

The Impact of Organizational Changes on Work Stress, Sleep, Recovery and Health

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Abstract: The study objective was to investigate the impact of different kinds of organizational changes, as well as anticipation of such changes, on work-related stress, sleep, recovery and health. It was hypothesized that impaired sleep and recovery increase the adverse health consequences of organizational changes. The data consisted of cross sectional questionnaire data from a random sample of 1,523 employees in the Swedish police force. It could be shown that extensive organizational changes including downsizing or a change in job tasks were associated with a small increase in work stress, disturbed sleep, incomplete recovery and health complaints. However, less extensive organizational changes like relocation did not affect these outcome variables. Anticipation of extensive organizational changes had almost the same effect as actual changes. Furthermore a moderating effect of sleep and work stress on gastrointestinal complaints and depressive symptoms was found. Thus, like former studies already suggested, extensive organizational changes resulted in increased stress levels, poorer health and impaired sleep and recovery. Furthermore, organizational instability due to anticipation of changes was as negative as actual changes. There was also some evidence that disturbed sleep increased these adverse health effects, in particular with respect to anticipation of organizational changes.

Key words: Organizational changes, Work stress, Sleep, Sleepiness, Recovery, Subjective health, Police officers

Introduction

Theoretical background

When getting under financial pressure many employers consider organizational changes like downsizing to be the obvious and most efficient solution to manage the economic demands. In addition to this, many companies seek constantly to improve their efficiency through restructuring or changing work procedures. Apart from the threat of unemployment, this leads to organizational instability, e.g. due to new work tasks, a new supervisor, new colleagues or relocation. A number of prospective studies consistently showed that downsizing, and other organizational changes associated with job insecurity as well as negative changes in

the psychosocial work environment, e.g. lowered job control, increased job demands and decreased social support, have adverse effects on self-reported health, hospital admissions, mortality and sickness absence^{1–5}). However, also organizational instability due to expansion, even expansion taking place in a positive climate, has been associated with cardiovascular risk factors and adverse health effects^{4, 6}). Thus it can be hypothesized that an organizational change is a stressful event in itself irrespective of adverse or favorable consequences.

Thereby, the extensiveness of the change might be important. Vahtera *et al.*¹) concluded that the extent of adverse health effects depends on the degree of downsizing. This might imply that minor organizational changes like relocation cause fewer negative health effects than extensive changes including downsizing or a change in job tasks.

Some studies specifically focused on the anticipa-

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tion phase of organizational changes. In a longitudinal study Ferrie *et al.*⁷⁾ found that threats to job security due to anticipation of privatization had adverse consequences for the health status of the employees already before their status of employment had changed. Swaen *et al.*⁸⁾ found that after a closure threat those employees who did not perceive an increase in job insecurity had a lower relative risk for fatigue and psychological distress than those who did perceive an increase in job insecurity. Thus, it might be claimed that already the anticipation of such organizational changes has comparable negative health effects.

The anticipation of organizational changes as well as times during which organizational changes actually take place, are periods of great stress and anxiety, which may also affect sleep quality^{9, 10)}. Thus, the few prospective studies showing that threat of unemployment predicts disturbed sleep and sleep duration^{2, 9)} fit well with other findings about the relationship between increased work stress and disturbed sleep^{11–13)}. However, very few studies have examined sleep variables in the context of organizational changes and no study has used a well-established instrument of sleep quality that captures the different dimensions of sleep disturbances, including symptoms of daytime sleepiness. Hence the effect of organizational changes on sleep and sleepiness is the main overall focus of the present study.

Also, recent research suggests that work stress, sleep and recovery – in the sense of psychological and physiological restoration and unwinding from work during leisure time¹⁴⁾ – might be important moderators of the association between stressors (e.g. organizational changes) and health^{15–19)}. Geurts and Sonnentag¹⁸⁾ presented evidence for the assumption that if stressful thoughts of work occur during non-work time this impairs recovery, particularly the possibility to unwind after work, and incomplete recovery has been shown to predict cardiovascular mortality²⁰⁾. Dragano *et al.*¹⁵⁾ and Kivimäki *et al.*¹⁶⁾ showed that the relationship between organizational downsizing and health might be moderated by negative changes in work stress, for instance effort-reward imbalance¹⁵⁾, decreased job control and increased job insecurity¹⁶⁾.

The aim of the present study was to explore the relationship between organizational changes, disturbed sleep, impaired recovery and poor health. In addition, a secondary aim was to evaluate whether unwinding, recovery, sleep and work stress would moderate the association between organizational changes and self-rated health.

