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The trait and occasion components of fatigue and their association with sickness absence

H. Hoofs[a,b,*], N.W.H. Jansen[a], M.W.J. Jansen[b,c], IJ. Kant[a]

[a] Department of Epidemiology, CAPHRI School for Public Health and Primary Care, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands

[b] Academic Collaborative Centre for Public Health Limburg, Public Health Service Southern Limburg, Geleen, The Netherlands

[c] Department of Health Services Research, CAPHRI School for Public Health and Primary Care, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands

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ABSTRACT

Objective: Fatigue is an important health outcome in public and occupational health care. To correctly understand and treat high levels of (prolonged) fatigue it is important to disentangle the state of fatigue into a time-varying (occasion) and -invarying (trait) component. Not only for understanding of the construct itself over time but also for its relation with (health) outcomes such as sickness absence.

Methods: Longitudinal data (n = 2316) from the Maastricht Cohort Study (MCS) study was used, which assessed fatigue across 4-month intervals using the Checklist Individual Strength (CIS).

Results: It was found that the occasion component explains 27.60% (95%-CI [25.80%; 29.40%]) of the variance of fatigue and the trait component 71.00% (95%-CI [69.00%; 72.90%]). The trait component was, furthermore, found to be a significant predictor of sickness absence.

Conclusion: Fatigue has a considerable time-invariant component. As this component is also related with other adverse health outcomes, preventive measures and interventions should take the difference between the occasion and trait component of fatigue into account.

1. Introduction

Fatigue is a common condition within the general population and is an important health problem [4,26,31]. Fatigue is, however, not a discrete disorder, but ranges from mild, frequent complaints to severe and prolonged characteristics. This multifaceted prolonged fatigue is found prevalent in the general population and can be a disabling condition being associated with various adverse health outcomes [1,25]. Also within the working population, fatigue plays an important role as it is found to be related to various negative health outcomes, such as sickness absence and subjective health complaints [5,17,30]. This high impact, in combination with an estimated 2-week prevalence rate of fatigue of around 38%, makes it an important concept within occupational health [32]. Whilst its importance seems irrefutable, the dynamics of fatigue are, however, poorly understood. That is, on the one hand, fatigue could be seen as a rather static construct, based on high correlations over time, with its state found to be rather robust [1,25]. This is also in line with findings which show that treatment of prolonged fatigue is difficult [21]. On the other hand, however, varying prevalence rates per sector, trade, and company and associated dynamic prognostic factors seem to suggest a more time-varying concept [18]. Based on these findings, it is likely that, on the continuum of fatigue employees show variation between occasions (time varying), but also to posit a certain trait-like (time-invariant) construct. Understanding these dynamics of fatigue is crucial for an enhanced understanding of the concept, its potential treatment and prevention.

To grasp the dynamics of fatigue it is important to disentangle its state. The state of fatigue is the observed level of fatigue of an employee at a specific moment in time. This observed state is, however, a combination of a time-invariant component and a component that varies over time. If measured longitudinally the observed level of fatigue can be disentangled into this time-invariant and time-varying component using a trait state occasion (TSO) model. The time-invariant component is the trait of fatigue which is stable over time. The trait component can, therefore, be regarded as the 'baseline' of an individual. A high trait implies, in general, high levels of fatigue. The trait component as such is a static characteristic of an individual. To fully account for the observed state, however, the trait should be combined with the occasion-specific level of fatigue. The occasion component can be thought of as the result of variations in the (working) environment of an employee. This trait-

* Corresponding author at: Department of Epidemiology, School CAPHRI Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands.
E-mail address: Huub.Hoofs@maastrichtuniversity.nl (H. Hoofs).

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occasion breakdown illustrates that, for individual employees, the same score may have different compositions. That is, an employee with an observed level of fatigue of '15' can have a high trait fatigue (i.e. '12') and low occasion fatigue (i.e. '3') or have a low trait fatigue (i.e. '4') and a high occasion fatigue (i.e. '11'). It should be noted, however, that in this simple example the former employee will have a higher state of fatigue as her or his trait level is higher. In other words, the scores of this employee will fluctuate around this baseline as a function of the current occasion component.

The disentanglement of the state of fatigue reveals whether it is strongly trait-like, entails a strong occasion-specific variance, or somewhere in between. For example, variance in depressive symptoms among adolescents is explained for 46% by a trait component and for 48% by an occasion-specific component [29]. The remaining 6% is explained by the auto-regressive (regression between consecutive occasions) component which connects successive occasions. Depending on the spacing between intervals, rapid successive occasions are more alike than more distant successive occasions [10]. Disentangling fatigue into a trait and occasion component can enhance further understanding of the concept of fatigue, which in turn can enhance successful development and implementation of preventive measures [14,27]. A strong time-varying component would, for instance, merit a different approach for effective treatment compared to a concept in which the trait component is most prominent. Moreover, employees with a different composition of occasion-specific and trait fatigue are likely to be receptive for different sorts of treatments and interventions. Occasion-specific fatigue could be associated with time-varying aspects such as a (temporary) high job strain. Potential interventions should, therefore, target the occasional aspects. As a high trait of fatigue is more static over time, more thorough interventions would be preferred (e.g. cognitive behavioral therapy).

