

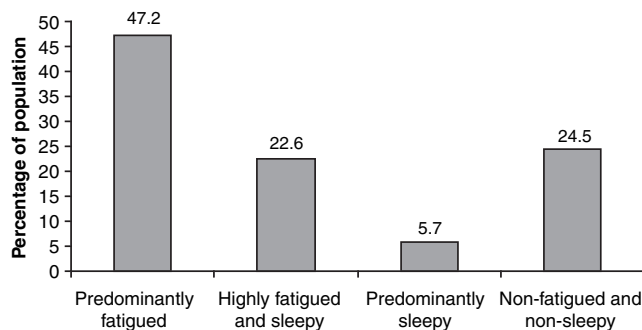
## Letter to the Editor

### What have fatigue and sleepiness in common?

Hossain *et al.* (2005) have recently suggested that fatigue and sleepiness can be independent consequences of sleep disorders. They found that a majority (64%) of referred patients with sleep disorders had pathological fatigue scores without overlap of sleepiness, while only 4% had pathological sleepiness without overlapping fatigue. To clarify the relationship between fatigue and sleepiness is of general interest since fatigue is a frequently encountered symptom also in other diseases such as multiple sclerosis (MS), where fatigue is one of the most disabling symptoms.

Here we present data on the relationship of fatigue and sleepiness in a sample of 53 patients (39 females, 14 males) with relapsing-remitting or secondary progressive MS from an ongoing study on fatigue and actimetry in MS patients. Patients had a mean age of  $42 \pm 11$  years. Mean duration of the disease was  $7.3 \pm 6.7$  years and the mean score on the Expanded Disability Status Scale (EDSS) was  $2.8 \pm 1.5$ . All patients were under treatment with Interferon-beta 1b (Betaferon). Exclusion criteria were psychoactive medication or treatment with corticosteroids during the last 3 months. The patients completed different questionnaires, two of them addressing fatigue and sleepiness. As in the study by Hossain *et al.* (2005) fatigue was assessed by the Fatigue Severity Scale (FSS; Krupp *et al.*, 1989) and sleepiness by the Epworth Sleepiness Scale (ESS; Johns, 1991). Mean ( $\pm$ SD) scores were  $4.2 \pm 1.6$  for the FSS, and  $8.3 \pm 3.7$  for the ESS. We adopted from Hossain *et al.* an FSS cut-off scores  $>3$  for increased fatigue and an ESS cut-off score  $>10$  for pathological sleepiness.

As in the Hossain *et al.* analysis we classified the MS patients into four groups according to their FSS and ESS scores. Twenty-five patients (47.2%) were fatigued but not sleepy, 12 patients (22.6%) were both fatigued and sleepy while only three patients (5.7%) were not fatigued but sleepy. The remaining 13 patients (24.5%) were neither fatigued nor sleepy (Fig. 1). The observed proportions are close to those reported by Hossain *et al.* for patients with sleep disorders, 63.9% scored high on fatigue only, 19.1% on fatigue and sleepiness, 3.9% on sleepiness only and 13.1% neither on fatigue nor on sleepiness. The data from both samples suggest that self-rated



**Figure 1.** Frequency and percentage of the four groups in the sample of  $n = 53$  patients with multiple sclerosis.

fatigue and sleepiness are two dimensions, which vary independently to a large degree.

However, while Hossain *et al.* reported a low correlation ( $r = 0.18$ ) between FSS and ESS total scores, this correlation was higher and significant ( $r = 0.52$ ,  $P < 0.001$ ) for our sample of MS patients. To further explore the relationship between the two scales, we have performed a single-item analysis (chi-squared tests). Taking multiple testing into account, only  $P$ -values  $\leq 0.01$  were accepted as statistically significant. Four of eight ESS items were significantly related to one or more FSS items, namely the items ESS 1 (sitting and reading), ESS 2 (watching TV), ESS 3 (sitting, inactive in a public place, e.g. a theatre or a meeting) and ESS 4 (as a passenger in a car for an hour without a break). From the nine FSS items, only three (FSS 1, FSS 3 and FSS 4) were significantly related to single ESS items.

The single-item analysis showed that there is limited overlap between both scales, and that the correlation between the FSS and ESS total scores depends essentially on a subset of items. The four ESS items, which were significantly related to FSS items describe situations where patients tend to fall asleep unintentionally while sitting more or less inactive. The four remaining ESS items, which did not correlate significantly with FSS items, describe situations where sleepiness is either intended or at least not clearly avoided, as in item 5 ('Lying down to rest in the afternoon when circumstances permit') and item 7 ('Sitting quietly after a lunch without alcohol'), or situations, where sleepiness would be absolutely inappropriate as in items 6 ('Sitting and talking to someone') and 8 ('In a car, while stopped for a few minutes in traffic'). It would be of interest to see whether patients with sleep disorders show a

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similar pattern of single-item relationship between ESS and FSS as patients with MS before discussing the range of overlap between both scales in greater detail.

In conclusion, fatigue and sleepiness are two dimensions with only limited overlap in patients with sleep disturbances and in those with MS. In both samples fatigue without sleepiness was frequent while sleepiness without fatigue was rare. In addition, a single-item analysis showed that only a subset of ESS items is significantly correlated with fatigue, as measured by the FSS.

#### ACKNOWLEDGEMENTS

The study was sponsored by Schering Deutschland GmbH.

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