Hypothesis

The review of previous research resulted in the fol-

lowing four hypotheses, which were tested in this study:

- (1) Organizational changes, which include downsizing or a change of job tasks, lead to more work stress, poorer recovery (including difficulties to unwind due to stressful thoughts about work during free time), disturbed sleep and poorer self-rated health. Thus, this hypothesis will partly investigate whether previous findings on organizational changes, increased psychosocial stress and poorer health can be confirmed in the present data set.
- (2) Less extensive organizational changes like relocation have a modest impact on stress, recovery and sleep, and consequently, will not be associated with poor health.
- (3) Anticipation of downsizing or of a change in job tasks has the same negative effects on health, recovery and sleep as if these organizational changes have actually taken place.
- (4) Work stress, sleep problems, stressful thoughts about work (which reflect difficulties to unwind) and incomplete recovery moderate the effect of organizational changes on health. If this assumption is correct, downsizing and changes in job tasks should have a weaker influence on health, if the individual perceives low levels of work-stress, has no sleep problems, is able to unwind and has the possibility to recover during free time.

Methods

Sample

In November and December 2003 a questionnaire was distributed to a random sample of 2,000 police-employees in Sweden. 1,523 (76%) answered the questionnaire. The local ethical committee in Stockholm approved the study. The questionnaire was part of a study related to work hours, safety and health among the Swedish police force. Of those who answered, 472 subjects (31%) were women, 1,042 subjects (68%) were men and 9 subjects (1%) did not answer the question about gender. The age range varied between 22 and 65 yr (mean: 46.8 yr) and 540 of the participants (35%) worked daytime while 973 (64%) were shift workers and 10 subjects (1%) did not answer the question about current working schedules. Two papers related to shift work have previously been published^{21, 22)}. The period between 2000 and 2005 was associated with frequent organizational changes in the Swedish police force, of which downsizing due to decreased economical resources was most common.

Questionnaire

The questionnaire contained questions about demo-

graphics, working hours, work situation, occupational stress, accidents, health, sleep/sleepiness, social situation, satisfaction and attitude to different shift schedules. For the purposes of the present study, results will be presented for the questions about work situation (including psychosocial work stress), sleep/sleepiness, health and job satisfaction. The psychometrics of these questions were presented in the paper by Eriksen and Kecklund²¹).

The questionnaire included one question about whether reorganization had occurred. The subjects were asked about different kinds of organizational changes like downsizing, important changes in job tasks, relocation, change of colleagues, change of supervisor or change of offices. It was possible to answer “no”, “yes, I have had this change last year” and “yes, I will have this change in the next year”. It was possible to answer both “yes, I have had this change last year” and “yes, I will have this change in the next year”.

In order to test the hypotheses, a reorganization index was built (see Table 1). The index distinguished between four different groups. The “no changes”-group contained those who have had no organizational changes at all and would not have one in the next year. The “only relocation”-group contained those who will have or have had relocation but not downsizing or changed job tasks. Relocation normally referred to minor changes and it was not necessary for the employee to move away from home. Relocation in this context is an example of less extensive organizational changes and the group was created in order to test the second hypothesis. The group “anticipation of extensive changes” contained those who

will have downsizing, important changes in job tasks or both. Thus, in this article, anticipation relates to known, rather than feared events. Finally the “had extensive changes”-group contained those who were affected by downsizing or changed job tasks during the last year. The latter group also included those who both have had and were awaiting extensive changes.

Several indices were used (see Table 1). The indices were based on well-established scales, which have been validated and demonstrate good psychometric properties. Sleep quality was measured using the Karolinska Sleep Questionnaire (KSQ²³). KSQ amongst others includes questions related to difficulties falling asleep, disturbed sleep, repeated awakenings, difficulties awakening, not feeling well-rested after sleep, sleepiness at daytime and involuntarily dozing off. Most of the questions had six response alternatives ranging from “never” to “always” (high scores mean poor sleep).

Three indices were computed out of the KSQ (see Table 1): a disturbed sleep index (DSI), an awakening difficulties index and a sleepiness index. DSI is related to insomnia complaints (e.g. difficulties initiating and maintaining sleep), whereas the awakening difficulties index is related to whether sleep was refreshing²¹). The sleepiness index measures feelings of daytime sleepiness and whether one has involuntary sleep events (dozing off) at work and at free-time.

