy for workplace health promotion on German dairy farms

Maxi Thinius, Martina Carola Jakob*

(Leibniz-Institute for Agricultural Engineering Potsdam Bornim, Germany)

Abstract: Studies across the globe have shown that at least three out of five milkers experience pain in the musculoskeletal system (MSS), mostly in the upper extremities. The World Health Organisation (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. It is well known that dairy farming, and milking in particular is coupled with several risk factors for developing musculoskeletal disorders. Technical measures seem to be insufficient to avoid physical overload. Therefore a more comprehensive approach seems to be necessary. In this study, four physical therapists, eight dairy executives and 25 milking parlor operatives were interviewed using guideline-based interviews concerning workplace health promotion and health in general. The results showed that most executives were open towards workplace health promotion as long as it is free and beyond working hours. But the interviews with the workers showed, that they do not necessarily prioritize health issues. Other issues such as communication between employer and employee as well as receiving credit for their work may increase contentment. Therefore, a multi-factorial strategy is needed to cope with (health) issues on German dairy farms.

Keywords: workplace health promotion, dairy farms, ergonomics, TOP principle, participatory approach

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1 Introduction

Musculoskeletal disorders (MSD) are the main reason for work absenteeism in the European Union (EU), affecting 40 mio. employees and causing financial damages of 0.5%-2% of the EU gross domestic output (GDP) each year (European Commission, 2003). A multitude of studies from Europe and the USA (Doughrati et al., 2014, Jakob, 2011, Kolstrup, 2012, Pinzke, 2003, Tuure and Alasutari, 2009, Kauke et al., 2010, Thinius, 2012) have shown that farm workers who regularly milk cows are more likely to suffer from pain in the MSS in at least one part of the body than workers in other professions. The studies have furthermore revealed that women are more often affected than men. Women do not only show a higher percentage of disorders in the MSS but also tend to have more affected body parts

(Thinius, 2012, Thinius and Jakob, 2014). They could have a disadvantage because of their anthropometrics characterized by lesser height and shorter arms and therefore a shorter outreach in comparison to men. Measurements in milking parlors have shown that the average horizontal distance between the center of the claw bowl and the edge of the platform can differ, depending on the parlor type and each cow's position. The horizontal distances in all parlors ranged from 15 cm up to 80 cm. Parallel parlors showed significantly smaller horizontal distances than herringbone or rotary parlors (Thinius and Jakob, 2014). According to DIN 33402-2:2005-12 (2005) the outreach for the arms of females (95th percentile, aged 18-65) is 75 cm. This value neglects the body depth which is 34.5 cm for women aged 18-65 in the 95th percentile, leaving a net arm reach of 40.5 cm for the average woman. For the 95th percentile for men aged 18-65, the net arm reach is 43.5 cm.

Earlier studies have already proven that it is the best to work with the teats on shoulder level. When working

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*Corresponding author: Martina Carola Jakob, Leibniz-Institute for Agricultural Engineering Potsdam Bornim, Germany. Email: mjakob@atb-potsdam.de

above or below shoulder level, the muscular activity is higher and based on the acquired data, it is also likely to happen that the horizontal distance exceeds the net arm reach and therefore, the milker has to bend and/or twist his/her trunk to reach the udder in many cases (Jakob et al., 2012). These awkward working postures along with the highly repetitive and monotonous work and the static muscular load of holding the claw in one hand can lead to pain in the muscular-skeletal-system (MSS). According to surveys, based on the Standardised Nordic Questionnaire (Kuorinka et al., 1987), the most affected body parts are the lower back (70%), neck (54%), shoulders (46%) and hands/wrists (45%) (Thinius and Jakob, 2014).

At present, the options to improve the workplace ergonomically are limited to a few technical devices, such as service arms, adjustable platforms, indexing or light milking units.

Apart from the technical environment, other risk factors such as cold temperatures, humidity, long working hours, shift work, little job satisfaction, high repetition, stress, age, gender or low social support (Wahlstedt et al., 2010) may also contribute to experiencing pain in the MSS. According to Wahlstedt et al. (2010), agriculture belongs to the three occupational classes where unfavorable ergonomics are highly prevalent factors, such as frequently bending neck and/or body forward, the use of vibrating tools or lifting weights of 1 kg more than once a minute.

