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Abstract

Purpose – Focusing on 420 women employed within the woman-dominated health care sector, the purpose of this paper is to investigate how any variation in their total workload (TWL) in terms of paid and unpaid work relate to various subjective health complaints (SHC) ($n = 420$) and the neuroendocrine stress marker cortisol ($n = 68$).

Design/methodology/approach – The authors explored how any variation in their TWL in terms of paid and unpaid work related cross-sectionally to SHC ($n = 420$), and the neuroendocrine stress marker cortisol ($n = 68$).

Findings – Hierarchical regression analyses showed that stress of unpaid work was most strongly related to diurnal variations in cortisol. Both stress of paid and unpaid work as well as TWL stress, but not hours spent on TWL, were related to SHC.

Practical implications – Taken together, objective measures of hours spent on various TWL domains were unrelated to outcome measures while perceptions of having too much TWL and TWL stress were linked to both cortisol and SHC, i.e. how individuals perceive a situation seem to be more important for health than the actual situation, which has implications for research and efforts to reduce individual TWL.

Originality/value – This study is unique in showing that unpaid work and perceptions having too much TWL relate to stress markers in women working in the public health care sector.

Keywords Stress, Paid work, Unpaid work, Cortisol, Subjective health complaints, Total workload

Paper type Research paper

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Stress-related health problems vary consistently between working women and working men with figures being higher among women than in men (OECD, 2011). A common explanation of such health differences involves the gender segregated labor market. In Sweden, this segregation is pronounced with women and men working in different sectors and

having to deal with different types of stressors at work. Specifically, more women are employed within education, health care and social services, where the work typically includes teaching, curing or caring for individuals not being colleagues but forming part of the general public that uses the different services (e.g. students, patients). Overall, in Sweden, the work within these sectors has been found to involve more job demands and less job control (Swedish Work Environment Authority, 2016, p. 2). However, besides women within education, health care and social services having to deal with a work situation that differs from that of sectors mostly employing men, women and men also face different challenges and demands outside paid work when juggling work with family life and its unpaid duties (Swedish Work Environment Authority, 2016, p. 2; Siegrist and Marmot, 2004). This means that the overall life situation of these working women living in Sweden is different from that of men. Such differences may partly explain consistent health disparities found between working women and working men. Taken together, these differences motivate analyzing separately the overall life situations of working women and working men. However, while the effects of psychosocial working conditions of different occupations and sectors have been studied (Swedish Work Environment Authority, 2016, p. 2; SBU, 2014), less is known of how total workload (TWL), and its separate parts of paid and unpaid work are associated with health-related outcomes in specific groups such as women working within the public health care sector. Women working in the public health care sector are exposed to more psychosocial work constraints including low job control, high job demands and low reward (Swedish Work Environment Authority, 2016, p. 2). Focusing on women employed within the woman dominated public health care sector, we investigated how any variation in their TWL in terms of paid and unpaid work was related to subjective health complaints (SHC) and the neuroendocrine stress marker cortisol. This allowed studying potential parallel mechanisms relating to health in a specific group of working women with a high prevalence of common mental and physical health problems that have been associated with sick leave.

TWL

Working women in Sweden typically have a higher TWL, including both paid and unpaid work, which results from them combining gainful employment and family responsibilities such as taking care of household tasks, children and other members of any extended family. Statistics from Sweden show that women spend more hours on paid work. On average, working women spend approximately 3.5 hours on unpaid work, while men spend about an hour less (Statistics Sweden, 2012). Although there are variations throughout life, statistics for women and men spending equal number of hours on paid work show that women still spend more time on household work than men (Gjerdingen *et al.*, 2001; Statistics Sweden, 2012). Spending about 20 hours per week on duties outside paid work means that working women have a higher TWL. Typically such a higher TWL allows less time for recovery and involves a poorer work-life balance (Lundberg and Frankenhaeuser, 1999). Over time, this has negative effects on health (Geurts and Sonnentag, 2006; Walters *et al.*, 2002). Such negative effects are in line with the role strain model which assumes that combining multiple roles of work and non-work life spheres increases individual strain, which in turn has negative effects in terms of increased self-reported stress, depression and SHC (Barnett and Hyde, 2001). However, in line with the role-enhancement model which assumes that multiple roles have positive health effects, research has shown a buffering effect of the number of hours spent on childcare (Krantz *et al.*, 2005). In addition, research focusing on individual perceptions has suggested that the perception of having a too high TWL relates more strongly to SHC than objective measures of the time spent on paid and unpaid work (Krantz *et al.*, 2005). Taken together, this means that individual perceptions may play a role

for health-related outcomes. Thus, linkages between the TWL of paid and unpaid work and health-related outcomes may vary depending on whether there is a focus on TWL in terms of hours spent on different tasks or on individuals' perceptions of their TWL.

