Introduction

Fatigue is one of the most prevalent health problems and dominates the stress related diagnoses that account for the increased levels of sickness absence in Sweden. Major factors behind fatigue is thought to be aging, sleep and work demands. This project sought to study the development of fatigue across aging and the relation of this development to stress and sleep. Importantly, we intended to study within-individual change over time, which is a unique approach compared to the previous cross sectional studies. We also link the development over time to presumably vulnerable occupational groups, such as those engaged in blue and white collar groups with exposure to high mental or physical work load (compared with other groups). We suspected that the popular assumption of increased fatigue across aging may not hold, but that aging may actually reduce alertness, although the work context and sleep problems may counteract this development in certain groups. 

The approach is new and the results will probably have an impact on the understanding of the development of fatigue and sleep in occupational groups as well as altering the view of elderly in the work force. The latter is likely to influence the optimal timing of retirement. It may also challenge scientific assumptions of the relation between sleep duration and fatigue. To investigate these issues we propose a study that uses two longitudinal registers with good information on fatigue, sleep, stress and sleepiness.

Prior work
Fatigue is usually seen as an inability to muster sufficient energy to carry out a task, or as a depletion of resources necessary for a task (Davies and Parasuraman, 1982). It is correlated with sleepiness but is not identical with that concept (Hossain et al., 2005). Fatigue is one of the most common medical symptoms (Chalder et al., 2010; Wessely et al., 1997). It is a central characteristic in the chronic fatigue syndrome (Sullivan et al., 2005), in burnout (Maslach and Leiter, 2005), in insomnia (Lichstein et al., 1997), as well as in health care consumption (Watt et al., 2000) and self-care ability (Visser and Smets, 1998), and plays a major role in sickness absence (Akerstedt et al., 2007; Janssen et al., 2003). The major determinants of fatigue are sleep loss, infections, stress and higher age (Avlund, 2010). The level of (work) stress is also a predictor of fatigue-based diagnoses like exhaustion syndrome (utmattningssyndrom) and maladaptive reaction to stress, which account for a large proportion of the sickness absence in Sweden (Försäkringskassan, 2014:17). Also cognitive impairment (Small et al., 2011) increases with age, as do sleep complaints, and sleep shortens (Ohayon and Bader, 2010).

It was suggested above that work stress and physical workload will influence fatigue. This means that different occupations may differ in the development of fatigue or sleep. However, data from Statistics Sweden (www.scb.se) indicates that physical fatigue is prominent in nursing, restaurant work and sales work among women and construction work and machine operating work among men. Sleep problems because of work are prominent in both gender among teachers and business economists, marketing specialists, HR personnel, social workers, as well as among leaders/supervisors in various areas.

Considering the importance of the development across time/age there is almost no data available from longitudinal studies, except for one study showing increased fatigue across 14 years (Westerlund et al., 2010). The problem with cross sectional studies is that they involve “cohort effects”, that is, there is likely to exist different life experiences in different cross-sectional age groups; the first formative years of life will differ considerably between, for example, todays 70 and 30 year olds. In addition, one needs to be able to follow individuals across time to understand developments and to be able to relate changes in one variable to those in another variable. We expect that the steepness of the age related changes in fatigue, sleep, and perhaps stress will be an important predictor of negative outcomes with increasing age. One might expect more dramatic changes in occupational groups with exposure to high work load (physical or mental). On the other hand, we have recently started to suspect that aging, in itself, may show reductions in fatigue if work load is adjusted for; this is based on laboratory studies (Dijk et al., 2010; Lowden et al., 2009). We can now test this hypothesis within the present project, adjusting for contributions from occupational groups. If the hypothesis is verified, society may need to change its negative view of older individuals in the work force. It may also influence decisions on the optimal timing of the official retirement age. And, it will change scientific thinking about the aging process.

It should be emphasized that fatigue has a close relation with sleepiness (Hossain et al., 2005), which will also be part of the present study. Sleepiness represents the tendency/need to fall asleep (Carskadon and Dement, 1987) and is strongly linked to insufficient sleep (Akerstedt et al., 2014). Sleepiness is also
associated with an increased risk of dementia (Hahn et al., 2013) and to cognitive problems in the general population (Ohayon and Vecchierini, 2002).

Purpose

The purpose was to study:
• the development of self rated fatigue, sleep quality, sleep duration, and sleepiness across a span of 8 years, in three different age groups at start (20-35 years, 36-49 years, and 50-64 years) with adjustment for occupation, and physical and mental workload.
• the development of psychosocial work demands, physical workload, self rated fatigue and sleep quality across a span of 8 years, in different occupations and in groups with different physical and mental workload, with adjustment for age at start.

2. Execution of the project

The database used is the “Swedish Longitudinal Occupational Survey of Health” (SLOSH). It is a nationally representative longitudinal study with follow-up every second year (from 2006 to 2014). It has a reasonable representation of individuals employed in health care, teaching, social work and administrators in private enterprise and government organizations. It has its origins in the Swedish Work Environment Survey (SWES), which in turn is based on nationally representative samples of the working population. The number of participants is 6580, all employed at the start of the study. The main variables for the present purpose are the same as in the WOLF cohort, and also includes additional indicators of fatigue (persistent fatigue, physical exhaustion, mental exhaustion) validated in burnout patients (Ekstedt et al., 2009).

