

Working Overtime Hours: Relations with Fatigue, Work Motivation, and the Quality of Work

Debby G. J. Beckers, MA
Dimitri van der Linden, PhD
Peter G.W. Smulders, PhD
Michiel A. J. Kompier, PhD
Marc J. P. M. van Veldhoven, PhD
Nico W. van Yperen, PhD

Objectives: We sought to better understand the relationship between overtime and mental fatigue by taking into account work motivation and the quality of overtime work and studying theoretically derived subgroups. **Methods:** We conducted a survey-study among a representative sample of the Dutch full-time workforce ($n = 1807$). The prevalence of overtime work and the associations between overtime and job demands, job variety, decision latitude, fatigue, and work motivation was studied through descriptive statistics. We used MANCOVA (covariates: age, gender, salary level) to compare six overtime-fatigue subgroups with respect to work motivation and job characteristics. **Results:** A total of 67% of the respondents worked overtime (mean, 3.5 hours). Overtime workers appeared to be nonfatigued, motivated workers with favorable work characteristics. MANCOVA revealed no significant overtime-fatigue interaction. **Conclusions:** Moderate overtime is common among Dutch workers, who seem to be happy workers with attractive jobs rather than fatigued employees. (*J Occup Environ Med.* 2004;46:1282–1289)

Overtime work is a common phenomenon all over the world. In Japan, workweeks that exceed 60 hours are no exception. It is well documented that this extreme type of overtime work can have severe health consequences and may eventually lead to death (“karoshi”).^{1,2} In Europe, detailed representative (inter)nationally comparable data on the prevalence of overtime work are scarce. A notable exception is a study by Merllié and Paoli,³ which shows that 20% of the employees work, on average, more than 44 hours a week. Occupational health research demonstrates that overtime work may be associated with health problems such as high blood pressure, increased risk of cardiovascular disease, and diabetes. Furthermore, overtime appears to be related to mental health problems such as depression and psychological distress.^{4,5,6}

Various researchers^{4,7} have argued that the relationship between overtime and health problems may be understood in terms of a chronic imbalance between effort expenditure at work and the opportunities to recover from work. After all, overtime not only leads to more effort investment but also to less time for recovery after work.⁸ Accordingly, one would expect a relatively strong relationship between the number of overtime hours and a recovery-indicator such as mental fatigue. Ample studies, however, indicated that the relationship between overtime and mental fatigue is either significant but low or not

From the Department of Work and Organizational Psychology, Radboud University Nijmegen (Ms Beckers, Dr van der Linden, Dr Kompier, Dr Van Yperen); TNO Work & Employment, Hoofddorp (Dr Smulders); University of Tilburg, Tilburg (Dr van Veldhoven); and University of Groningen, Groningen, The Netherlands (Dr van Yperen).

Address correspondence to: Debby Beckers, Department of Work and Organizational Psychology, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands; E-mail: d.beckers@psych.ru.nl.

Copyright © by American College of Occupational and Environmental Medicine

DOI: 10.1097/01.jom.0000147210.95602.50

significant at all (r ranging from 0.00–0.12).^{5,9,10}

We believe that at least five possible explanations for the weak overall association between overtime and mental fatigue can be distinguished: 1) Restriction of range in the amount of overtime: to demonstrate associations between overtime work and fatigue, enough variance in overtime is necessary; a study without contrast in amount of overtime work is unlikely to yield a correlation between overtime and any outcome variable; 2) Restriction of range in fatigue: employed workers mostly constitute a relatively healthy subset of the total population. It may well be that overtime workers who persevere in working overtime in turn constitute a healthy and nonfatigued subset of the total population of (overtime) workers. This might lead to an underestimation of the true relationship between overtime and fatigue; 3) Not paying attention to the quality of overtime work^{4–6}: whereas previous research mostly studied overtime from a quantitative perspective (number of hours worked overtime), there are strong indications that it is also the quality of overtime work that counts. A recent study, for example, suggests that overtime work might only be related to health problems under adverse psychosocial working conditions;¹¹ 4) Overtime work may be fun: not only may high-quality overtime work be unrelated to health problems (negative outcomes), it may also have positive outcomes, that is, contribute to psychological health, work motivation, and work satisfaction;^{12,13} 5) Weak and insignificant associations between overtime work and fatigue in the total study population may conceal different patterns within meaningful subgroups, for example, subgroups with different overtime-fatigue profiles.

To assess the relationship between overtime work and fatigue, these five issues need to be taken into account. Preferably, such a study: 1 and 2) should be based on a large, hetero-

geneous, and representative sample of employees with enough contrast with respect to overtime hours and fatigue; 3) should take into account the quality of overtime work; 4) should address potential positive outcomes such as work motivation as well; and 5) should differentiate between theoretically specified subgroups.