SHC

In general, women report more mental health complaints than men and are particularly over-represented among those having stress-related health problems (OECD, 2011). Investigating SHC involves measuring common health problems such as mental or physical health problems, emotional exhaustion or problems sleeping. Typically, this includes asking about palpitations, head ache, extreme fatigue, sleeping problems, neck pain and upper back pain or shoulder pain (Ihlebaek and Eriksen, 2003). These complaints are common in the general population, but for some individuals these complaints reach a level that requires health care (Eriksen and Ursin, 2004) and perhaps sick leave. Across different SHC, frequencies are generally higher in women than in men, with more women than men rating their SHC as moderate or severe (Krantz *et al.*, 2005). Moreover, women working within the health services have been found to have a significantly higher prevalence of SHC compared to workers in other sectors (Ihlebaek and Eriksen, 2003). The findings also suggest that SHC reported by working women result from the interaction between conditions at work and household duties, so called work-family conflict (WFC) (Krantz *et al.*, 2005). This motivates investigating how hours spent on paid and unpaid work, and the related experience, relate to commonly reported SHC and a neuroendocrine marker.

Neuroendocrine markers

Much research has focused on identifying linkages between various aspects of psychosocial stress and neuroendocrine markers focusing particularly on the hypothalamic-pituitary-adrenal (HPA) axis, and its primary outcome cortisol (e.g. Kristenson *et al.*, 2011; Chida and Steptoe, 2009). Cortisol affects central bodily functioning and has been suggested as a key marker for explaining how stress can turn into disease (e.g., Kristenson *et al.*, 2011; Chida and Steptoe, 2009). Cortisol secretion follows a distinct diurnal profile characterized by a rapid increase after waking in the morning and a subsequent decline during the remainder of the day. The cortisol awakening response (CAR) typically refers to the aggregate measure of cortisol during the first hour of awakening (e.g. Kristenson *et al.*, 2011). Both an elevated and a lower CAR as well as diurnal cortisol profiles have been linked to poor health. For instance, individuals exposed to stress can exhibit lower cortisol levels at waking and a flatter area under the daytime cortisol curve (Clow *et al.*, 2010; Kristenson *et al.*, 2011). Also, enhanced CARs have been linked to work stress, other types of life stress, and mental health problems in terms of depression and depressive symptoms (Chida and Steptoe, 2009), while a diminishing CAR has been linked to positive psychological affect (e.g. happiness, well-being, optimism), fatigue-related symptoms and post-traumatic stress (Chida and Steptoe, 2009; Kristenson *et al.*, 2011). However, meta-studies have shown that findings are inconsistent (Kristenson *et al.*, 2011; Pruessner *et al.*, 2003; Stetler and Miller, 2011).

TWL and neuroendocrine markers

Even though stress outside work has been suggested to affect health to the same extent as job stress (e.g. Chida and Steptoe, 2009; Karlson *et al.*, 2012), the vast majority of studies have focused on job stress. The few existing studies of diurnal variation of cortisol including stress in the home domain have shown that cortisol output is high both at work and at home in women, while for men the cortisol output is higher at work than at home. For women, however, their neuroendocrine activation have been found to increase when they get home after work (Lundberg and Frankenhaeuser, 1999). This suggests that, for women, demands at home involve stress. This notion is supported by other studies showing that uneven

responsibilities at home may contribute to women and men reacting differently with regard to cortisol responses over the day (Bergman *et al.*, 2008) and that women but not men reporting stress at home show a flatter diurnal cortisol curve than is to be expected (Sjörs *et al.*, 2014). Other findings show that more hours spent on housework are associated with lower salivary cortisol (Eller *et al.*, 2011). A reason for these mixed results may relate to individual differences in how individuals perceive their TWL, in terms of total hours of workload, and to variations in their ability and possibility to control their TWL (Kristenson *et al.*, 2011; Lundberg and Frankenhaeuser, 1999).

