REWARD AND OVER-COMMITMENT INCREASE TRAPEZIUS MUSCLE ACTIVITY IN A REAL OFFICE WORK ENVIRONMENT

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Statement of Problem

While workplace psychosocial factors are widely recognized for their associations with work-related upper extremity disorders and their symptoms among office workers, pathways explaining this relationship are still unclear. Biomechanically, psychosocial stress could increase muscle activity, which in turn could lead to the development of musculoskeletal symptoms (Wahlstrom 2005). Evidence supporting a link between laboratory-induced stress and increased muscle activity exists (eg Wang et al 2011); however, there is currently no evidence from studies conducted in a real work environment, using real psychosocial factors and taking personality traits of workers into account (eg Siegrist 2004). Therefore, this study investigated the interactive effects of a workplace psychosocial factor, reward, and a personal factor, over-commitment, on muscle activity of the trapezius and extensor carpi radialis muscles while office workers were performing their own computer work at their own workstations.

Methods

We measured muscle activity of 120 office workers (86 female, 23-63 years) for approximately two hours each. Participants from 9 departments at the VU University and VU University Medical Center in Amsterdam, the Netherlands were recruited based on their reported reward and over-commitment scores (Siegrist et al 2004) . All workers who filled out the questionnaire (n=854) and agreed to take part in the measurements (n=348) were classified into 3 tertiles for reward and for over-commitment, and workers within the most extreme tertiles (lowest reward/over-commitment, highest reward/over-commitment, lowest reward/highest over-commitment, highest reward/lowest over-commitment) were invited to participate in the measurements.

Surface electromyography (EMG) electrodes mounted on the right and left trapezius and extensor carpi radialis recorded muscle activity for 1 to 2 hours while participants completed their work at their own workstations. The median muscle activities during interactions with the computer were calculated from the rectified and smoothed EMG signals normalized to the amplitude measured during maximum voluntary contractions (MVCs).

To test the hypothesis that participants reporting low reward and high over-commitment had higher muscle activities, the median values were modeled using a repeated-measures analyses of variance (RMANOVAs) with right/left side, reward, over-commitment, and the reward-by-over-commitment interaction as the independent variables. For the extensor carpi radialis, since the interaction was not significant, it was removed and the model rerun. The analyses included any of 10 potential confounders (BMI, Gender, Anthropometry, etc.) that changed the partial eta squared of any independent variable by at least 10%. Tukey’s post-hoc analysis provided pair wise comparions.

Analyses and Results

Median trapezius muscle activities during computer use were approximately 2% MVC larger for participants reporting low reward and high over-commitment (~5.5% MVC) compared to participants reporting low reward and low over-commitment (~3.5% MVC), with no difference for high reward ($p=0.04$). There were no main or interactive effects of reward and over-commitment on extensor carpi radialis muscle activity ($p=0.68$), all workers had muscle activities of approximately 5%MVC.

Implications and Conclusions

This study provided evidence in support of a biomechanical pathway between workplace psychosocial and personal factors and trapezius muscle activity. The result for the trapezius is not surprising considering the ample laboratory evidence supporting such an association (eg Wang et al 2011), but indicates that true workplace psychosocial factors can indeed induce an increased muscular response. This study also demonstrated that overcommitment, a personal factor, has an effect on trapezius muscle activity and therefore that personal factors should be recognized along with workplace psychosocial factors for their associations with biomechanical loading and possibly musculoskeletal symptoms. Previous studies have reported evidence of an association between laboratory-induced stress and extensor carpi radialis muscle activity, but this was not supported by this field study. It may be possible that other workplace

psychosocial factors, capturing different psychosocial aspects within the workplace, may influence extensor carpi radialis muscle activity.

Since the findings of this study indicate that workers' psychosocial and personal factors can influence their physical exposures, multiple aspects of the work environment, and also of the individual, must be taken into account as part of prevention efforts aimed towards reducing physical exposures and musculoskeletal symptoms (Kennedy et al 2010, Wahlstrom 2005).