A Swedish version of the Hospital Anxiety and Depression Scale (HAD²⁴) was used to measure anxiety and depressive symptoms, with four response alternatives for every question (min 0 – max 42). The Shirom

Table 1. List of composite indices used in the analyses

Index name	Scale	Meaning of levels
Disturbed sleep index (DSI)	6 point scale (metric)	High levels indicate disturbed sleep
Awakening difficulties index	6 point scale (metric)	High levels indicate awakening difficulties
Sleepiness index	6 point scale (metric)	High levels indicate high sleepiness
Job satisfaction index	5 point scale (metric)	High levels indicate high job satisfaction
Work demand index	5 point scale (metric)	High levels indicate high work demands
Decision latitude index	5 point scale (metric)	High levels indicate high decision latitude
Reorganization index	4 point scale (nominal)	1: no changes 2: only relocation 3: anticipation of extensive changes 4: had extensive changes
Work stress index	2 point scale (nominal)	1: no work stress 2: has work stress
Unwind index	2 point scale (nominal)	1: has difficulties to unwind 2: can unwind
Recovery index	2 point scale (nominal)	1: can recover 2: has problems with recovery
Sleep index	2 point scale (nominal)	1: no sleep problems 2: has chronic sleep problems

Melamed Burnout Instrument²⁵) contained a list of different mental states associated with exhaustion and tension, to which the individual had seven response alternatives ranging from “hardly ever” to “almost always”; one had to specify up to which degree the respective state was experienced. A mean was calculated based on all questions and the minimum score was 1 whereas the maximum score was 7. Furthermore the questionnaire included a list of items, which measured the frequency of health problems [ranging from “never” (1) to “always” (5)] related to the following sub-components: fatigue, pain, gastrointestinal complaints and cognitive complaints²¹).

A job satisfaction index was built (see Table 1) by averaging the questions about general work satisfaction, satisfaction with work tasks, satisfaction with colleagues and satisfaction with supervisors (1 low satisfaction – 5 high satisfaction). The Cronbach’s alpha for the index was 0.76.

The questionnaire also included the “Demand-Control-Social support” (DCS) questions developed by Theorell and others²⁶). The DCS instrument was slightly modified and the response scales were five graded for the questions related to work demands and decision latitude (1 low – 4/5 high). In addition, a composite work stress index was built out of the components “social support at work”, “work demand index” and “decision latitude index” (see Table 1). An individual who either felt a lack of social support (i.e. have an index score that was ≤ 2), or had to deal with high work demands at least most of the time (index score ≥ 4) or had never or seldom the possibility to make decisions about work (index score ≤ 2) was classified as having “work stress”. Normally most studies calculate the job strain index or separate scores for work demands, social support and decision latitude. However, in order to reduce the number of variables in the statistical analyses for the fourth hypothesis we preferred to calculate a combined work stress variable that takes all three sub-components into account.

The questionnaire also included questions related to unwinding and recovery. An unwind index concerning difficulties to unwind during free-time was built (see Table 1). The index included the following three statements: “I often think about work problems when awakening”, “I always think about work in the evenings” and “It’s easy for me to unwind when I come home after work”. The response scale ranged from “full agreement” to “no agreement at all”. Individuals who experienced difficulties to unwind in at least one of these situations (as indicated by responding with “full agreement” or “almost agree” for the first two questions and “no agreement at all” and “hardly agrees” for the third

item), were classified as having “difficulties to unwind”.

Also a recovery index was constructed, which differed between those who were “able to recover” and those who had “problems with recovery” (see Table 1). The index was built out of the items “do you get sufficient rest (besides sleep)” (response scale: 1 definitely sufficient – 5 clearly insufficient), “do you have time to recover between work days” (response scale: 1 between every work shift – 5 never), “do you have time to recover on free days” (response scale: 1 every period with free days – 5 never) and “work intrudes on leisure time” (response scale: 1 no agreement at all – 4 full agreement). An individual with either insufficient recovery in general (≥ 4), or a lack of recovery between work periods or on free days (score ≥ 4) or an individual whose work intruded leisure time (score ≤ 2) was classified as having “problems with recovery”.

We also calculated a composite sleep index (see Table 1) based on the indices “DSI” and “awakening difficulties”, plus “whether one regards the sleep complaints as a health problem” (1 very large problem – 5 very minor problem, the cut off point was ≤ 2). The sleep index differed between those who had “no sleep problems” and those who had “chronic sleep problems”. An individual who often or always had problems either with disturbed sleep or awakening (index score ≥ 5) or perceived “sleep problems as a health problem” was classified as having “chronic problems with sleep”.

The work stress index, the unwind index, the recovery index and the sleep index were used to test the fourth hypothesis.

Data analysis

The data were analyzed using SPSS 15.0. The influence of organizational changes on different kinds of sleep/sleepiness, recovery, health indices and work stress (hypotheses one to three) were analyzed by means of analysis of covariance (ANCOVA) using the factors age, gender and work hour system (day work vs. shift work) as covariates. Post-hoc Tukey HSD tests were calculated when the overall ANCOVA demonstrated a significant group effect. As the group “had extensive changes” also contained those who had and anticipated extensive changes, the group was further divided into the subgroups “had but not anticipates extensive changes” and “had and anticipates extensive changes” and *t*-tests on differences between these groups concerning sleep, recovery and health were performed.