Based on this, there is a need for a more fine-grained exploratory analysis describing how factors such as TWL (hours spent on paid and unpaid work, respectively) and work-life balance are associated with stress-related health in women working within the public health care sector. Moreover, the analysis of TWL hours is complemented with individual perceptions of TWL satisfaction including questions of wanting to change TWL, TWL stress and TWL control. Thus, the aim of the present study is twofold: to investigate the associations between stress of unpaid work, stress of paid work, TWL and WFC on cortisol output during the day, and to investigate the associations between these predictors on SHC in women.

In view of previous findings, the following hypotheses were formulated:

H1. TWL, WFC, stress of paid work and unpaid work, respectively, and negative TWL perceptions are related to cortisol slope values.

H2. TWL, WFC, stress in paid and unpaid work and negative TWL perceptions are related to SHC, hypothesizing that a higher TWL, conflict and stress of paid and unpaid work, respectively, are associated with more SHC.

H3. High and low TWL, WFC, stress of paid and unpaid work show different patterns of diurnal variation in cortisol during the day, with individuals having high scores in these variables also having a higher CAR and a reduced recovery in the evening.

Method

Participants

The study uses data from a research program of work, stress and health (e.g. von Thiele Schwarz, 2008) including 476 women working with patients within the public health care sector. Of the 476 invited to an initial questionnaire study, 420 volunteered participation. Of these women, 250 were invited to a subsequent substudy of neuroendocrine activation in terms of salivary cortisol. After screening the salivary cortisol measures with respect to medication, coffee intake, smoking, chronic disease as well as non-compliance, in particular non-compliance in the second morning cortisol measure which should be sampled 30 minutes after awakening (Dockray *et al.*, 2008), data from 68 women were included in the statistical analysis. At the time of the data collection, the mean age was 45 years.

Measures

Besides background factors (age, marital status and children living at home), self-reports were provided in a questionnaire covering issues relating to TWL, WFC and SHC. Table I presents descriptive statistics on the study variables.

Background factors. Age was coded as chronological age. Marital status was coded as 0 = married/cohabiting, 1 = partner, not cohabiting, 2 = single. Whether the respondents had children living at home was measured with a question asking whether the respondent had children in the household which was coded 0 = No, 1 = Yes. Full time refers to 40 hours per week while part-time refers to less than 40 hours per week irrespectively of hours spent on unpaid work.

Demographics	SHC sample ($n = 420$) n (%)	Cortisol sample ($n = 68$) n (%)
Education		
Elementary/vocational (0)	220 (59)	47 (69.2)
University (1)	102 (32)	21 (31)
Marital status		
Married/cohabiting (0)	201 (62)	51 (75)
Partner, not cohabiting (1)	26 (27.0)	3 (4)
Single (2)	96 (30)	14 (21)
Living with children		
No (0)	161 (50)	34 (50)
Yes (1)	159 (49)	34 (50)
Full time work		
No (1)	111 (34)	43 (63)
Yes (2)	212 (66)	25 (37)
Predictors	Mean (SD)	Mean (SD)
WFC (mean 1-4)	2.6 (1.4)	2.3 (1.0)
TWL (hours/week)		
40-45.5	83 (25.7)	13 (19.1)
45.6-56	85 (26.3)	14 (20.6)
56.1-69.5	88 (27.2)	19 (27.9)
59.5-99	67 (20.7)	21 (30.9)
> 99	12 (2.8)	7 (10.2)
TWL (mean hours/week)	57.1 (17.1)	63 (21)
Perceived TWL (range 1-7)		
Change TWL	4.7 (1.6)	4.1 (2.0)
Decide TWL	4.7 (1.9)	5.0 (1.7)
TWL Stress	4.1 (1.6)	4.1 (1.7)
Stress of paid work	4.2 (1.9)	4.2 (1.9)
Stress of unpaid work	3.37 (1.9)	3.51 (1.8)
Outcomes	Mean (SD)	Mean (SD)
Subjective health complaints (range 1-3)	1.9 (0.54)	1.9 (0.52)
Cortisol slope 1		1.04 (0.30)
Cortisol slope 2		1.25 (0.27)
Cortisol slope 3		0.62 (0.30)

Table I.
Descriptive statistics for the study variables

Predictive variables. TWL was calculated as the total sum of self-reported hours spent on paid work, household tasks, care for children and other tasks (i.e. four variables formed an additive index) during a typical week. Also, in the descriptive analyses, hours spent on each of these domains were analyzed separately. This measure of TWL and its domains has been used previously and findings suggest that respondents provide accurate reports of their time use (Lindfors *et al.*, 2006; Mårdberg *et al.*, 1991).