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Paper 4 Promoting Safety and Health in Young Employees
- Diane Rohlman, PhD, Oregon Health & Science University, Portland, OR; Megan Parish, MPH; Eric Serres, BS; Hannah White, BS; Diane Elliot, MD; Dede Montgomery, MS

Discussant: W. Kent Anger, PhD, Oregon Health & Science University, Portland, OR

Effects of Organizational Change on Employee Well-Being (Paper Panel Session)
Palos Verdes
Chair: Irene Houtman, PhD, TNO, Hoofddorp, The Netherlands

Paper 1 Being in a Non-Preferred Job After Organizational Change: Associations With Employability and Well-Being in Swedish Managers
- Claudia Bernhard-Oettel, PhD, Stockholm University, Sweden; Katharina Näswall, PhD; Prof. Gunnar Aronsson

Paper 2 Premerger Mental Health and Change in Job Position During Merger as Predictors of Postmerger Psychotropic Medication
- Pauliina Mattila-Holappa, LicPsych, Finnish Institute of Occupational Health, Helsinki, Finland; Karina Nielsen, PhD; Krista Pahkin, LicSocSci; Aki Koskinen, MS; Anne Kouvonen, PhD; Marianna Virtanen, PhD; Ari Väänänen, PhD

Paper 3 Interactions Between Lean and Psychosocial Work Environment in a Hospital Setting: A Multiple Method Study
- Waqar Ulhassan, MSc, Karolinska Institute, Stockholm, Sweden; Ulrica von Thiele Schwarz, PhD; Johan Thor, PhD; Christer Sandahl, PhD; Hugo Westerlund, PhD

Job Demands and Musculoskeletal Symptoms (Paper Panel Session)
San Fernando
Chair: Songqi Liu, PhD, Pennsylvania State University, University Park, PA

Paper 1 Reward and Over-Commitment Increase Trapezius Muscle Activity in a Real Office Work Environment
- Jennifer L. Bruno Garza, BS, Harvard University, Boston, MA; Belinda H.W. Eijckelhof, MS; Maaike A. Huysmans, PhD; Peter W. Johnson, PhD; Jaap H. van Dieen, PhD; Prof. Allard J. van der Beek; Jack T. Dennerlein, PhD

Paper 2 Job Strain, Effort–Reward Imbalance and Neck, Shoulder and Wrist Symptoms Among Chinese Workers
- Shanfa Yu, PhD, Henan Provincial Institute of Occupational Health, Zhengzhou, Henan Province, China; Akinori Nakata, PhD; Dr. GuiZhen Gu; Naomi G. Swanson, PhD; Lihua He, PhD; Dr. Wenhui Zhou; Sheng Wang, PhD

Paper 3 The Role of Tremor Assessment in Construction Workers to Prevent Hand Arm Vibration Syndrome
- Linda M. Jones, PhD, Massey University, Wellington, New Zealand

Interpreting Longitudinal Surveys: The Balance of Change and Stability in Organizational Life (Symposium)
San Bernardino
Chair: Michael P. Leiter, PhD, Acadia University, Wolfville, NS, Canada

Paper 1 Stability and Change Model of Work Engagement and Job Resources: A Seven-Year Three-Wave Follow-Up
- Piia Seppälä, MA, Finnish Institute of Occupational Health, Helsinki, Finland; Jari Hakanen, PhD; Riku Perhoniemi, MA; Asko Tolvanen, PhD; Wilmar Schaufeli, PhD

Paper 2 Contrasting Methods for Analyzing Changes in Burnout
- Michael P. Leiter, PhD, Acadia University, Wolfville, NS, Canada; Christina Maslach, PhD

Paper 3 Positive and Negative Mood Trajectories and Their Relationship to Work Ability, Self-Rated Health and Life Satisfaction: A 13-Year Follow-Up Study
- Auli Airila, MSocSc, Finnish Institute of Occupational Health, and University of Helsinki, Finland; Jari J. Hakanen PhD; Ritva Luukkonen PhD; Sirpa Lusa PhD; Anne Punakallio PhD

The Role of Psychological Factors and Support in Worker Well-Being (Paper Panel Session)
San Pedro
Chair: Gwendolyn Puryear Keita, PhD, American Psychological Association, Washington, DC

Paper 1 A Team and Individual-Level Model of Antecedents and Outcomes of Job Crafting
- Maria Tims, MSc, Erasmus University, Rotterdam, The Netherlands

Paper 2 The Role of Work Psychosocial Factors in Ergonomics
- Dr. Elvia Luz González-Muñoz, Ergonomics Research Center, Universidad de Guadalajara, Mexico

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