The current study meets these design-demands because it: 1 and 2) uses a large and representative sample of the Dutch workforce; 3) includes the three most important psychosocial job characteristics, that is, job demands, job variety, and decision latitude¹⁴ as indicators of the quality of (overtime) work; 4) not only considers a possible negative health indicator (fatigue), but also a positive indicator (work motivation); and 5) differentiates between subgroups of employees, with different overtime-fatigue profiles. In this context, the aim of the current research was to answer two related questions:

1. What is the prevalence of overtime work, and to what extent is the amount of overtime work related to (a) fatigue, (b) work motivation, and (c) the quality of (overtime) work (job demands, job variety, decision latitude)?
2. To what extent do subgroups of fatigued and nonfatigued (non) overtime workers differ with respect to quality of work (job demands, job variety, decision latitude) and work motivation?

Materials and Methods

Sample and Procedures

The data were collected as part of a questionnaire study on the work situation of Dutch employees.¹⁵ A random sample of 8000 persons was drawn from the total Dutch workforce, and 4009 workers (50%) actually completed the questionnaire. To relate potential differences in fatigue and work motivation to differences in overtime hours per se and not to the number of contractual work

hours, only respondents who reported more than 32 contracted work hours a week were included in our study. Consequently, the final sample consisted of 1807 persons (77% males, 23% females). Respondents ranged in age from 16 to 63 (mean, 41.7 years) and worked on average 38.5 work hours on contract. The sample may be considered to be representative for the total Dutch full-time working population in terms of age, salary level, and contracted work hours.¹⁶

Measures

Overtime Work. Overtime hours were assessed with the following item: “On average, how many hours a week do you work overtime?” (paid AND unpaid overtime work; include work you execute at home; DON’T include your commuting time).

Quality of (overtime) work. Job demands were measured with five items from the “Job demands” scale of the Job Content Questionnaire.¹⁷ A sample question is: “Do you have to work very fast?” Job variety was measured with five items from the scale “Skill discretion” of the JCQ, for example: “Do you get to do a variety of different things on your job?” Decision latitude was measured using five items from the “Decision latitude” scale of the JCQ. An exemplary question is: “Do you have the freedom to decide how to do your job?” The items of these three scales are scored on a four-point Likert scale, ranging from 1, “never,” to 4, “always.” Higher scores on these scales indicate higher (quantitative) workload, more job variety and more decision latitude, respectively. Cronbach’s α were 0.83, 0.74, and 0.83, respectively.

Fatigue. Fatigue was measured with five items from the Dutch version of the Maslach Burnout Inventory.¹⁸ An example item is: “I feel used up at the end of the workday” (1 = “never,” 7 = “every day”). Cronbach’s α was 0.91. Norm-scores were available for this measure,

which made it possible to qualify a respondents' score as being "high" or "low" (see below).

Work Motivation. The 10 work motivation-items were derived from the Work-engagement scale.¹⁹ Typical items are: "When I get up in the morning, I am motivated to go to work" and "I am enthusiastic about my work." Items are scored at a five-point scale, ranging from 1, "hardly ever," to 5, "always." Cronbach's α was 0.91.

For each respondent, we averaged the item scores per measure into single indicators.

Covariates. To ensure that associations between the study-variables were not caused by confounding personal characteristics, we controlled for the potential impact of gender (male/female), age, and salary-level (five levels).

Statistical Analyses

Question 1 was answered through descriptive statistics (means, correlations). As for Question 2, we first distinguished between respondents with high levels of fatigue and respondents with low fatigue levels, based on norm scores determined by Schaufeli and Van Dierendonck.¹⁸ These norm scores were established using a large sample of the Dutch workforce. The norms for low (scores between 1.0 and 1.99) and high fatigue (scores greater than 3.20) were based on the lowest and

highest quartile scores of their norm sample, respectively.

Next, we distinguished between three overtime subgroups: employees who did not work overtime at all, those who worked relatively low overtime, and those who worked relatively much overtime. On the basis of Barton and Folkard,²⁰ Folkard,²¹ and Harrington²² we assigned respondents to the "high-overtime group" if the quantity of overtime hours exceeded 20% of the contracted working hours. Respondents whose amount of overtime hours ranged between 1% and 20% of the contracted working hours were assigned to the "low-overtime group." Employees who did not work overtime were part of the "no-overtime group."

To answer Question 2, a MANCOVA was conducted with overtime (no, low, high) and fatigue (fatigued vs. nonfatigued) as between subject factors, and job demands, job variety, decision latitude, and work motivation as 'dependent' variables. Gender, age, and salary level were included as covariates.