For the analysis was used mixed model approaches for the change over time. First an analysis in three age groups across 8 years was carried out, with control for occupation In a second analysis change across aging was analyzed for the main occupational groups, with adjustment for age.

3. Achieved results

Study 1. Aging and the change in fatigue and sleep – a longitudinal study across 8 years in three age groups

The purpose of the present study was to investigate the trajectories of sleep and fatigue across 8 years of aging in a large group (N>8,000) of individuals. A second purpose was to investigate whether fatigue trajectories would differ between age groups, and whether different trajectories of fatigue would be reflected in a corresponding difference in trajectories for sleep variables.

Results from mixed model analyses showed that fatigue decreased across 8 years in all age groups, while sleep problems increased, non-restorative sleep decreased, weekend sleep duration decreased, and weekday sleep duration showed different patterns depending on age. Apart from trajectories across time, the lowest fatigue was seen in the oldest group, followed by the
intermediate group, and the youngest group. Furthermore, the larger the
decrease in fatigue, the larger was the increase in sleep duration across years,
the lower was the increase of sleep problems, and the larger was the decrease of
non-restorative sleep. Sleep duration did not change with aging (except for the
group who retired and showed increased sleep). Sleep problems increased
somewhat.

\[ \text{Figure 1. Change in fatigue across time for three age groups} \]

Taken together, the age related decrease in fatigue, weekend sleep duration, and
non-restorative sleep, as well as the decrease in sleep problems in the oldest
group suggest that aging, at least in relatively healthy individuals, seems to have
positive effects on fatigue and sleep. This runs counter to much previous
research based on cross-sectional cohorts. Since the findings on age-trajectories
of sleep and fatigue lack previous studies, there is a need for corroboration from
similar self-report approaches, but also from actigraphy or polysomnography.

See publication: Akerstedt T, Discacciati A, Miley-Akerstedt A, Westerlund H. Aging and
the Change in Fatigue and Sleep - A Longitudinal Study Across 8 Years in Three Age

Study 2 Development of work demands and sleep across eight years of
work/ageing in blue and white collar workers: A prospective study based on the
SLOSH cohort.

The purpose of this study was to investigate whether work demands change
across eight years of aging / increased work experience, and whether
occupational groups show different trajectories of change, and if such
trajectories are reflected in trajectories of sleep or fatigue. As a complement to
psychosocial work demands, also physical workload was included.
The results show that work demands decreased markedly across 8 years, with the strongest decrease in the high white-collar group, and the weakest in the blue-collar group. The oldest group showed a stronger decrease than younger groups. Physical workload decreased markedly, and particularly so in the blue-collar group (and not at all in the high white collar group). The decrease was larger in the older group than in the younger groups. Fatigue decreased, and sleep problems increased in a similar way in the occupational groups. The decrease in work demands was directly related to the decrease in fatigue, particularly in the high white-collar group. The large decrease in physical workload in the blue-collar group was related to an increase in workday sleep duration.

![Figure 2](image)

**Figure 2.** Change across time for work demands, physical workload, fatigue and sleep problems in three occupational groups.

The results suggest that increased time of exposure to work markedly reduces psychosocial work demands and physical workload with the strongest effects among high white-collar workers and blue-collar workers, respectively. The results also suggest a link between decreased work demands and decreased fatigue, mainly in high white-collar workers. The results suggest a positive development of work demands and workload across time. This observation also means that studies of the effects of work demands or physical workload on health need to take the improvement in work conditions into account in the analyses.

**See publication:** Torbjörn Åkerstedt, Andrea Discacciati, Hugo Westerlund: Development of work demands and sleep across eight years of work/ageing in blue and white collar workers: A prospective study based on the SLOSH cohort. Submitted.

**Discussion and conclusions**

The study shows that fatigue decreases with aging, in contrast with common belief and the oldest group report least fatigue, while the youngest group shows most fatigue. The reason is not clear, but one hypothesis is that the need for sleep decreases with aging {Akerstedt, 2018 #13911}. There is also the
contribution of reduced psychosocial work demands with aging, a reduction that was related to decreased fatigue. Also physical workload decreased with aging, but with a less obvious link to fatigue. The observed changes with age indicates that working life becomes less of a burden with increasing age. The data does not permit analysis of causation, but it is likely that increasing experience at work leads to less stress and less fatigue. Probably promotion may contribute. We suggest that the positive trend with aging should be recognized in discussions of the role of older individuals in working life.

References


4. Activities to ensure practical use of the results

With the second paper published we will start informing media.

5. Publications, presentations, other dissemination

We have submitted an abstract abstract for oral presentation to the World Sleep Meeting in Vancouver, Canada (September 2019): “The effects of eight years of aging on work demands fatigue and sleep in blue- and white-collar workers”

One paper has been published in a scientific journal.


Another paper has been submitted to a scientific journal

Torbjörn Åkerstedt, Andrea Discacciati, Hugo Westerlund: Development of work demands and sleep across eight years of work/ageing in blue and
white collar workers: A prospective study based on the SLOSH cohort. Submitted.

The study has been featured in Sydsvenskan 5 juli 2017, Expressen 21 mar 2018 17:10 och i SVT, Metro, Aftbladet 18 mar 2018., SVD 4 april. Svensk studie: Vi blir faktiskt piggare med åldern

När den andra artikeln blivit accepterad av en vetenskaplig tidskrift så kommer vi att gå ut med press release och informera dagspressen.