In order to test the fourth hypothesis we performed ANOVAs with the reorganization index and either the work stress index, the sleep index, the unwind index or the recovery index as independent variables, and different dependent variables indicating health. According

to Baron and Kenny²⁷⁾, ANOVAs are appropriate to test a moderation effect if both independent variable and dependent variable are categorical, thereby moderation manifests itself by an interaction. The alpha level for all analyses was set to 0.05 and no correction was made for the number of statistical tests. Pollard and Richardson²⁸⁾ argue that changing to a more conservative alpha-level (e.g. 0.01) would decrease the conditional prior probability to make a Type I error, simultaneously, it would decrease the power of the test and thus lead to an increase of the proportion of Type I errors in the literature computed as “the ratio of such errors to the total number of rejections of the null hypothesis²⁸⁾”.

Results

Table 2 shows the frequency distributions of the reorganization index. Most of the employees (639 or 42%) had extensive organizational changes during the last year, while 215 (14%) persons were anticipating extensive changes. 339 of the participants (23%) belonged to the relocation group and 313 participants (21%) were not affected of any organizational changes during the last year.

The four groups differed with respect to gender and work schedules (see Table 2). The proportion of women was highest in the anticipation group and lowest in the “had extensive changes”-group. The relocation group and the group that had extensive changes included more shift workers. The relocation group was also slightly younger than the other groups.

Table 3 shows the results of the ANCOVAs for the reorganization index and the variables related to sleep, recovery, health, work related stress and job satisfaction. All analyses yielded small but significant differences

between groups. The employees, who recently had or currently anticipated extensive changes like downsizing or a change in job tasks, had more problems with sleep and sleepiness as well as difficulties to unwind and problems with incomplete recovery. Their general and mental health was poorer compared to that of the other two groups. Furthermore their job satisfaction score was lower.

Table 4 shows the results for the post-hoc tests between the different groups. They revealed no differences between the “no changes”-group and the “only relocation”-group, with the exception of “work intrudes leisure time” which was more common in the relocation group. The groups “anticipation of extensive changes” and “had extensive changes” differed from the “no changes”-group in almost every variable. This indicates that extensive changes but not minor changes are associated with negative health effects.

The differences in work stress, sleep, recovery and health between those who were anticipating extensive changes and those who recently have had either downsizing or a change in job tasks, were mostly marginal and did not become significant in the post-hoc analyses (see Table 4), with the exception of work demands that were slightly higher for the group that recently had extensive changes.

Of those who had extensive changes, the subgroups “had but not anticipates extensive changes” (N=430) and “had and anticipates extensive changes” (N=207) did not differ with respect to age, gender and work hours. The *t*-tests revealed significant differences between these subgroups for some recovery variables and HAD anxiety, consistently showing that recovery and health of those who already had extensive changes, but were not awaiting more changes were better (see Table 5).

Table 2. Frequency distributions of gender and working schedules, and mean age (± 1 SD), in the different reorganization categories

	No changes	Only relocation	Anticipation of extensive changes	Had extensive changes
All	313	339	215	639
Gender				
Women	118 (37.70%)	94 (27.73%)	92 (42.79%)	161 (25.20%)
Men	194 (61.98%)	245 (72.27%)	123 (57.21%)	475 (74.33%)
Missing	1 (0.32%)	0	0	3 (0.47%)
Work schedules				
Daytime	135 (43.13%)	93 (27.43%)	92 (42.79%)	214 (33.49%)
2-shift	76 (24.28%)	71 (20.94%)	78 (36.28%)	153 (23.94%)
3-shift	102 (32.59%)	172 (50.74%)	45 (20.93%)	270 (42.25%)
Missing	0	3 (0.88%)	0	2 (0.31%)
Age (mean ± 1 SD)	47.69 ± 10.05	43.93 ± 10.54	46.98 ± 9.61	47.78 ± 9.40

Table 3. Means (± 1 SD) and F-values for the ANCOVAs between the reorganization index and different dependent variables indicating work stress/job satisfaction, sleep, recovery and health (F-values were adjusted for age, gender and shift work)