TWL perceptions: experiences of TWL were measured using previously validated single-item questions (Mårdberg *et al.*, 1991) regarding TWL control, change TWL, TWL stress. The question asking respondents to rate their TWL control using the following question: "To what extent do you decide over your total workload in paid work, household work, childcare and other duties?" To measure the extent to which individuals wanted to change TWL, the following question was used: "To what extent do you want to change your total workload?" To measure how stressful respondents perceived their TWL, TWL stress was measured asking the following question: "Overall, how stressed are you regarding your

total workload?" Responses were given on a seven-point scale ranging from "not at all" to "to a large extent." All responses were coded with high scores corresponding to not deciding over TWL, change TWL and suffering from TWL stress (Lundberg *et al.*, 1994).

WFC was measured with three questions asking the respondent how often work interfered with life outside work and the other way around when it comes to various tasks and socializing with family and friends. Ratings were made on a seven-point scale ranging from rarely (1) to very often (7).

Stress of paid and unpaid work, respectively, were measured using two questions asking about stress that can be referred to each of these domains, stress of paid work and stress of unpaid work. Respondents provided ratings on a seven-point scale ranging from rarely (1) to very often (7).

Dependent variables. Saliva for cortisol was sampled at three time points (T1 = at waking, T2 = 30 minutes after waking and T3 = in the afternoon) on a workday. Transformed (natural log) cortisol values of T1, T2, and T3 were calculated. Slopes were calculated using the transformed values. Slope 1 was computed by subtracting T1 from T2, while Slopes 2 and 3 were computed subtracting values of cortisol T3 from T2 (Slope 2) and T3 from T1 (Slope 3). The area under curve (AUC) reflecting the dynamics of post-awakening cortisol changes was calculated as baseline-to-peak increase (Stalder *et al.*, 2016).

SHC (Eriksen *et al.*, 1999) typically covers common health-related problems over a specific time period. Here respondents were asked to report palpitations, head ache, extreme fatigue, problems sleeping, neck pain and upper back pain and shoulder pain during the last six months. Respondents were first asked whether they had experienced a complaint and if yes, to rate its intensity on a scale ranging from 1 to 3. A total SHC score was computed with high scores indicating more complaints.

Procedure of cortisol sampling

Saliva samples were collected within two weeks after completing the initial questionnaire, at three points in time during an ordinary workday: immediately at waking, at 30 minutes post-awakening, and in the late afternoon at 4.30 p.m. Saliva samples were collected using the Salivette® (Sarstedt Inc. Rommelsdorf. Germany), a plastic tube with a suspended insert containing a sterile neutral cotton wool swab. Participants were instructed to chew on the swab for two minutes before putting it back into the tube and sealing it. They were also instructed to refrain from eating, smoking, drinking coffee/tea (or other beverages containing caffeine) or brushing their teeth during 30 minutes before sampling saliva (e.g. Dockray *et al.*, 2008; Stalder *et al.*, 2016). All samples were stored in plastic bags in room temperature before being returned to the research team on the next workday. Then saliva samples were transported to the laboratory where they were stored in a freezer (−20°C) until analyzed. Cortisol was determined using competitive radioimmunoassay (Spectria Cortisol RIA. Orion Diagnostica. Espoo. Finland; intra-assay precision < 5 percent. 1.7-4.1 percent and inter-assay precision < 10 percent. 4.3-9.0 percent). Each sample was analyzed twice and in randomized order with values expressed in nmol/L.

Each participant was instructed to complete a diary and return it along with the test tubes. Details on time and date for saliva sampling and questions on eating, smoking, drinking coffee/tea (or other beverages containing caffeine), medication and chronic diseases were included in the diary.

Statistical analyses

First, all cortisol values were transformed (natural log) before analyses. SHC was used both as a continuous value and dichotomized using median values as a cut-off. To describe associations between all study variables, Pearson correlation coefficients (r_p) were computed both in the full sample and in the subsample.