Besides an enhanced understanding of fatigue and its potential treatment, disentanglement of fatigue into an occasion and trait component can also shed light on its relation with *other* health outcomes [29]. A significant health outcome is sickness absence which is a source of marked distress for the employee and has high direct and indirect costs for employers, employee, and society [12]. Sickness absence is, as such, a pressing problem urging for preventive measures. Studies focus, therefore, on the observed state of fatigue and its association with sickness absence (e.g. [5,17]). This association between fatigue (i.e. its state) and sickness absence can, however, also be disentangled into the association between sickness absence with the (a) occasion and the (b) trait component of fatigue using the TSO model. This disentanglement may greatly clarify the dynamics that form the association between fatigue and sickness absence [9,20]. Furthermore, it gives insight into the role of the different components in the development of sickness absence and their potential as preventive measure [7]. That is, different sorts of preventive measures are likely to be more or less successful depending on whether the occasion or the trait component is the dominant factor in the association between fatigue and sickness absence.

To gain a deeper understanding of the relation between fatigue and sickness absence it is important to distinguish different forms of absence. In the literature short-term sickness absence and a high absence frequency are found to be partly related to attitude [19]. Long term sickness absence is suggested to be related to poor health and inability to perform work tasks [13]. In this context, long-term sickness absence is often referred to as a primarily involuntary and necessary absence measure, whilst short term absence and absence frequency can be seen as primarily voluntary absence measures. This difference shows how important it is to differentiate the underlying mechanisms of both forms of sickness absence. Notice that, the relation between the occasion and trait component of these different forms of sickness absence could differ as well. In conclusion, both the breakdown of fatigue into an occasion and trait component and the breakdown of the association between fatigue and short- and long-term sickness absence across these components are crucial for a deeper understanding on how a reduction of fatigue may lead to the prevention and reduction of sickness absence. The goal of the current study is, therefore, twofold:

1. Breakdown of the observed state of fatigue, which is longitudinally measured with an interval of 4 months, into a trait and occasion component.
2. Breakdown of the association of fatigue and short- and long-term sickness absence among these trait and occasion components.

2. Methods

2.1. Sampling and procedures

This study is based on data from the ongoing Maastricht Cohort Study (MCS), using its first 10 waves (T0–T9). The MCS was set up in May 1998 including 12,140 participants from 45 different companies. At baseline measurement, all included participants were aged between 18 and 65 [18,24]. Written informed consent was obtained from all participants. The study was of a strict observational nature and was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Between wave T8 and T9, which was a 16-month interval, company absence records were also available to measure sickness absence. These records were available for 13 of the 45 companies, covering 6603 employees (21.53% female) at baseline (T0). It was, furthermore, necessary that employees did not switch companies as otherwise incomplete information was present regarding sickness absence during this period. Employees were therefore excluded if they were non-respondent on any of the 9 waves. Spacing between the waves was 4 months, except between T8 and T9 for which the interval was 16 months. All employees who returned the baseline questionnaire received the two short questionnaires T1 (response rate [rr] 87.61%, n = 5785) and T2 (rr = 79.48%, n = 5248) as well. Employees returning the baseline questionnaire and at least one of the short questionnaires received the extensive questionnaire T3 (rr = 71.83%, n = 4743). Employees returning the T3 questionnaire also received the short questionnaires T4 (rr = 67.01%, n = 4425) and T5 (rr = 63.32%, n = 4181). Employees who returned the questionnaire at T3 and at least one of the consecutive short questionnaires also received the extensive questionnaire T6 (rr = 57.50%, n = 3797). Again, employees returning the T6 questionnaire also received the short questionnaires T7 (rr = 54.93%, n = 3627) and T8 (rr = 52.76%, n = 3484). The T9 questionnaire was the last wave included in the current study (rr = 39.59%, n = 2614). For a detailed description of the MCS study population see Kant et al. [18].

From these 2614 employees only the 2316 employees were included who did not indicate a change of employer. Employees were additionally excluded if they were pregnant or had multiple jobs. Pregnancy could highly influence the fatigue measurement and for employees with multiple jobs not all sickness absence information was present. This resulted in a final study population of 2168 employees.

2.2. Measures

2.2.1. Fatigue

Fatigue was measured with the Checklist Individual Strength [2,34]. This questionnaire includes four subscales of which only the subjective fatigue experience (8 items) was used in the present study. Each item includes a statement (e.g.: Thinking requires effort) applying to the last two weeks which has to be scored on a 7-point Likert scale (yes, this is true to no, this is not true). Within the MCS the Cronbach's α was 0.93 [3]. Due to model complexity issues it was not possible to construct a model incorporating all 20 items and four latent factors at once. For the main analysis, therefore, the subjective fatigue subscale, with its corresponding 8 items, was used to illustrate the dynamics of an important aspect of fatigue also in relation to sickness absence.