	No changes	Only relocation	Anticipation of extensive changes	Had extensive changes	F-value
Work stress/job satisfaction					
Social support at work (1–4 good)	3.23 \pm 0.47	3.18 \pm 0.45	3.00 \pm 0.48	3.06 \pm 0.46	15.21***
Job satisfaction index (1–5 good)	4.19 \pm 0.57	4.10 \pm 0.58	3.89 \pm 0.67	3.92 \pm 0.62	18.85***
Work demand index (1–5 high)	2.93 \pm 0.65	3.03 \pm 0.57	3.11 \pm 0.66	3.26 \pm 0.63	22.22***
Decision latitude index (1–5 high)	3.21 \pm 0.86	3.11 \pm 0.75	3.01 \pm 0.79	3.06 \pm 0.81	4.32**
Sleep					
Disturbed sleep index (1–6 poor)	2.44 \pm 0.99	2.53 \pm 0.98	2.67 \pm 1.14	2.59 \pm 1.00	2.75*
Awakening difficulties index (1–6 poor)	2.38 \pm 0.94	2.50 \pm 0.93	2.68 \pm 1.13	2.56 \pm 0.97	4.96**
Sleepiness index (1–6 poor)	2.02 \pm 0.66	2.15 \pm 0.69	2.21 \pm 0.82	2.21 \pm 0.73	5.49**
Sleep problems as a health problem (1–5 no problem)	3.64 \pm 1.15	3.44 \pm 1.13	3.43 \pm 1.23	3.29 \pm 1.15	6.93***
Recovery					
Enough rest (1–5 not enough)	2.27 \pm 0.74	2.37 \pm 0.83	2.49 \pm 0.87	2.47 \pm 0.83	7.03***
Recovery between work (1–5 never)	1.58 \pm 0.92	1.67 \pm 0.92	1.71 \pm 1.01	1.75 \pm 0.96	2.98*
Recovery on free days (1–5 never)	1.59 \pm 0.75	1.73 \pm 0.76	1.78 \pm 0.82	1.76 \pm 0.82	4.15**
Unwind after work (1–4 bad)	1.71 \pm 0.71	1.76 \pm 0.74	1.94 \pm 0.84	1.93 \pm 0.79	8.50***
Think about work problems when awaking (1–4 good)	3.11 \pm 0.88	3.08 \pm 0.87	2.78 \pm 0.93	2.78 \pm 0.91	14.97***
Think about work in the evenings (1–4 good)	3.31 \pm 0.85	3.33 \pm 0.80	3.08 \pm 0.94	3.13 \pm 0.84	6.95***
Work intrudes leisure time (1–4 not at all)	3.06 \pm 0.90	2.84 \pm 0.90	2.72 \pm 0.95	2.62 \pm 0.95	15.97***
Health					
Health in general (1–5 poor)	2.13 \pm 0.99	2.18 \pm 0.92	2.37 \pm 0.90	2.36 \pm 0.98	6.44***
HAD anxiety (0–21 poor)	4.72 \pm 3.94	4.62 \pm 3.68	5.67 \pm 4.00	5.27 \pm 3.85	5.01**
HAD depression (0–21 poor)	3.69 \pm 3.08	3.94 \pm 3.11	4.68 \pm 3.49	4.66 \pm 3.12	8.63***
Cognitive complaints (1–5 poor)	1.92 \pm 0.67	1.96 \pm 0.64	2.03 \pm 0.69	2.06 \pm 0.65	4.65**
Pain (1–5 poor)	1.97 \pm 0.91	1.95 \pm 0.84	2.21 \pm 0.96	2.11 \pm 0.91	5.27**
Gastrointestinal complaints (1–5 poor)	1.62 \pm 0.59	1.74 \pm 0.62	1.83 \pm 0.77	1.85 \pm 0.67	10.08***
Burnout (Shirom-Melamed score) (1–7 poor)	2.96 \pm 1.28	2.90 \pm 1.16	3.23 \pm 1.29	3.16 \pm 1.19	5.43**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. Post-hoc analyses (Tukey-HSD): mean differences between the “no change”-group and the other groups and between the “anticipation of extensive changes”-group and the “had extensive changes”-group

	No change-only relocation	No change-anticipation of extensive changes	No change-had extensive changes	Anticipation of extensive changes-had extensive changes
Work stress/job satisfaction				
Social support at work (1-4 good)	0.05	0.22***	0.17***	-0.05
Job satisfaction index (1-5 good)	0.09	0.30***	0.27***	-0.03
Work demand index (1-5 high)	-0.10	-0.17*	-0.33***	-0.16**
Decision latitude index (1-5 high)	0.09	0.21*	0.15*	-0.06
Sleep				
Disturbed sleep index (1-6 poor)	-0.09	-0.23*	-0.16	0.07
Awakening difficulties index (1-6 poor)	-0.11	-0.29**	-0.18*	0.11
Sleepiness index (1-6 poor)	-0.13	-0.20*	-0.20***	-0.01
Sleep problems as a health problem (1-5 no problem)	0.19	0.21	0.36***	0.15
Recovery				
Enough rest (1-5 not enough)	-0.09	-0.21*	-0.21**	0.01
Recovery between work (1-5 never)	-0.08	-0.13	-0.17*	-0.05
Recovery on free days (1-5 never)	-0.14	-0.20*	-0.18**	0.02
Unwind after work (1-4 bad)	-0.04	-0.23**	-0.23***	0.00
Think about work problems when awaking (1-4 good)	0.03	0.33***	0.32***	0.00
Think about work in the evenings (1-4 good)	-0.04	0.22*	0.17*	-0.04
Work intrudes leisure time (1-4 not at all)	0.20*	0.32**	0.43***	0.11
Health				
Health in general (1-5 poor)	-0.05	-0.24*	-0.25**	-0.01
HAD anxiety (0-21 poor)	0.10	-0.95*	-0.60	0.35
HAD depression (0-21 poor)	-0.26	-1.01**	-0.99***	0.02
Cognitive complaints (1-5 poor)	-0.05	-0.12	-0.15**	-0.03
Pain (1-5 poor)	0.04	-0.23*	-0.14	0.09
Gastrointestinal complaints (1-5 poor)	-0.12	-0.21**	-0.23***	-0.03
Burnout (Shirom-Melamed score) (1-7 poor)	0.05	-0.28*	-0.21	0.07