Results

Question 1: Prevalence and Correlates of Overtime

In the present sample 67.3% worked overtime (mean, 3.52 hours a week; Table 1); 39.3% worked 1 to 4 hours overtime; 14.8% 5 to 8 over-

time hours; 8.8% worked 9 to 12 overtime hours; 1.8% worked on average 13 to 16 overtime hours, and another 1.8% 17 to 20 overtime hours a week. Finally, less than 1% reported more than 20 weekly overtime hours. The remaining 32.7% reported no overtime hours at all.

Table 1 presents the prevalence of and associations between the study variables in the total sample. From this Table, it follows that these respondents reported on average a medium amount of job demands (mean, 2.52, with 2 equaling "sometimes" and 3 equaling "often") whereas they often (mean, 3.02, with 3 equaling "often") had job variety and decision latitude (mean, 2.93). When compared with the norm scores,¹⁸ their average fatigue level was moderate (mean, 2.67, "less than once a month"), whereas their level of work motivation was rather high (mean, 3.45, with 3 equaling "regularly" and 4 equaling "often").

Table 1 also demonstrates that no general association was found between the amount of overtime and fatigue. Interestingly, there was a significant general association between the amount of overtime and work motivation: higher levels of overtime were related to higher levels of work motivation. As could be expected, the amount of overtime was positively related to job demands. Working overtime also was positively related to higher levels of

TABLE 1
Means, Standard Deviations and Correlations Among the Main Variables in This Study ($n = 1807$)

Variable	Mean	s.d.	1	2	3	4	5	6	7	8
1. Overtime	3.52	4.63								
2. Job demands	2.52	0.57	0.28**							
3. Job variety	3.02	0.51	0.17**	0.22**						
4. Decision latitude	2.93	0.59	0.10**	0.06*	0.26**					
5. Fatigue	2.67	1.36	0.04	0.34**	-0.05*	-0.15**				
6. Work motivation	3.45	0.76	0.21**	0.14**	0.46**	0.28**	-0.35**			
7. Age	41.67	10.49	0.01	0.08**	0.04	0.06**	-0.04	0.12**		
8. Gender†	-	-	-0.08**	0.06*	-0.01	0.00	0.09**	-0.05*	-0.29**	
9. Salary-level‡	3.07	1.07	0.24**	0.16**	0.21**	0.21**	-0.08**	0.14**	0.32**	-0.22**

* = $P < 0.05$. ** = $P < 0.01$

† 1 = male, 2 = female

‡1 = 0-999; 2 = 1000-1499; 3 = 1500-1999; 4 = 2000-2500; 5 = >2500 Euro.

job variety and decision latitude. Finally, higher levels of job motivation went together with lower levels of fatigue, and vice versa.

Question 2: Differences Between Fatigued and Nonfatigued (Non) Overtime Workers

To differentiate between fatigued and nonfatigued subgroups, 603 respondents who were moderately fatigued according to the norm scores (scores 2.00 to 3.19) were excluded from further analyses. The remaining sample (*n* = 1204) approximately equaled the total sample (*N* = 1807) with respect to percentages of age-groups, gender, and salary-level as well as with regard to the mean levels of job demands, job variety, decision latitude, and work motivation (Table 2).

Our categorization (high/low/no overtime versus fatigued/nonfatigued) of the remaining 1204 respondents resulted in six different subgroups: 1) no overtime/nonfatigued; *n* = 240; 2) low

overtime/nonfatigued; *n* = 309; 3) high overtime/nonfatigued; *n* = 103; 4) no overtime/fatigued; *n* = 171; 5) low overtime/fatigued; *n* = 293; 6) high overtime/fatigued; *n* = 88.

The subgroups obviously differed with respect to number of overtime hours and fatigue in accordance with our “manipulation” (see Table 3 for means). The high-overtime groups (nonfatigued and fatigued) reported significantly more overtime hours than the low-overtime groups (nonfatigued and fatigued), which in turn reported significantly more overtime hours than the no-overtime groups (nonfatigued and fatigued; $F[2,1663] = 762.97; P < 0.001$). Similarly, irrespective of the number of overtime hours, the fatigued and nonfatigued respondents differed significantly on fatigue ($F[1,1104] = 1487.58; P < 0.001$), with the “fatigued” respondents reporting most fatigue.

High-fatigue respondents (*n* = 552) and low-fatigue respondents

(*n* = 652) did not differ significantly with regard to overtime hours ($F[1,1104] = 0.47; P = 0.49$) nor did the overtime groups (no/low/high) differ significantly on fatigue ($F[2,1663] = 0.40; P = 0.67$), which is in accordance with the above reported not significant overall correlation between overtime and fatigue.

