

RECOMMENDATIONS FOR SUFFICIENT PHYSICAL ACTIVITY AT WORK

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Many contemporary work tasks are characterised by little or no physical activity. This pertains to the whole body as well as specific areas such as head and neck. Too little whole body physical activity is generally known to increase the risk of chronic diseases like vascular disorders and diabetes. Low-intensity tasks of static nature are regarded as one of the causes of work related musculoskeletal disorders of neck and shoulders. TNO¹ has developed recommendations for a healthy amount of physical activity at work, both for the whole body and the neck-/shoulder area. These recommendations are presented here, including their scientific basis.

Keywords: physical inactivity, sedentary work, low-intensity static loading, musculoskeletal disorders

1 Introduction

1.1 Contemporary work often lacks physical activity

More and more present-day jobs and work tasks involve little or no physical activity. Examples are present-day production industries, where walking to fetch tools or supplies is minimised to maximise the output (“lean manufacturing”), and modern offices, where every device is at hand and neck and shoulders hardly move because the eyes are fixed to the computer screen. Although the reduction or elimination of high physical loading is a beneficial development for some parts of the body, e.g. lower back and shoulders, it is often not favourable for the whole body’s physical activity level. ‘Under loading’ of the body is a side effect of this development.

1.2 Physical inactivity brings about health risks

Too little whole body physical activity is generally known to increase the risk of chronic diseases like vascular disorders and diabetes (US Surgeon General 1996). And prolonged static loading of the musculoskeletal system is regarded as risk factor for the development of musculoskeletal disorders (MSDs) of the loaded body parts (Gezondheidsraad 2000). Even static loading of low intensity, as occurs in VDU work, is related to MSDs in the neck-/shoulder area (Visser 2004). In that case, the duration of the sustained loading is considered the main risk (Sjøgaard & Jensen 2006).

1.3 Guidelines can reduce the health risks

The health risks associated with too little physical activity of the whole body and too long-lasting static loading of the neck-/shoulder area may be reduced by suitable

¹ TNO: Netherlands Organisation for Applied Scientific Research

interventions at the work place. Such interventions should always be tailor-made, that is, adjusted to the specific design of the workplace and work tasks and to the health risks present. However, the basis of those interventions should be general: valid guidelines. The Dutch Ministry of Health, Welfare and Sport asked TNO in 2002 to develop valid guidelines to tackle the increasing problem of physical inactivity at work.

2 Objectives

The main objective of the project was to develop guidelines to reduce the health risks associated with 'work that lacks body movements' ('bewegingsarm werk' in Dutch). Further objectives were to develop and/or evaluate appropriate assessment methods, to develop measures to meet the guidelines and to implement the guidelines. The project period was 2003-2006. This paper will only deal with the guidelines.

3 Methods

3.1 Choices at the start

We decided to look at 'work that lacks body movements' at two different levels. First, the whole body level, because this work restricts the worker to walk or make other large body movements. Second, the level of head-neck-shoulders, because sedentary work often involves tasks in which hand and head movements are limited. The hands often have to control an instrument or input device, and the eyes have to gaze to a patient or a computer screen. We made this distinction, because different health risks are associated with lack of whole body movement and lack of head-neck-shoulder movements.

3.2 Project steps

The following project steps were carried out: 1) literature search to find interventions that could be a valid basis for the guidelines; 2) translate suitable interventions into practical guidelines, draft version; 3) discuss this version with TNO experts; 4) adjust draft guidelines; 5) obtain support from national experts and opinion leaders, obtain advice from international experts, and inform and get feedback from the target group; 6) finalise guidelines; 7) publish guidelines.

4 Results

4.1 Recommendation I: "be physically active, at and on your way to work"

It is recommended that:

1. On an 8-hours workday, an adult employee accumulates 30 minutes or more of moderate-intensity² physical activity, either during work, during the lunch break, or on his/her way to or from work.
2. On an 8-hours workday, continuous standing is limited to 1 hour; continuous sitting to 2 hours and the total standing duration does not exceed 4 hours.

The first part of the recommendation is a general health promotion measure, aimed at reducing the risks associated with too little whole body physical activity. The second part aims to reduce the risk of acquiring varicose veins, and the occurrence of local discomfort in feet, lower legs and lower back during the workday.

² at least 4 MET (Metabolic Equivalent) or 200 kcal above resting metabolism, or 30% HRR (Heart Rate Reserve).

4.1.1 *Scientific rationale*

The first recommendation is based on the ACSM guideline for physical activity and public health (Pate et al 1995; Balady et al 2000) and its Dutch equivalent: the NNGB (Kemper 1999). The second recommendation is based on the ISO 11226, a European standard on static postures (ISO/FDIS 11226(E) 1999).

4.2 *Recommendation II: “take a time-out to recover”*

It is recommended that:

1. On an 8-hours workday, an adult employee takes a recovering time-out of at least 7½ minutes in the morning and at least 10 minutes in the afternoon after each work shift of at most 1½ hour. Recovery is either a rest period or another task, to relax, respectively dynamically load the neck-/shoulder area. It is a rest period, though, at least once in the morning and once in the afternoon.
2. Within each 1½-hours work shift, an adult employee takes a recovering time-out of at least 30 seconds after at most 20 minutes. Recovery is rest in this case.