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Because there were no group differences with respect to sleep disturbances, the results were not included in Table 5.

The major outcome statistic concerning the ANOVAs to test hypothesis four was, whether interaction effects

between organizational changes and the indices for work stress, sleep, unwinding and recovery existed. Significant interactions would mean that work stress, sleep, difficulties to unwind and recovery moderated the association between organizational changes and health

Table 5. Means (± 1 SD) and T-values for the *t*-tests between the groups “had but not anticipates extensive changes” and “had and anticipates extensive changes” and different dependent variables indicating recovery and health

	Had extensive changes but no anticipation	Had and anticipates extensive changes	T-value
Recovery			
Enough rest (1–5 not enough)	2.42 \pm 0.79	2.58 \pm 0.89	–2.15*
Recovery between work (1–5 never)	1.70 \pm 0.89	1.86 \pm 1.09	–1.86
Recovery on free days (1–5 never)	1.76 \pm 0.81	1.78 \pm 0.85	–0.31
Unwind after work (1–4 bad)	1.87 \pm 0.76	2.07 \pm 0.85	–2.97**
Think about work problems when awaking (1–4 good)	2.84 \pm 0.90	2.68 \pm 0.93	2.03*
Think about work in the evenings (1–4 good)	3.19 \pm 0.82	3.00 \pm 0.86	2.67**
Work intrudes leisure time (1–4 not at all)	2.68 \pm 0.94	2.51 \pm 0.97	2.12*
Health			
Health in general (1–5 poor)	2.36 \pm 1.00	2.41 \pm 0.98	–0.52
HAD anxiety (0–21 poor)	5.02 \pm 3.76	5.85 \pm 4.00	–2.50*
HAD depression (0–21 poor)	4.48 \pm 3.07	5.00 \pm 3.16	–1.96
Cognitive complaints (1–5 poor)	2.04 \pm 0.64	2.10 \pm 0.67	–1.18
Pain (1–5 poor)	2.10 \pm 0.92	2.15 \pm 0.93	–0.65
Gastrointestinal complaints (1–5 poor)	1.82 \pm 0.66	1.92 \pm 0.70	–1.87
Burnout (Shirom-Melamed score) (1–7 poor)	3.15 \pm 1.19	3.18 \pm 1.17	–0.33

* $p < 0.05$, ** $p < 0.01$.

outcomes. The ANOVAs yielded significant interactions between the reorganization index and the work stress index for the “HAD depression” scale ($p < 0.05$) and between the reorganization index and the sleep index for the “gastrointestinal complaints” ($p < 0.01$). In addition there was a tendency towards a significant interaction between the sleep index and “HAD depression” ($p = 0.054$). For recovery and difficulties to unwind, no significant interactions were obtained. Figure 1 shows that the effect of anticipating extensive changes was more negative for those who had work stress or sleep problems. The main effects for the work stress index, the sleep index, the unwind index and the recovery index were all significant ($p < 0.001$).

Discussion

The results showed that extensive organizational changes had a negative, albeit rather small, impact on

subjective health, work stress, sleep, sleepiness and recovery. Furthermore, anticipation of extensive changes also somewhat increased health complaints, work stress, and impaired sleep and recovery. Minor organizational changes such as relocation were not associated with impaired health, recovery and sleep or increased work stress. Thus, the first three hypotheses were confirmed. Furthermore, the obtained results corresponded well with previous studies showing a clear negative effect of organizational changes (e.g. that involves downsizing) on health and work stress^{1, 6, 16, 29}). However, the major focus on of the present study was on sleep and recovery, which has not been extensively studied before.