So far there is no statistical evidence for any one of those risk factors to be the leading cause for the development of pain or disorders in the MSS. Gender as explained is the most dominant and significant variable and overlaid by disadvantageous anthropometrics according to existing parlor design.

The aim of the study was to find work organizational and work environmental improvements as well as to identify preventive actions such as training or personal protective equipment to reduce the evidence of pain and disorders in the MSS of milkers. Therefore,

physiotherapists were interviewed as experts to name preventive actions as well as other measures.

Executives on dairy farms were interviewed to get an overview of measures that have been executed, are currently done or will be tackled in the future. They were also asked to give an assessment on the feasibility of workplace health promotion. Finally the milking parlor operatives were interviewed to get information about their individual health engagement and their own ideas to improve their work routine. As a result, a catalogue with measures based on the TOP principle was generated to serve as a guideline for modern dairy farms.

2 Methods

Data was collected with the help of self-designed, guideline-based interviews. The sampling method applied for interview partner recruitment was a non-probability convenience sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher and regarding the farmers due to their willingness to participate.

Four female physiotherapists were asked for actions they suggest improving the health status of milkers. Their answers provided a baseline for the structure of the interviews with the milking parlor operatives and the farm executives. Several dairy farms were contacted by e-mail or telephone and asked to participate in the study. On each farm, a production manager or a director were interviewed, along with at least two milking parlor operatives. The interviews were recorded and later transliterated or, if the noise level did not allow recording, written down. All of them were nonpaid.

2.1 Farm characteristics

Eight dairy farms in the area of Eastern Germany were finally willing to participate. None of them was a family farm. The smallest farm owned 190 milking cows at that time, the biggest farm had 2,200 cows and the average over all farms was 800 milking cows. Four farms had a rotary, three farms a herringbone and one farm had a parallel milking parlor. Each rotary system featured a

technical helping device such as a support arm (twice), an adjustable floor or the MultiLactor ® (semi-automatic milking system without claw bowl).

2.2 Milking parlor operatives

Twenty-five milking parlor operatives, fifteen of them female, were interviewed. The men's ages ranged from 22 to 60 years with an average of 38 years and an average work experience of 19 years. The women were aged 35 to 61 years with an average age of 49. Their average work experience was 24 years.

3 Results

3.1 Interviews with the physiotherapists

General recommendations given by the physiotherapists were to loosen up and stretch muscles before, during and after work in order to improve the blood flow in the limbs, and especially in the arms and hands. Risk factors such as repetitive movements, hand force, static load, awkward postures, but also the cold temperatures, humidity and stiff flooring were identified. The number of risk factors on the other hand showed that there is no single solution. A combination of injury prevention was suggested focusing on exercises at work, during leisure time as well as ergonomics and personal protective equipment.

Exercises should focus on the strained body parts and be carried out on a regular basis while working as well as after work. Opportunities to do so during work should be found for example while getting the cows from the barn, chasing them into the milking parlor or while waiting for them to finish milking.

There are several exercises for the trunk muscles which can be provided by physiotherapists, coaches, books or the internet. But it is not only important to exercise on a regular basis but also to do it correctly in order to prevent further damage to the MSS. Short sessions from five to ten minutes instead of intensive but rare exercise sessions were recommended. Another possibility proposed by the physiotherapists weresportsactivitiesfocusing on the low-lying

musculature like yoga, pilates, gymnastics or swimming. A noticeable effect should be seen within six to twenty-four months, depending on the milker's age and the intensity of exercise.

Cold protection was pointed out to be very important, too. Therefore milking parlors should be heated properly during winter time and draft should be avoided. Milkers should also wear warm and intact working clothes and proper rubber boots. A pit floor made of plastic grids or laid out with rubber mats would preserve the joints and could decrease pain in the lower extremities.

Other recommendations from the physiotherapists were back therapy training during work time, health days with different focuses (e.g. smoking, back health, recreation) or a program for breaks with loosening and relaxing exercises.