Both recommendations aim to tackle the sustained character of low-intensity static loading in the neck-/shoulder area by restricting the duration of the loading period. These interventions are supposed to reduce work-related short-term loading effects in the neck-/shoulder area, like local fatigue and discomfort. We did not find sufficient scientific evidence to claim a decrease of long-term loading effects, i.e. (diagnosed) work-related MSDs in the neck-/shoulder area. It is plausible, though, that our recommendations contribute to decreasing the risk of these disorders.

4.2.1 *Scientific rationale*

The scientific motivation comes from a number of studies. Their conclusions are that:

- Extra breaks, in addition to the usual coffee and lunch breaks, limit discomfort and fatigue in neck/shoulder (e.g. Balci & Aghazadeh 2003; Looze et al 2005);
- Micro breaks, e.g. 30 seconds per 20 minutes, limit discomfort and fatigue in neck/shoulder (McLean et al 2001);
- The inability to take extra breaks is associated with a higher risk of MSDs in the upper extremities (e.g. Bergqvist 1995; Ferreira et al 1997);
- Productivity is not unfavourably affected by the extra breaks (e.g. Dababneh et al 2001; Galinsky et al 2000);
- A break duration of 7,5 to 10 minutes is the best of the reviewed alternatives for both employees and employer (e.g. Boucsein & Thum 1997; Thé et al 1999);
- The break duration should be longer in the afternoon than in the morning (Boucsein & Thum 1997; Looze et al 2005);
- Active breaks (i.e. exercise) do not have more value, nor less value compared to passive breaks (i.e. rest) with respect to limitation of fatigue and discomfort during work, and regarding disorder reduction in employees with MSDs (e.g. Heuvel et al 2003; Mathiassen & Winkel 1996);
- Diversity in load intensity (as occurs in proper job rotation) has a positive effect on fatigue development in shoulder muscles (Mathiassen & Turpin-Legendre 1998; Sundelin 1993).

5 Discussion

We have decided to call the result of our project *recommendations*, and not *guidelines*, because we feel the results are not ‘strong’ enough to be labelled guidelines. To begin with, prospective research about the health effects of our recommendations is lacking. Thus, we can *recommend* companies and workers to follow the recommendation, but cannot *charge* them to do it. Secondly, the first recommendation is based on guidelines for the populations in general, and not the working population in particular. Thirdly, the second recommendation is based on intervention studies within specific work areas, while we have not examined the validity of an extrapolation to other work areas.

5.1 Considerations and choices regarding Recommendation I

The recommendations refer to an 8-hours workday. In case of shorter work periods, the recommended durations are reduced accordingly (e.g. 15 minutes of moderate-intensity activity on a 4-hour workday). For overweight and obese employees, though, the length of moderate-intensity physical activity in recommendation I should be extended to 60 minutes to affect body weight and body fat (Saris et al 2003).

We decided that the ACSM’s standard to develop and maintain cardio respiratory fitness (20 minutes of high-intensity activity on (at least) 3 workdays (Pollock et al 1998)) cannot replace the 30 minutes of moderate-intensity activity on 5 work days. While the intensity level is all right, the intensity period is too short. We also decided that the 30 minutes of activity may be accumulated during the day, and do not apply a lower limit to the duration of one activity bout (e.g. 5 minutes), as such is not described in the NNGB. Also, activity bouts of short duration will help to lose weight or change one’s attitude towards healthy physical activity. Moreover, short duration bouts are more easily put into daily work practice than 5-minute bouts. We do realise, though, that unbroken physical activity is required to affect the cardio-vascular system.

Furthermore, we did not include a recommendation on the total sitting duration of an 8-hour workday, for example 5 or 6 hours as is often proposed. A field study on the applicability of our recommendations to four of the target groups showed that a 5-hour sitting limit was too strict. Only 5% of 39 VDU-workers studied met this standard. Also, there is no evidence that prolonged sitting causes health disorders (Nordin 2004).

5.2 Considerations and choices regarding Recommendation II

The recommendations are meant for work-related low-intensity static loading of average precision, time pressure and emotional load. In case of higher than average precision (e.g. lots of mouse manipulation), higher than average time pressure (e.g. approaching deadline), and higher than average emotional load (e.g. troublesome client at the counter), the recommended work shift durations ought to be reduced and/or the recommended time-out durations increased. This suggestion stems from some recent studies. Epidemiological studies by van den Heuvel (2005) have shown that MSDs in the neck/shoulder area are associated with: high task demands, high efforts combined with low payment, and undue personal commitment. And experimental studies on high precision work have shown increased muscle activation and little alternation of activity between different parts of a muscle or between various muscles (review by Douwes and Huysmans (2006)). Sustained muscle activity in high precision work is thought to be required to suppress the neuro-motor noise, i.e. noise resulting from imprecise motor control (Galen & Müller 2001). At this moment, however, we have no sound scientific motivation to define alternative durations.

The recommendations are meant for work-related low-intensity static loading. In case of high-intensity static loading, for example as a result of high force exertion with the hands, other guidelines on physical workload should be applied (e.g. (Grinten et al 2004)). If more strict recommendations have been agreed upon within a company or a group of companies, for instance in collective bargaining agreements, these agreements have priority over our recommendations.

The number of intervention studies on work-related low-intensity static loading was limited, making the scientific basis of the current recommendations fairly small. We strengthened this basis by thorough discussions and a consensus meeting with TNO experts and by adjusting the recommendations after consulting external experts. We regard the current versions as a solid starting point; open to discussion, extension, fine-tuning, and practical application.

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