The minor increase in disturbed sleep associated with extensive organizational changes is likely to be related to increased work stress. Hence, work demands slightly increased, whereas social support at work, decision latitude and job satisfaction slightly decreased for those exposed to extensive organizational changes such

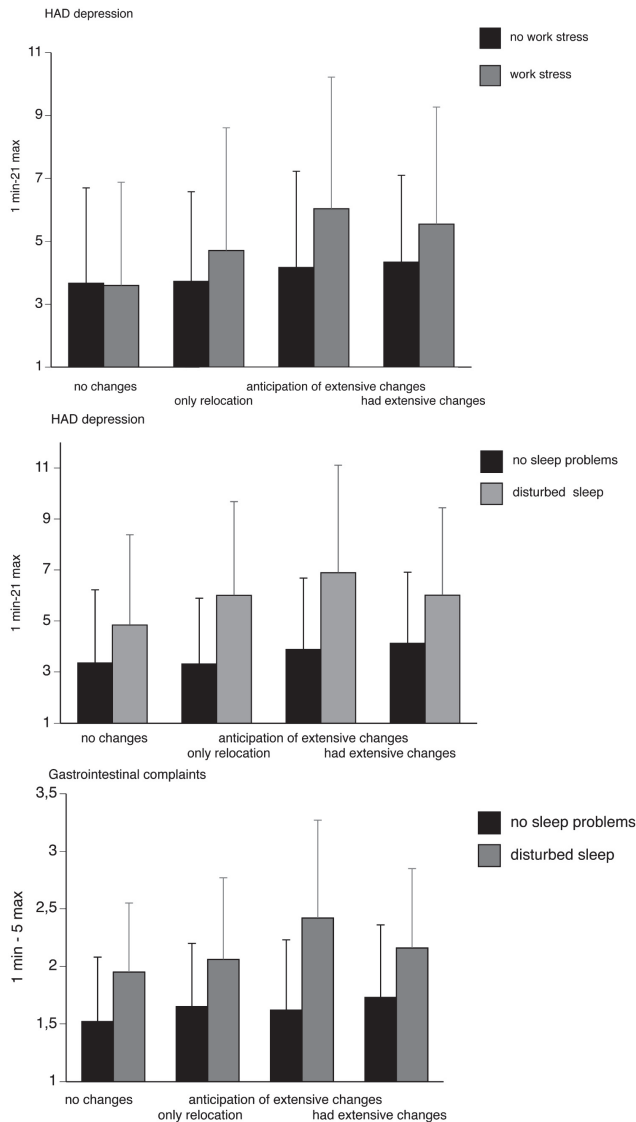


Fig. 1. Means and SD for HAD depression (0–21 high) and gastrointestinal complaints (1–5 poor) for those with work stress (upper panel) and disturbed sleep (middle and lower panel) in the different reorganization groups.

as downsizing or changed job tasks. In line with studies showing that subjective reports of work stress (e.g. job strain) are related to disturbed sleep^{11–13, 23}, those who experienced extensive organizational changes more frequently reported difficulties to unwind after work and that work intruded leisure time. This suggests that exposure to extensive organizational changes probably caused increased biological and psychological activation (stress) during free time which may have interfered with sleep and recovery. It should, however, be pointed out that we did not formally test whether the association between organizational changes and disturbed sleep was mediated by work stress.

Unlike extensive organizational changes, minor chang-

es such as relocation did not increase work stress, disturbed sleep, incomplete recovery or health complaints. This supports the suggestion that changes, which do not affect staffing or work tasks, are not related to elevated work stress and therefore the increase in sleep and health complaints will only be marginal. It should be pointed out that relocation in some circumstances might be an extensive organizational change. For example, relocation to a new town might cause considerable stress due to finding a new home, moving the family, changing children’s schools etc. However, this kind of relocation was rare in the present study.

Anticipation of organizational changes increased sleep disturbances and incomplete recovery as much as having extensive changes. Anticipation of organizational changes was also associated with lower job satisfaction and higher work stress. Thus, it is suggested that disturbed sleep associated with the anticipation phase was linked to stress and difficulties to unwind. The association between the anticipation phase and disturbed sleep is in agreement with studies showing a relationship between threat of unemployment and poor sleep^{2, 9}. It has also been shown that anticipation of a difficult next day is associated with increased levels of uneasiness at bedtime and physiological sleep disturbances such as reduced amount of slow wave sleep³⁰. One might have expected that anticipation of organizational changes should have a stronger relationship with difficulties to unwind and other stress related symptoms. However, the results comparing the “anticipation of extensive changes group” with the “had extensive changes” group did not support this assumption. Even though the anticipation group had a higher burnout and anxiety score (which can be regarded as proxy measures of stress symptoms) than the group that “had extensive changes”, these differences were not statistically significant. On the other hand, *t*-tests between the “had extensive changes”-subgroups; “had but not anticipates extensive changes” and “had and anticipates extensive changes”, revealed impaired recovery for those awaiting more changes. The latter differences are in favor of the hypothesis that the anticipation phase may have more negative consequences than exposure to actual extensive organizational changes.