Hierarchical regression analyses were performed to analyze the associations between the predictor variables WFC, TWL, stress of paid and unpaid work on cortisol (slope values 1: T2-T1; 2: T3-T1; 3: T2-T3 and AUC) and SHC, respectively. The covariates age, marital status and children living at home were included in the first step while the other variables were added in step 2. Multicollinearity tests showed VIF values about 1.3 and tolerance values of 0.70.

ANOVAs for repeated measures were computed to analyze differences in TWL, WFC, stress of paid and unpaid work, respectively (dichotomized into high and low with median values as cut-offs) on cortisol T1, T2 and T3, calculating the between- and within-group effect of the dichotomized predictors, along with the interaction between the predictor and cortisol. Moreover, a one-way ANOVA was performed to investigate mean differences in cortisol measures between groups with high and low SHC.

Results

Tables II and III show correlations between the study variables. Specifically, as shown in Table II, SHC complaints were associated with high WFC, stress of paid and unpaid work, TWL stress and wanting to change the amount of TWL. WFC was associated with increasing hours on paid work, more stress of paid work, more stress of unpaid work, higher TWL stress, wanting to change TWL, lower TWL control and more overtime work. TWL was significantly associated with more WFC, more hours of paid and unpaid work as well as to stress of unpaid work. In the subsample (Table III), stress of unpaid work was associated with Slopes 2 and 3, i.e. high stress of unpaid work was coupled with a sharper diurnal curve and reduced cortisol decrease in the evening.

Table IV presents results of hierarchical regressions for the full sample and the cortisol subsample, respectively. Results showed that stress of unpaid work was significantly associated with Slopes 2 and 3 while TWL stress was related to Slope 3. Also stress of unpaid work, stress of paid work, TWL stress and wanting to Change TWL were significantly associated with SHC. However, rerunning the same analysis on SHC in the cortisol subsample failed to reach significance, which probably relates to reduced statistical power in this smaller sample (results not shown).

A mixed ANOVA for repeated measures showed a significant interaction effect of cortisol but only for stress of unpaid work (Figure 1). Separate one-way ANOVAs showed a significant difference at T3, that is the afternoon measure ($F = 4.76$; $p < 0.05$). No significant mean differences in cortisol were found between women reporting high and low SHC (for Slope 1: $F = 1.78$; $p > 0.05$) nor for any of the other predictors (high and low TWL: e.g. Slope 1: $F = 1.16$, $p < 0.05$; WFC: $F = 1.88$, $p < 0.05$; stress of paid work: $F = 2.12$, $p < 0.05$).

Discussion

The aim of the present study was to explore if TWL, WFC and stress of paid and unpaid work, respectively, were related to diurnal variations in cortisol and to SHC among women working in the public health care. Contrary to the *H1* and *H2*, TWL in terms of the total number of hours spent on paid and unpaid tasks was not related to any of the outcome measures. However, according to *H1*, as seen in the association between TWL stress and the evening measures of cortisol in the hierarchical regression analysis, experiences of stress relating to TWL seemed important for recovery among this group of women. Moreover, and in line with *H1*, the hierarchical regression analyses showed that stress of unpaid work had the strongest association with the diurnal variation in cortisol.

Comparing women reporting high stress of unpaid work to those reporting low stress of unpaid work showed a trend suggesting a group difference in diurnal variation, which is in line with *H3*. Specifically, women in the high stress group seemed to start on a slightly, but not significantly, lower level and end on a significantly higher cortisol level. This is in line

Table II. Correlations (r_p) between TWL, WFC, stress in paid and unpaid work, TWL perceptions, cortisol measures and subjective health complaints