3.2 Interviews with the milking parlor operatives

The parlor workers were questioned about their attitude towards health, their own ideas how to improve ergonomics, work organization and their interest in workplace health promotion. The extent of employee participation and job satisfaction were also questioned.

Every third male worker experienced pain in the MSS during work. Half of the females encountered pain, although 60% of them exercised more often than the men (40%) and every fourth female used personal protective equipment such as inner soles, individually-fitted foot beds or bandages. In exchange, men were more willing to become active in order to improve their health. Sports which were enjoyed by the milkers were horseback riding, soccer, table tennis, dancing, riding the bicycle or fitness courses like pilates and aquarobics.

Eleven out of twenty-five workers needed constitutional treatments, e.g. massages, physiotherapy or treatments at health resorts to cure already existing problems. 75% of all interviewed milking parlor operatives would like to do more for their health but they see a conflict with their work schedule and other responsibilities. Some of them have children or elderly family members to take care of others have their own

house, garden and animals. Most of them admitted to be too tired after work and to rather sit down and relax than exercise.

When questioned about their shift system, 68% of the workers expressed their satisfaction. Reasons for negative responses were working in double-shifts, no fixed shift system, or starting the morning shift too early.

When asked for wishes or changes in the working environment, it was mentioned to have more staff for milking, a reduced number of cows, less time milking or more acknowledgements for their performance. Ergonomic improvements were also asked for, such as adjustable floors (29%), support arms (10%) or indexing (5%). Twelve workers already used a support arm, an adjustable floor or the MultiLactor® in their milking parlor and they all agreed that the device was helpful and even eased the pain in the MSS in most cases.

3.3 Interviews with the executives

The guideline-based interviews with the executives covered health-related topics, e.g. the status of employee's illness, constitutional measures in the past, present and future, ideas for workplace health promotion and the integration of workplace health promotion.

Almost every interview partner was aware that milking parlor operatives suffer from pain in the MSS and tried to improve the workplace as a consequence. The taken measures were mostly technical and conducted while building a new milking parlor. New milking parlors received helping devices such as the MultiLactor®, an adjustable floor or new windows. Apart from technical measures, some of the farms also made use of the industrial physician, provided skin care products and training courses. The most important questions and answers can be found in Table 1 below.

Table 1R *Summary of the interviews with the executives*

	Problem with absent days	Aware of problem	Measures (past, present, future)	Open for WHP/ integration possible?	Own ideas
F1	yes	yes	yes	difficult / no	none
F2	yes	yes	yes	n.a. / no	none
F3	no	yes	yes	yes / yes	shift system, light rubber boots, morning break
F4	no	no	none	yes / yes	not necessary
F5	no	yes	yes	yes / no	none
F6	no	yes	yes	yes / yes	Vouchers for physiotherapy, thermal spring; smoking cessation
F7	no	yes	yes	yes / yes	Vouchers for physiotherapy, good-working shift schedule
F8	no	yes	yes	yes / yes	MultiLactor®, training, less chemicals

4 Discussion

4.1 The interview results

The interviews not only provided the asked information but also showed inconsistencies and that other factors were prioritized over health by the milkers.

First of all, there was a conflict between the high prevalence of pain in the MSS and the low rate of sick days on dairy farms. According to the high rate of

disorders in the MSS, which were acute in some cases, one would expect that milking parlor operatives have a lot of sick days, too. The interviews did not explain this controversy. On some farms, there are not enough workers to replace a sick colleague, so the other milkers have to work more and sometimes have to renounce free days. That could lead to a moral conflict. But on farms with a sufficient personnel capacity, there seems to be no reason to attend to work sick.

The low rate of absenteeism is a counter-argument for workplace health promotion, too, and does not motivate the farmers to take action because there seems to be no need to. In addition to the absence of need, many executives stated that their employees do not use provided offers like skin care and protective equipment when handling chemicals and criticized that the majority of them lacks discipline. It should be the executive's duty to find out why such offers are not used and what offers would be used by the employees.

