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Self-rated recovery from work stress and allostatic load in women

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Abstract

Objective: The objective of this study was to investigate the relationships between self-rated recovery from work stress and biologic dysregulation in terms of allostatic load (AL) and individual biomarkers, respectively, in healthy women within the public health care sector. **Methods:** Two hundred forty-one women completed self-ratings of recovery and took part in a standardized medical examination, which provided individual biomarkers that were used to compute AL. **Results:** Cluster analysis of self-rated recovery resulted in three cluster profiles, including (1) recovered women (n=108), (2) nonrecovered women (n=51), and (3) fatigued women (n=82). Sequential logistic regression analysis showed that the fatigued profile had an increased risk for high AL. In contrast, there was no significant difference in individual biomarkers between recovery profiles. **Conclusions:** The findings establish an association between biologic processes and self-rated recovery from work stress, thus supporting the hypothesis that insufficient recovery may result in high AL.

Keywords: Cumulative risk; Occupational stress; Public health care; Recuperation; Unwinding

Introduction

It has been suggested that insufficient or poor recovery is pertinent to stress-related ill health [1–4]. Previous research on the biologic pathways of recovery from work stress have mainly focused on stress hormones such as catecholamines (adrenaline and noradrenaline) and cortisol. Several studies [1,5,6] have shown that insufficient recovery from work is associated with higher catecholamine output in women and men. For cortisol, previous findings have shown that high cortisol reactivity at work and low cortisol reactivity off work are associated with a higher need for recovery in men [7]. Furthermore, recent findings have shown that high morning cortisol is associated with insufficient recovery from work in female and male white collar workers [4].

The concept of *allostatic load* (AL), in extending the focus on separate biomarkers, has been proposed as a multisystems approach describing how daily stress relates to health and disease [8–12]. This model focuses on an individual's experience of challenging events and associated biologic responses of the body. It also takes into account the ability of bodily systems to reach stability through change and distinguishes between the effects of acute and chronic stress responses, respectively. Acute stress responses necessary for adapting to current demands posed by the environment have a potentially protective effect if followed by periods of rest and recovery. However, repeated and/or prolonged stress-related activation increases wear and tear of bodily systems, which increases AL. Examples of conditions contributing to AL and increased health risks are hypothesized to include frequent exposure to stressful conditions without enough time for rest and recovery and inability to shut off the stress response after the end of the stress exposure (e.g., being unable to unwind in the evening after work). AL has been operationalized as a summary indicator of biologic challenges of multiple bodily systems

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to reflect this multisystems view. To date, the operationalization of AL differs between studies, depending on the type and number of biomarkers available [13–16]. However, across studies, findings have shown that a high AL increases the risk for future ill health [17,18].

With the use of a multisystems approach, we set out to investigate the relationships between self-rated recovery from work stress and biologic dysregulation load in terms of AL in employed women.

Methods

Participants

Participants were female employees of two public health care organizations in Stockholm, Sweden, who took part in a larger project aimed at investigating the impact of changes in the scheduling of work on employee health and well-being. Participation was voluntary but encouraged by the employer. In all, 390 persons were invited to participate in the study; 367 of these individuals volunteered. For the purposes of this study, only data from female employees (n=312) were included. Of these employees, pregnant women (n=9), individuals with known diabetes medulla (n=7), and those with missing data (n=38) were excluded. After data screening, univariate outliers in biomarkers considered erroneous (n=17) were excluded. The final sample consisted of 241 women. There were no significant differences in demographic characteristics between the women included in the final sample and the others.

Design and procedure

Prior to the data collection, all participants were given detailed oral and written information about ethical issues and procedures for the measurements involved (self-ratings in a questionnaire and a health checkup). The questionnaire was completed at home and returned to the licensed nurse who performed the health checkup, which took place in the morning in a secluded room at the workplace. All participants were instructed to refrain from eating for 12 h prior to the checkup. In addition, they were asked to rise at least 2 h before the health checkup was scheduled and in the meantime refrain from coffee and nicotine and avoid intense mental or physical activity. All health checkups followed a specific protocol and involved sampling of blood and measurement of waist–hip ratio (WHR), blood pressure, and heart rate (HR). Blood samples were drawn to determine blood lipids, including total cholesterol (TC), triglycerides, high-density lipoproteins (HDLs) and low-density lipoproteins (LDLs), LDL/HDL ratio, dehydroepiandesterone sulfate (DHEAS), glucose, glycosylated hemoglobin (HbA_{1c}), and prolactin. In all, 25 ml of venous blood was sampled and left to coagulate for a minimum of 30 min and a maximum of 120 min before being centrifuged at room temperature (15 min, $1000\times g$) and transported to a commercial laboratory for chemical analysis. WHR was calculated based on waist circumference (centimeters) measured at the narrowest point between the rib and the iliac crest and on hip circumference (centimeters) at the maximal buttocks. A semiautomatic device (Boso, Bosch+ Sohn, Germany) was used to measure systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). After an initial 5-min resting period, measurements were repeated three times, with 5-min rests between measurements. The median value of these three recordings was used to reduce the influence of potential technical errors. The project was approved by the Central Ethical Review Board.

Psychological measures

Questionnaires

In addition to demographic information on age, sex, and family situation (marital status and whether there were any children living at home), the questionnaire also covered education; details on employment characteristics (current position and number of work hours per week); health behaviors, including nicotine consumption (yes/no) and alcohol consumption (frequency and quantity consumed); and whether an individual suffered from a chronic disease.

An eight-item version of a recovery measure [2,4] assessing recovery from work stress was used. More specifically, this measure includes items assessing need for recovery, recuperation, and fatigue as related to work at different time points (e.g., in the morning, after work, and after a weekend). Respondents were asked to indicate their overall level of recovery and fatigue along a five-point response format with *never* and *very often* as end points, with high scores indicating insufficient recovery. The internal consistency (Cronbach's α) for the original scale was .85 [4]; that for the present study was .83.

Biologic measures

AL

A measure of AL must include parameters from multiple regulatory systems to provide a proper assessment of cumulative biologic dysregulation [13]. The following parameters, which were available in the current data set, were included in the present operationalization of AL to reflect multiple systems: SBP, DBP, and HR (measures of cardiovascular activity); HDL, LDL, LDL/HDL ratio, and TC (blood lipids associated with increased risk of atherosclerosis and cardiovascular disease); triglycerides (measures of fat deposits; high values are associated with diabetes and overweight); serum DHEAS (a functional HPA axis antagonist); glucose and HbA_{1c} (an integrated measure of glucose metabolism over the previous 30–90 days); prolactin (sensitive to sleep and stress [19–21]); and WHR (reflects adipose tissue deposition and metabolism).