As shown in Table 4, MANCOVA revealed a multivariate main effect of overtime. The overtime groups differed from each other with respect to job demands, job variety, decision latitude, and work motivation.

Follow-up analyses indicate that respondents with much overtime reported significantly higher job demands (mean, 2.81), job variety (mean, 3.17), decision latitude (mean, 3.04), and work motivation (mean, 3.75) than the no-overtime workers (respectively; mean, 2.30; mean, 2.89; mean, 2.83; mean, 3.26; $P < 0.05$). The high-overtime workers also reported significantly more job demands, decision latitude, and work motivation than respondents from the low-overtime group (respectively; mean, 2.57; mean, 2.95; mean, 3.49; $P < 0.05$). The low-overtime group, in turn, differed significantly from the no-overtime group on job demands, job variety, decision latitude, and work-motivation ($P < 0.05$).

There also was a significant multivariate main effect of fatigue. Fatigued respondents reported more job demands (mean, 2.76), less decision latitude (mean, 2.81), and less work motivation (mean, 3.12) than nonfatigued respondents (respectively; mean, 2.30; mean, 3.03; mean, 3.72).

As there were no significant overtime-fatigue interaction effects, the two main effects of overtime and fatigue appeared to be statistically independent, not multiplicative. That is, the main “effect” of fatigue on job demands, decision latitude, and work motivation holds true for all levels of overtime, that is, for both (high and low) overtime workers and for non-overtime workers alike. Moreover, for both levels of fatigue, more over-

TABLE 2
Characteristics of the Total Sample (Including NonFatigued, Moderately Fatigued, and Fatigued Respondents) and the Sample Without the Moderately Fatigued Respondents

	Total sample (<i>n</i> = 1807)	Sample without moderately fatigued respondent (<i>n</i> = 1204)
Gender		
Male	76.8%	78.0%
Female	23.2%	22.0%
Age-groups		
15–25	5.6%	4.7%
26–35	27.1%	26.2%
36–45	28.4%	29.0%
46–55	28.2%	28.2%
56–64	10.6%	12.0%
Salary-level (Euro)		
0–999	2.8%	3.1%
1000–1499	32.3%	32.0%
1500–1999	33.9%	34.4%
2000–2500	17.6%	16.7%
>2500	13.5%	13.7%
Job demands	M = 2.52 (SD = 0.57)	M = 2.51 (SD) = 0.60
Job variety	M = 3.02 (SD) = 0.51	M = 3.01 (SD) = 0.52
Decision latitude	M = 2.93 (SD) = 0.59	M = 2.93 (SD) = 0.60
Work motivation	M = 3.45 (SD) = 0.76	M = 3.44 (SD) = 0.80

TABLE 3
Means on Overtime and Fatigue of the Six 'Overtime/Fatigue Subgroups'*†

	Overtime		
	No	Low	High
Nonfatigued	Subgroup 1 $M_{\text{overtime}} = 0.0$ $M_{\text{fatigue}} = 1.4$ $n = 240$	Subgroup 2 $M_{\text{overtime}} = 3.1$ $M_{\text{fatigue}} = 1.5$ $n = 309$	Subgroup 3 $M_{\text{overtime}} = 12.1$ $M_{\text{fatigue}} = 1.4$ $n = 103$
Fatigued	Subgroup 4: $M_{\text{overtime}} = 0.0$ $M_{\text{fatigue}} = 4.5$ $n = 171$	Subgroup 5: $M_{\text{overtime}} = 3.2$ $M_{\text{fatigue}} = 4.3$ $n = 293$	Subgroup 6: $M_{\text{overtime}} = 12.6$ $M_{\text{fatigue}} = 4.6$ $n = 88$

*Subgroup-pairs (1 and 4), (2 and 5), and (3 and 6) differ significantly from one another with respect to the amount of overtime hr ($P < 0.001$).

†Subgroups 1, 2, and 3 differ significantly from subgroups 4, 5, and 6 on fatigue ($P < 0.001$).

TABLE 4
Results of a Multivariate Analysis of Covariance (MANCOVA), with Age, Gender (1 = Male, 2 = Female), and Salary Level (1 = 0–999; 2 = 1000–1499; 3 = 1500–1999; 4 = 2000–2500; 5 = > 2500 Euro) as Covariates

Overtime (O)	Multivariate		Univariate
	F(8,2118)		F(2,1062)
	8.63***	Job demands	21.65***
		Job variety	9.42***
		Decision latitude	6.28**
		Work motivation	14.41***
Fatigue (F)	Multivariate		Univariate
	F(4,1059)		F(1,1062)
	17.37***	Job demands	17.85***
		Job variety	0.06
		Decision latitude	9.36**
		Work motivation	30.60***
O × F	Multivariate		Univariate
	F(8,2118)		F(2,1062)
	1.66	Job demands	1.39
		Job variety	1.26
		Decision latitude	1.47
		Work motivation	2.48

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

time is related to more job demands, decision latitude, job variety, and work motivation.