	Age	Marital status	Children	SHC	TWL	WFC	Paid hrs/w	House hrs/w	Children hrs/w	Other hrs/w	Overtime hrs/w	Stress paid work	Stress of unpaid work	TWL stress	TWL control
Age															
Marital status	0.01														
Children	0.22**	−0.19													
SHC	0.19	0.01	0.07												
TWL	−0.15*	−0.13	0.08	0.06											
WFC	0.26**	0.00	0.30	0.28**	0.15**										
Paid work hrs/w	0.16*	0.13	0.11	0.01	0.20**	0.23**									
Household hrs/w	0.05	−0.22**	0.28**	0.11*	0.65**	0.05	−0.12*								
Children hrs/w	−0.40**	−0.07	0.48**	0.11	0.79**	0.21**	−0.09	0.41**							
Other hrs/w	0.05	0.06	0.03	−0.04	0.32**	0.06	−0.10	0.06	−0.05						
Overtime hrs/w	−0.02	−0.04	−0.03	−0.04	0.12	0.24**	0.29**	−0.02	0.14	0.22**					
Stress paid work	0.22**	−0.15	0.11	0.41**	0.10	0.43**	0.10*	0.05	0.07	−0.03	0.05				
Stress unpaid work	0.09	−0.09	0.26**	0.32**	0.17**	0.37**	−0.01	0.17**	0.16*	0.09	0.08	0.32**			
TWL stress	0.18	−0.14	−0.14	0.45**	0.09	0.40**	0.08	0.09	0.10	−0.01	0.11	0.69**	0.56**		
TWL control	0.09	−0.05	0.06	−0.08	0.06	0.20**	−0.05	0.07	−0.02	−0.04	−0.05	0.18*	0.13**	0.23**	
TWL change	−0.22	−0.06	0.09	0.40**	0.09	0.42**	0.20**	0.05	0.13	0.00	0.06	0.48**	0.29**	0.54**	0.19**

Notes: $n = 420$. AUC, area under curve; WFC, work/family conflict; TWL, total workload. Marital status: married = 0; partner = 1; no partner = 2; children: yes = 1; no children = 0. *$p < 0.05$; **$p < 0.01$

Table III.
Correlations (r_p) between TWL, WFC, stress in paid and unpaid work, TWL perceptions, cortisol measures and subjective health complaints

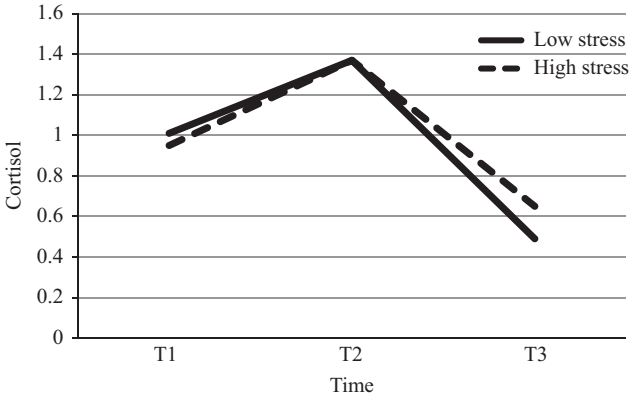
	Age	Marital status	Child	Slope 1	Slope 2	Slope 3	AUC	SHC	TWL	WFC	Paid hrs/w	House hrs/w	Child hrs/w	Other hrs/w	Over time	Stress paid work	Stress unpaid work	TWL stress	TWL control
Age																			
Marital status	0.06																		
Children	0.12	−0.24																	
Slope 1	0.12	0.00	0.00																
Slope 2	0.17	0.01	−0.04	−0.59**															
Slope 3	0.28*	−0.01	−0.06	0.34**	0.87**														
AUC	0.06	0.02	0.03	0.92**	−0.74**	−0.35**													
SHC	0.29*	0.07	−0.11	0.15*	−0.18	−0.21*	0.16												
TWL	−0.08	−0.28*	0.33*	−0.01	0.06	0.06	−0.02	0.08											
WFC	−0.43**	−0.03	−0.04	−0.09	−0.05	0.05	−0.13	−0.04	0.11										
Paid hrs/w	−0.09	0.31*	−0.06	0.20	−0.08	0.10	0.18	0.08	0.08	0.34**									
Household hrs/w	0.06	−0.32**	0.16	−0.06	0.11	0.03	−0.06	0.10	0.77**	0.02	−0.14								
Children hrs/w	0.16	−0.23	0.27	0.04	−0.08	0.11	0.02	0.13	0.60**	0.16	−0.26	0.32							
Other hrs/w	0.12	0.04	−0.16	0.04	0.07	−0.01	0.04	−0.07	0.30	0.04	0.16	−0.04	−0.02						
Overtime hrs/w	−0.18	−0.15	0.06	0.15	−0.07	0.01	0.13	0.13	0.23	0.23	0.51**	0.12	0.52**	0.07					
Stress paid	−0.10	−0.17	−0.11	0.05	0.03	−0.01	0.05	0.28*	0.12	0.36**	0.16	0.05	−0.01	0.07	0.13				
Stress unpaid	−0.27*	0.02	0.14	0.09	−0.26*	−0.26*	0.08	0.30*	0.12	0.40**	−0.02	0.06	0.04	0.07	0.14	0.25*			
TWL stress	−0.28*	−0.14	0.10	0.10	0.03	−0.03	0.07	0.39**	0.08	0.38**	0.18	0.02	0.02	−0.06	0.07	0.74**	0.53**		
TWL Control	−0.24*	−0.11	0.26*	0.12	0.03	0.08	0.09	0.19	−0.28*	−0.23	0.15	0.15	0.28	0.06	−0.03	0.37**	0.30*	0.46**	
TWL Change	−0.36**	0.04	0.14	−0.03	−0.14	−0.10	−0.03	0.39**	0.16	0.38**	−0.14	0.05	0.10	−0.03	0.07	0.68**	0.41**	0.67**	−0.38**