The executives themselves want workplace health promotion to be free of charge and outside working hours, which shows, that they are not ready to invest in the maintenance of the personnel's health. The return on investment can be shown quite clear when the aim is to reduce absent days from work. Aldana et al. (2001) found out that participants in health promotion programs had 36% less absenteeism and could decrease the affiliated costs by one third. They determined a cost-benefit-ratio of \$1:2.50. But since absent days are not a problem in the German dairy industry, research faces the same challenge as other industrial countries as well: to measure productivity and expose the relationship between work productivity and the occupational health and safety costs per worker (Nagata et al., 2014). Agricultural employers therefore have to look at WHP at a wider angle and think of the long-term benefits. A motivating factor should be the lack of junior and skilled employees. Extended benefits of WHP could make the job and the farm more attractive for applicants and help to overcome the shortage of entrepreneurs. The health of older, well-qualified milking parlor operatives could be maintained and kept vital as long as possible.

On the milkers' side, the priority to be active for their own health differed a lot. Women in general were more willing to see a doctor or a physiotherapist about their discomfort, tended to use (more) personal aids and tried to engage in some kind of sports or exercises. The interviews furthermore showed that health issues were not of major importance for the employees and that they

were rather concerned about matters of communication. Many of them claimed that the executives were not open for their problems and ideas, did not give enough feedback, showed deficient appreciation for their work and every third milker claimed to have no right to say in a matter. But they were also able to identify other factors which affect their physical and psychological well-being. Their wishes showed problematic aspects in their farm's milking parlor. An unexpected high number of milking parlors lacked a heater or a heating system and many milkers would like to have an adjustable floor which suggests that they work in awkward body postures. The employer's aim should be to optimize the milking parlor and provide a safe and ergonomic work place and to encourage its personnel to take care of their health. Meanwhile the milker has the duty to look after himself and treat medical conditions in order to prevent chronic diseases.

4.2 The TOP principle

If increased stresses and strains, risks and/ or hazards are found on an enterprise, measures should be taken. There are several procedures to reduce strain which can and even should be combined in order to get the best results possible. The TOP principle is a classification of preventive actions and distinguishes in technical (T), organizational (O) and personal (P) measures. Technical and organizational measures both belong to the structural prevention, while the personal measures belong to the behavior-oriented prevention (Hartmann et al., 2013). A literature review by Sockoll et al. (2008) showed that multi-component programs have the highest rate of success. Those programs, which often consisted of training courses, technical aids, rearranged working sites, and an altered work organization, had a success rate of 97%. The mere implementation of technical aids caused an improvement in 90% of the studies.

Low-price and flexible workplace health promotion programs are required for small and medium-sized enterprises (SME) which do not have the same financial and human resources as large-scale enterprises. But they

have the advantage of short and less bureaucratic communication ways within the company, less hierarchy and tend to have a stronger social bond between colleagues and with the manager. The key to the

successful implementation of WHP and similar workplace improvements is employee involvement in detecting and solving problems! See Figure 1 please.