Discussion

This study was designed to examine the prevalence of overtime work and the relationship between the number of overtime hours on the one hand and fatigue, work-motivation, and the psychosocial quality of work on the other. Furthermore, to gain insight into why some employees who work overtime are fatigued, whereas others are not, we examined

if and how fatigued and nonfatigued (non) overtime workers differed with respect to quality of overtime work and work motivation.

Regarding the prevalence of overtime work, we found that moderate overtime was common in our sample of Dutch full-time workers: approximately two thirds reported working overtime, and more than 50% worked 1 to 8 overtime hours per week. Extreme overtime work (total working hours >60 a week)¹⁰ hardly occurred in our sample. Less than 1% of the respondents reported

working more than 60 hours per week.

In line with several previous studies on overtime, we found no general association between overtime hours and fatigue. On the contrary, the pattern of associations between overtime, work quality, and work motivation suggests that overtime workers in our sample are employees with relatively favorable work characteristics (high decision latitude, high job variety, high job demands) who are enthusiastic about their job (high work-motivation). Therefore, on average, overtime workers seem to be “happy” workers with active and attractive jobs, rather than fatigued employees (question 1). However, it would be too straightforward to conclude “overtime is fun.” Some previous studies did find associations between overtime hours and health complaints, and several researchers^{4,5} emphasized that the true extent of the relationship between overtime work and fatigue-related outcomes may be obscured by lack of attention for moderating variables. Our second question addressed this latter issue in more detail. To obtain more insight into the circumstances under which overtime coincides with fatigue, we compared different theoretically derived subgroups of employees (fatigued and nonfatigued employees with no, low, or high overtime). Our results show that, relative to nonfatigued overtime workers, fatigued overtime workers reported higher job demands, less decision latitude, and less work motivation. Hence, one might conclude that overtime work is related to fatigue in case of an adverse psychosocial work environment. Although strictly spoken this conclusion is not wrong, it does not give a complete picture of the relationship between overtime work, fatigue, psychosocial work characteristics, and work motivation. That is, also fatigued *nonovertime* workers reported worse psychosocial work characteristics and less work motivation than nonfatigued *nonovertime* workers. Thus, regardless of *over-*

time work, adverse psychosocial work characteristics appear to be related to fatigue and low work-motivation. This finding suggests that overtime work does not appear to be the decisive factor for fatigue (question 2).

It is important to note that the present study deals with *nonextreme* overtime work. Particularly chronic extreme overtime work (> 60 work hours a week), which is quite common in Asia²³ and in particular professions (ie, doctors and truck drivers),^{24–26} is likely to lead sooner or later to fatigue “anyway,” ie, even in case of a well-designed psychosocial work situation, because chronic extreme overtime work requires constant effort of employees and prohibits adequate recovery. This chronic lack of recovery may manifest itself in fatigue, and in the long run in health problems, including psychosomatic complaints, emotional exhaustion, sleep problems, and cardiovascular disease.^{27–29}

Strong Assets, Study Limitations, and Recommendations for Future Research

We have argued that at least five design requirements need to be addressed in a study on the overtime–fatigue relationship. These refer to: restriction of range (1, 2), quality of overtime work (3), the motivating potential of work (4), and subgroups (5). These five design requirements are met in the present study. “Restriction of range in overtime hours” does not seem to be a major concern, as the amount of overtime hours ranged from 0 to 30 hours a week. Although 80% of the sample reported working less than 6 overtime hours and therefore only a small proportion of the sample reported a high amount of overtime, it may be concluded that there is enough contrast with respect to the occurrence of overtime hours. Moreover, our sample is large and representative, so these prevalences may be regarded

as a valid reflection of the total Dutch population of full-time workers.

Another strength of the present research is that we distinguished between fatigued and nonfatigued respondents based on validated norm-scores.¹⁸ Brenninkmeyer and Van Yperen³⁰ showed that individuals who were labeled “fatigued” according to these norm-scores were indeed severely fatigued. Furthermore, restriction of range in fatigue is not an issue in our study considering that both the fatigued and the nonfatigued subgroups were large ($n = 552$ and $n = 652$, respectively). This reduces the potential influence of a healthy worker effect as well. Thus, it is unlikely that the absence of a general association between overtime and fatigue is due to a lack of variation in overtime work and/or a specific selection of healthy workers.