Notes: $n = 68$. AUC, area under curve; WFC, work/family conflict; TWL, total workload. Marital status: married = 0; partner = 1; no partner = 2; children: yes = 1; no children = 0. *$p < 0.05$; **$p < 0.01$

	Slope 1		Slope 2		Slope 3		AUC		SHC	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
Age	0.28	0.11	0.15	0.17	0.28	0.28	−0.00	0.01	0.08	
Marital status	−0.01	0.02	0.00	0.00	0.00	0.00	0.05	0.08	0.12*	
Children	−0.03	−0.04	0.03	0.04	0.02	0.02	−0.01	0.13	−0.15	
WFC		−0.13		0.13		0.08		−0.22		−0.03
TWL		0.08		0.03		0.12		0.01		0.01
Stress unpaid work		−0.13		−0.37*		0.37*		0.17		0.16**
Stress paid work		0.05		−0.12		−0.12		0.19		0.22**
Stress TWL		0.13		0.31		0.46*		−0.00		0.19*
Control TWL		0.11		−0.07		−0.02		0.09		0.03
Change TWL		−0.16		−0.05		−0.15		−0.18		0.12*
R^2		0.16		0.15		0.15		0.14		0.24

Notes: AUC, area under curve; SHC, subjective health complaints; WFC, work/family conflict; TWL, total workload. Marital status: married = 0; partner = 1; no partner = 2; children: yes = 1; no children = 0; R^2 refers to explained variance in step 2. *$p < 0.05$; **$p < 0.01$

Table IV.
Hierarchical regression analyses (β coefficients) analyzing predictors of cortisol measures ($n = 68$) and subjective health complaints ($n = 420$)



Notes: $n = 68$ (low stress, $n = 36$; high stress, $n = 32$). Significant interaction effect and a significant difference between high and low stress in T3

Figure 1.
ANOVA for repeated measures stress in unpaid work and diurnal cortisol on a workday

with *H3* and follows previous studies showing a stronger association between unpaid work and cortisol than between paid work and cortisol (Sjörs *et al.*, 2014). Also, previous research has shown that the neuroendocrine activation increases when women get home from work (Lundberg and Frankenhaeuser, 1999). Despite the current study sampling the last cortisol measure of the day in the late afternoon, the previous findings were reproduced; women reporting high stress from the unpaid family domain had slightly higher cortisol levels than did women reporting low stress from the unpaid family domain.

Categorizing TWL in its separate parts into hours spent on paid work, household work, caring for children and other tasks, the correlation coefficients showed that hours spent on household tasks and children seemed to contribute the most to the TWL among women. As the majority of the women work full time there is little variation in hours spent on paid work. Statistically, this may make time spent on different non-work tasks adding more to the variance in TWL. However, as this finding also emerged in the cortisol subsample, where the variation in hours spent on paid work is larger, this cannot fully explain the result.