The fourth hypothesis referred to whether sleep, recovery and work stress influence the association between organizational changes and health. It was predicted that poor sleep, incomplete recovery or work stress should strengthen the negative impact of having or anticipating extensive organizational changes. The results did not show strong support for this hypothesis. For example, incomplete recovery and difficulties to unwind did not modify the relationship between organi-

zational changes and health symptoms. Work stress and disturbed sleep had a significant but weak effect with respect to depression and gastrointestinal complaints. The results suggest that disturbed sleep and work stress interacted with the anticipation of organizational changes, leading to more complaints. Disturbed sleep and work related stress are well known risk factors for poor mental health, e.g. depressive symptoms^{31,32}), and there are also studies showing that poor sleep is associated with gastrointestinal complaints³³). Nevertheless, the obtained interaction between organizational changes and sleep or work stress respectively is weak and may be spurious. It is still an open question whether work stress, poor sleep and incomplete recovery moderate the relationship between organizational changes and health.

Concerning the results of the ANCOVAs, it has to be acknowledged that though the effects are very consistent across variables, the differences between the four groups although significant, are rather small (see Tables 3 and 4). This could lead to the interpretation that while there definitely is an impact of organizational changes on job satisfaction, health, sleep and recovery, this impact might not be particularly strong. Before coming to this conclusion, it should be considered that the sample consisted of those still healthy enough to work. Therefore the sample might be seen as a survivor population and thus the impact of organizational changes might be underestimated.

The study has several limitations that should be taken into account when interpreting the results. Firstly, the design is cross-sectional, which means that we cannot draw any conclusions about causality. Although we imply that organizational changes preceded the outcome measures, it might be possible that the groups differed with respect to work stress, sleep, recovery and health before they were exposed to extensive organizational changes. For example, it is not unlikely that a poor psychosocial work environment was one reason for initiating a major organizational change and this may have confounded the results.

Secondly, we have no information on how the organizational changes were carried out. Workplace reorganizations that aim to increase employees' opportunities to make decisions or participate in decision-making processes at work may decrease work stress and can have beneficial effects on health³⁴). For example, there are a few studies that have evaluated employee participation interventions intended to reduce the negative effects of organizational changes such as downsizing and relocation³⁵). However, the results show that psychosocial and health outcomes are only marginally affected³⁴). Still it is possible that information on whether the reorganization process was favorable might have made the results

clearer. It might also be that previous experiences of negative organizational changes influenced the adverse effects that were obtained in the present study.

A third limitation is related to common method bias. The independent and the dependent variables were based on self-ratings. Thus there is a risk that the obtained relationships between organizational changes, sleep, recovery, work stress and health are attributable to the measurement method rather than to the constructs of interest³⁶). At least the response format for the questions related to recovery, sleep and health complaints were very similar, which means that a response bias could have influenced some of the obtained results. However, it should be pointed out that the questions that referred to organizational changes were relatively neutral and contained no negative or positive words. Furthermore, the context of the study was to examine whether work hour characteristics are related to work stress and health while organizational changes were only a minor topic in the questionnaire. Nevertheless, it cannot be ruled out that common method bias has influenced the results.

Finally, the study group was quite homogenous since all individuals were employed in the Swedish police force. As a consequence, the results may not be representative to other occupational groups and work places. However, in the representative Swedish work environment survey from 2003, psychosocial stress and health complaints were relatively low among police officers compared to other occupations³⁷). One exception was "high psychological workload" where police officers were among the top ten occupations.

To sum up the limitation section, the results should be interpreted with some caution and need to be confirmed in controlled, prospective studies.

There are also some practical implications, which can be derived from the results of this study.

First of all, employers should keep in mind that organizational changes might be a stressful event for the employees, both before and after the change has taken place. Even those transformations intended to be beneficial to the employees, can lead to an initially increased stress level accompanied by sleepiness as well as sleep, recovery and health problems. Maybe, the problems with anticipation can be avoided or minimized, if the employers not only informed their employees in time about the forthcoming change, but also gave them the possibility to influence the change. The negative impact of anticipation probably results from the uncertainty about what exactly will change and thus the unpredictability of what will happen. This might be counteracted to some extent with clear information about the intentions of the organizational change, the details about how

it will be performed and specifications on what exactly the change implies for them and their work.

The fact that even favorable organizational changes can lead to an initially increased stress-level is important for some intervention studies. If the aim of the intervention is to improve health and well being of the employees, the expected results may not be visible if outcome variables are measured directly after the reorganization has taken place. The adverse effects of the change process can mask the beneficial effects for quite some time.

Conclusion

Like former studies already suggested, organizational changes, which include a change in job tasks or downsizing, lead to a somewhat increased stress level as well as slightly increased health problems. This study added that complaints about poor sleep, sleepiness and incomplete recovery also increased in connection with extensive organizational changes. Another key finding was that this is even true for the anticipation of such changes. Furthermore the risk of developing subclinical depression was especially high in individuals with work stress or sleep problems in addition to the organizational changes.

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