We believe that another strong point follows from the third design-demand: We took into account the quality of overtime work (the amount of job demands, job variety, and decision latitude). Fourth, we not only addressed the relationship between overtime work and a negative indicator of well-being (fatigue) but also a positive indicator of well-being (work-motivation). Finally, we differentiated between six meaningful overtime/fatigue-subgroups, thus addressing fatigued and nonfatigued subgroups with (high/low) and without (no) overwork. This gave us the opportunity to assess under what conditions overtime ‘contributes to’ fatigue.

Despite these assets, the study had some limitations as well. A first limitation is the cross-sectional nature of our study, which implies that no causal inferences can be made. Currently, it remains unclear, for example, whether work motivation is an antecedent of overtime work, whether overtime work increases work motivation, or both. It is our conviction that traditional one-shot one-directional cause-effect interpretations (eg, “motivation leads to

overwork”; “overwork leads to fatigue”) are too simplistic schemata for understanding the dynamic within-persons relations between work behaviors (such as overwork), the willingness to spend effort (motivation), and individual “outcomes” such as fatigue or satisfaction. Most probably, these variables mutually influence each other over time: across time the same variable can thus influence another variable and in turn be influenced by that other variable (reciprocal relations).³¹ To illustrate this intertwining, let us consider two potential trajectories of two possible subgroups of workers, represented by worker 1 and worker 2. Worker 1 has a well-designed job and is therefore highly motivated; accordingly she invests more hours to work than contractually obliged; her increased effort (overwork) may in turn lead to better work performance (eg, more output) and more supervisory recognition for performance; this ‘in turn’ may lead to higher motivation. In short: nice job → motivation → overwork → performance → reward → higher motivation. Highly motivated worker 2 may invest a lot more hours than contractually obliged; increased effort (overwork) may first lead to better performance (e.g., more output) but after some time of prolonged extreme overwork his performance deteriorates as he becomes more and more fatigued; as a consequence he receives less support from colleagues and supervisors and less interesting task assignments. In short: high motivation → much overwork → at first performance becomes better, later worse due to high fatigue → less support → less interesting tasks. To gain more insight into the direction of causation and into the feedback loops within various causal processes, future studies should apply longitudinal designs with multiple waves.³² Such prospective studies provide better possibilities for understanding the across time dynamics between overtime, psychosocial work characteristics, work-motiva-

tion, and fatigue. Repeated measurements may also shed more light on the possible interrelations between motivation and fatigue, eg, whether (and how, ie, via which mechanisms) highly motivated overtime workers in the long run may become fatigued overtime workers.

A second limitation of this study is that the “quality” of (overtime) work was addressed with three variables (job demands, job variety, decision latitude) that specified overtime work, ie, its job content. However, the quality of overtime work involves more than “just” its job content. We hypothesize that at least two other manifestations of the quality of overtime work may moderate the relationship between overtime and fatigue: 1) whether overtime work is executed voluntarily or involuntarily; and 2) whether employees get rewarded for doing overtime work. One of the main findings of this study is that the general Dutch overtime worker is a motivated person. Although we lack specific empirical data in this respect, on the basis of their relatively high levels of decision latitude we assume that their overtime activities are mainly self-chosen. We cannot tell whether the associations that were found in this study (ie, a not significant overtime-fatigue association; a significant overtime-motivation association) can be generalized to situations of involuntary overtime work. With regard to rewards, stress theory and theories on work motivation¹⁴ learn that rewards are crucial for starting and keeping up motivational processes. Rewards not only include payment of overtime work, but also recognition by peers and supervisors, job security, and promotions.³³ We assume that rewards can motivate employees to work overtime and that rewards also may reduce adverse consequences of job stressors. The relevance of these classifications is illustrated by Van der Hulst and Geurts,¹¹ who showed that overtime work is only associated with fatigue under the unfavorable situation of

involuntary overtime work for low rewards.

A third limitation is that all study variables were obtained through self-reports. As a consequence, we cannot exclude the possibility that the magnitude of the effects reported here might be biased due to common-method variance or the wish to answer consistently.^{34,35}

Theoretical and Practical Implications

From a theoretical point of view, it is interesting to see that “overtime can be fun” and is not typically related to fatigue. The strong association between overtime and work motivation combined with the absence of a general association between overtime and fatigue clears the way for overtime research from a more positive and motivational point of view.³⁶

To further disentangle the complex relations between overtime hours, job characteristics, work motivation, and fatigue, we need better data and better designs. With regard to better data, we recommend taking into account our five design requirements and collecting data that give insight into the forced-unforced and paid-unpaid structure of overtime work. With respect to study designs we recommend the use of multi-wave full-panel designs.^{31,32} In addition to such longitudinal designs, we recommend quasi-experimental designs centered on “natural experiments”: studies of groups of employees in a high versus low overtime condition.^{37,38} We also recommend intervention studies, that is, systematic comparisons of the health/well-being of the same employees in a Time 1 high overtime condition and, after the introduction of measures to reduce (excessive) overwork, in a Time 2 no or low overtime condition, preferably with a control condition. Better data and better designs will help us to learn about the type of causal relationships between these variables, as they will allow us to

further specify under which circumstances overtime work has positive consequences for health and well-being, and under which circumstances overtime may have detrimental effects.