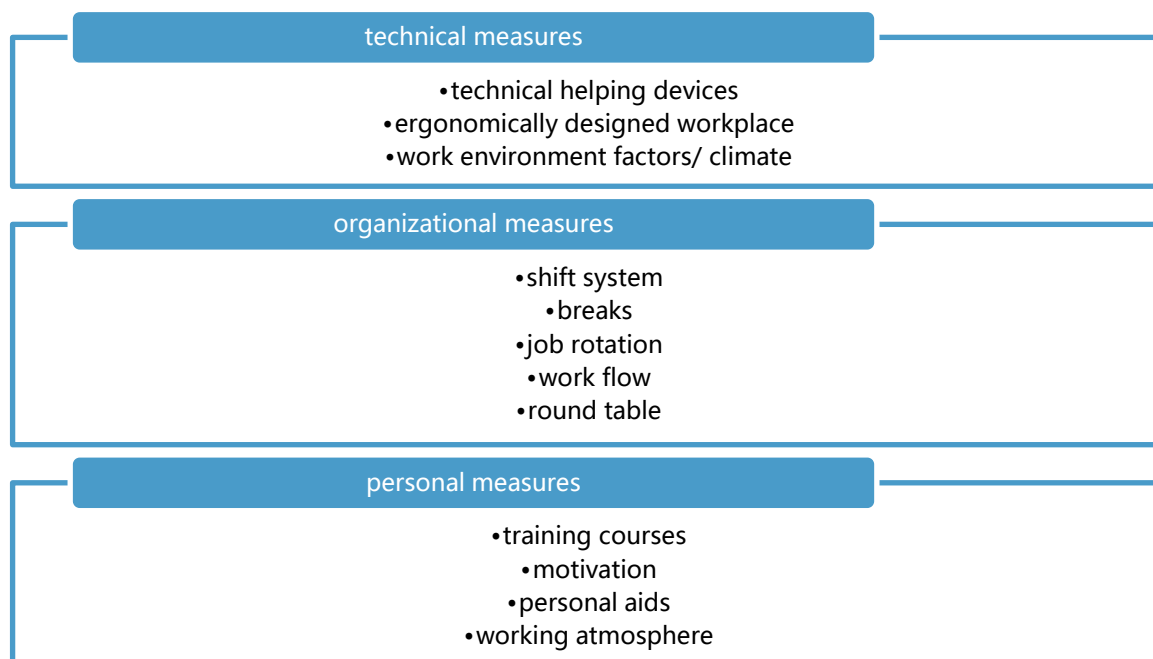


Figure 1 List of some possible measures for dairy farms based on the TOP principle

5 Conclusions

The interviews with the physiotherapists showed that they have no universal solution to reduce the number of disorders in the MSS but they mentioned a multitude of factors which need to be considered to improve parlor work. Therefore, a flexible plan of actions, custom-made for each enterprise and each worker, is required to take into account the diverse existing conditions. Following the participatory approach in combination with the TOP principle seems to be the most promising way to improve the health status of milkers. At present, there is a lack of comparable, significant studies dealing with WHP in SME. Therefore, the whole process of contacting enterprises, implementing interventional measures, the process of those interventions and the measurable achievements must be analyzed and documented (Hasle and Limborg, 2006). Japanese studies found out that a successful action checklist must be easy to understand, precise, feasible and low-cost. The best way to implement

such an action checklist is to have trained facilitators (Nishikido et al., 2006).

The dairy farms should definitely include their employees and use the TOP principle, which can be adapted to the local situation, like the WISE concept created by the International Labor Office (ILO, 2012). The WISE concept makes use of group discussions including staff representatives and a collective brainstorming to find solutions for the problems. The survey revealed that most executives are open to WHP and think that it could be integrated but they clearly pointed out it has to be free of charge and outside of working hours. A fully developed program for workplace health promotion for dairy farms does not seem realizable at the moment because there is no demand and no necessity for it. Technical improvements are already common and accepted by dairy farms but most technical helping devices lack scientific evidence on the effect of worker's health because there are almost no studies that measure their effect on the milker. Further research is

needed to prove positive impact of those devices and optimize them.

Little changes in work organization, i.e. job rotation or the implementation of active breaks are low-price or even free and could still have a significant effect on the work atmosphere and the employees' well-being and motivation. A study carried out on behalf of GEA Westfalia Surge (confidential, 2009), defining the comfort for milkers, has shown, as well as this study does, that many farms have communication problems between the milking parlor operatives and the executives and that the majority of the milkers feel misunderstood. The executives need to be open to their staff's ideas and should encourage the dialogue with them. A quarterly round table would provide an opportunity to give feedback on the work done by the milkers, talk about problems at work and set milestones and goals for the upcoming months, e.g. less somatic cells in milk, less calf death losses or a better heat management. Investments should also be discussed and evaluated to see if they are both necessary and useful. Studies have shown that job satisfaction has a high influence on physical and an even higher influence on mental health (Faragher et al., 2005), work performance and absenteeism (Rahman and Sen, 1987). As a consequence, improvement of communication and participation should have a high priority on dairy farms with respect to a better work environment and a higher job satisfaction among milking parlor operatives.

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