Taken together, the results suggest that the unpaid work domain seems more important for cortisol than the paid work domain. This suggests that taking care of children and household work seem important factors to consider for stress among women. Partly, this can perhaps be explained by the existing borders between the paid and unpaid work domains; that is, the stress of the unpaid work domain is more difficult to leave behind and avoid as compared to the paid work domain. At least this is the case for the group of women investigated here, who fulfill their paid work tasks at work and, because of restrictions relating to health care work, are unable to bring home any paperwork. Also, these restrictions probably explain why there is no association between WFC and cortisol. Moreover, the tasks relating to the unpaid work domain are performed during the time in which individuals, according to societal norms, should recover from work. This may add to the perception of unpaid work tasks constituting an extra load. Also, gender roles and the different expectations on caregiving roles of mothers and fathers may relate to this (Elvin-Nowak, 1999).

It should be noted that stress of paid and unpaid work, similarly to psychosocial work stressors, is of mild or moderate intensity. Thus the effects of such mild or moderate stressors may not be captured through a few salivary cortisol measurements during a single workday (cf. Karlson *et al.*, 2012). Also, if an individual copes adequately with work and non-work stressors, this induces a successive attenuation of the stress response and a rapid return to baseline levels. However, with stress of unpaid work being associated with cortisol, the present study findings may suggest that the home domain is a more stressful situation than paid work. This finding was particularly clear for the last cortisol measure when the women were at home. Albeit preliminary, the findings follow previous research suggesting that the challenges and demands of the unpaid workload relating to the home domain and its associations with HPA-axis functioning and SHC may constitute a mechanism relating to compromised health in working women (Sjörs *et al.*, 2014; Eller *et al.*, 2011).

As for the effects on SHC, including stress-related complaints such as back and shoulder pain, fatigue and problems sleeping, that were investigated in the full sample the pattern is slightly different. Partly in line with *H2*, both stress of paid and unpaid as well as TWL stress, but not TWL measured in hours, were related to SHC. In the cortisol subsample, these associations did not reach significance which probably relates to statistical power. As concerns SHC, both paid and unpaid work domains are important to take into account to counteract health problems in women working within the public health care sector.

Interestingly, self-reports of total hours spent on various tasks, which involves a more objective measure of time use, were unrelated to outcome measures. However, the perception of, e.g., too much TWL and TWL stress was linked to both cortisol and SHC. This suggests that individual perceptions of a situation are more important for health than the actual (objective) situation. This follows previous findings (Krantz *et al.*, 2005) showing that the perception of a too high TWL show a stronger association with health problems than did the objective number of work hours spent on paid and unpaid work.

The correlation analyses showed that the associations between the outcome variables, SHC and cortisol were statistically significant. But there were no significant mean differences in cortisol between women reporting high and low SHC. Yet, a recent study (Sveinsdottir *et al.*, 2015) showed that individuals with high SHC had an increased CAR compared to referents. However, others have reported inconsistent findings regarding the associations between cortisol and mental health measures. For instance, most studies have failed to show any significant relationships between burnout and cortisol, and when producing significant findings the results remain inconsistent (Jonsdottir *et al.*, 2012).

Limitations of the present study include the cross-sectional design that limits conclusions regarding causality, the small sample size of the cortisol subsample (due mostly to exclusions arising from non-compliance in the time for sampling saliva in the morning)

which decreases power and increases the risk for false negative findings. However, the repeated cortisol measures reflect adequately the associations between TWL, stress in both domains and stress reactions. Also, the cortisol measures used here were carefully screened before analyses with respect to well-known confounders such as smoking, alcohol consumption and coffee intake (Dockray *et al.*, 2008). Yet, the findings regarding cortisol should be considered tentative. As this study focused exclusively on women employed within the health services, it is impossible to generalize to other groups and we cannot relate our results to previous findings regarding gender differences. Future research should scale up the study of biomarkers and be careful regarding the monitoring of compliance of study participants to ascertain that study participants provide data of adequate quality. Also women and men in more gender balanced occupations and sectors should be studied to provide additional knowledge regarding the associations of paid and unpaid work along with the stress of these different domains in relation to various health-related outcomes.

To conclude, stress in unpaid work was related to diurnal variation in cortisol and stress in unpaid as well as paid work was related to SHC. Self-ratings referring to more objective measures of time use, that is, total hours spent on various TWL domains, were unrelated to outcome measures while the perception of too much TWL and TWL stress was linked to both cortisol and SHC. This suggests that how an individual perceives a situation seems more important for health than the actual situation.

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