Practical implications of this study do follow from these theoretical implications. Overtime work is in many cases not a problem. Relative to overtime work, psychosocial work characteristics (and especially job demands) are much more strongly related to fatigue. A job redesign recommendation is therefore not so much to reduce moderate overtime work, but to optimize the quality of work during contractual work hours as well as during overtime hours. This study indicates that companies should pursue the creation of “active jobs”³⁹: during contractual as well as overtime hours, employees should have high (but not too high) job demands, high (but not too high) decision latitude, and high (but not too high) job variety in order to stimulate work motivation and to prevent them from getting (too) fatigued. Such active jobs should be accompanied by sufficient possibilities for recovery, not only during the working day but also in between (periods of) working days. Because it can be expected that extreme overtime work by definition stands in the way of adequate recovery, it should be prohibited.

References

1. Haratani T, Karoshi. Death from overwork. In: Stellman JM, ed. *Encyclopedia of Occupational Health and Safety*. 4th ed. Geneva: International Labour Office; 1998;5:18–5.19.
2. Uehata T. Long working hours and occupational stress-related cardiovascular attacks among middle-aged workers in Japan. *J Human Ergol*. 1991;20:147–153.
3. Merllié D, Paoli P. *Ten years of Working Conditions in the European Union*. Dublin: European Foundation for the Improvement of Living and Working; 2001: 1–11.
4. Van der Hulst M. Long work hours and health. *Scan J Work Environ Health*. 2003;29:171–188.
5. Sparks K, Cooper C, Fried Y, Shirom A. The effects of hours of work on health: a

- meta-analytic review. *J Occup Org Psychol*. 1997;70:391–408.
6. Spurgeon A, Harrington JM, Cooper CL. Health and safety problems associated with long working hours: a review of the current position. *Occup Environ Med*. 1997;54:367–375.
 7. Härmä M. Are long workhours a health risk? *Scan J Work Environ Health*. 2003;29:167–169.
 8. Meijman TF, Mulder G. Psychological aspects of workload. In: Drenth PJD, Thierry H, De Wolff CJ, eds. *Handbook of Work and Organizational Psychology*; vol 2 (Work psychology). 2nd ed. Hove, UK: Psychology Press; 1998:5–33.
 9. McCarrt AT, Rohrbaugh JW, Hammer MC, Fuller SZ. Factors associated with falling asleep at the wheel among long-distance truck drivers. *Accident Anal Prev*. 2000;32:493–504.
 10. Park J, Kim Y, Chung HK, Hisanaga N. Long working hours and subjective fatigue symptoms. *Ind Health*. 2001;39:250–254.
 11. Van der Hulst M, Geurts S. Associations between overtime and psychological health in high and low reward jobs. *Work Stress*. 2001;15:227–240.
 12. Van Echtelt P, Smulders P. Waarom werknemers overuren maken: drie mechanismen getoetst [Why employees work overtime: examination of three mechanisms]. *Tijdschrift voor Arbeidsvraagstukken*. 2003–19;4:272–285.
 13. Bliese PD, Halverson RR. Individual and nomothetic models of job stress: an examination of workhours, cohesion, and well-being. *J Appl Social Psychol* 1996;26:1171–1189.
 14. Kompier MAJ. Job design and well-being. In: Schrabracq MJ, Winnubst JAM, Cooper CL, eds. *The Handbook of Work and Health Psychology*. Chichester: John Wiley & Sons; 2003:429–454.
 15. Smulders PGW, Andries, F, Otten F. *Hoe denken Nederlanders over hun werk. . . ? Opzet, kwaliteit en eerste resultaten van de TNO Arbeidssituatie Survey*. [What do the Dutch think of their work. . . ? Design, quality, and first results of the TNO Work Situation Survey]. Hoofddorp: Plantijn Casparie Heerhugowaard; 2001.
 16. Dutch Central Bureau of Statistics. *Yearbook of Statistics 2003*. Voorburg/Heerlen; 2003.
 17. Karasek RA. *Job Content Instrument: Questionnaire and User's Guide*. Los Angeles: Department of Industrial and Engineering, University of Southern California; 1985.
 18. Schaufeli W, Van Dierendonck D. *Handleiding van de Utrechtse Burnout Schaal (UBOS)*. [Manual Utrecht Burnout Scale]. Lisse: Swets & Zeitlinger; 2000:47–56.
 19. Schaufeli WB, Salanova M, González-Romá V, Bakker AB. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. *J Happiness Studies*. 2002;3:71–92a.
 20. Barton J, Folkard S. Advancing versus delaying shift systems. *Ergonomics*. 1993;36:59–64.
 21. Folkard S. A critique of JM Harrington, November 1993. Unpublished manuscript, October 1994, Department of Psychology, University of Wales, Swansea.
 22. Harrington JM. Shift work and health—A critical review of the literature on working hours. *Ann Acad Med (Singapore)*. 1994;23:699–705.
 23. Kawakami N, Haratani T. Epidemiology of job stress and health in Japan: Review of current evidence and future direction. *Ind Health*. 1999;37:174–186.
 24. Baldwin PJ, Dodd M, Wrate RW. Young doctors' health—I. How do working conditions affect attitudes, health and performance? *Soc Sci Med*. 1997;45:35–40.
 25. De Croon EM, Blonk RWB, De Zwart BCH, Frings-Dresen MHW, Broersen JPJ. Job stress, fatigue, and job dissatisfaction in Dutch lorry drivers: towards an occupational-specific model of job demands and control. *Occup Environ Med*. 2002;59:356–361a.
 26. Feyer AM, Williamson AM. Work and rest in the long-distance road transport industry in Australia. *Work Stress*. 1995;9:198–205.
 27. Houtman I, Broersen J, De Heus S, Zuidhof P, Meijman T. Cijfers, trends en analyses van grootschalig bevolkingsonderzoek [Statistics, trends, and analyses of large-scale study of the population]. In: Houtman I, Schaufeli W, Taris T, eds. *Werk en Psychische Vermoeidheid: Cijfers, Trends en Analyses*. Gorinchem: Samson; 2000.
 28. Sluiter JK, De Croon EM, Meijman TF, Frings-Dresen MHW. Need for recovery from work related fatigue and its role in development and prediction of subjective health complaints. *Occup Environ Med*. 2003;60(Suppl 1):i62–i70.
 29. Van Amelsfoort LGPM, Kant IJ, Bültmann U, Swaen GMH. Need for recovery after work and the subsequent risk of cardiovascular disease in a working population. *Occup Environ Med*. 2003;60(Suppl 1):i83–i87.
 30. Brenninkmeyer V, Van Yperen NW. Diagnostiek van burnout met de Utrechtse Burnout Schaal [Diagnostics of burnout with the Utrechtse Burnout Scale]. *Nederlands Tijdschrift voor de Psychologie*. 1999;54:105–108.
 31. De Lange AH, Taris TW, Kompier MAJ, Houtman ILD, Bongers PM. On the relationships between work characteristics and mental health: examining normal, reversed and reciprocal relationships in a 4-wave study. *Work Stress*. 2004;18:149–166.
 32. Taris TW, Kompier MAJ. Challenges in longitudinal designs in occupational health psychology. *Scand J Work Environ Health*. 2003;29:1–4.
 33. Siegrist J. Adverse health effects of high effort/low reward conditions. *J Occup Health Psychol*. 1996;1:27–41.
 34. Conway JM. Method variance and method bias in industrial and organizational psychology. In: Rogelberg SG, ed. *Handbook of Research Methods in Organizational and Industrial Psychology*. Malden: Blackwell; 2002:344–365.
 35. Taris TW, Kompier MAJ, De Lange AH, Schaufeli WB, Schreurs PJG. Learning new behaviour patterns: a longitudinal test of Karasek's active learning hypothesis among Dutch teachers. *Work Stress*. 2003;17:1–20.
 36. Nelson DL, Simmons BL. Health psychology and work stress: A more positive approach. In: Campbell Quick J, Tetrick LE, eds. *Handbook of Occupational Health Psychology*, 1st ed. Washington DC: American Psychological Association; 2003:97–119.
 37. Friedman M, Rosenman RH, Carroll V. Changes in the serum cholesterol and blood clotting time in men subjected to cyclic variations of occupational stress. *Circulation*. 1958;17:852–861.
 38. Kristensen TS. Workplace intervention studies. *Occup Med*. 2000;15:293–305.
 39. Karasek, R. Demand/control model: a social, emotional, and physiological approach to stress risk and active behaviour development. In: Stellman JM, ed. *Encyclopedia of Occupational Health and Safety*, 4th ed. Geneva: International Labour Office; 1998.