

Assessment of occupational stress in higher education employees through the cortisol awakening response.

Dr Thomas Campbell¹, Dr Tony Westbury¹, Professor Richard Davison²,
Professor Geraint Florida-James¹

¹ Edinburgh Napier University, ² University of the West of Scotland



INTRODUCTION

The cortisol awakening response (CAR) is a distinct element of the diurnal pattern of cortisol release, which occurs within the first 30 to 60 minutes of awakening (1) and is partly driven by the reactivation of memory and the anticipation of demands to be faced in the day ahead (2, 3). Although widely used to investigate psychosocial work-related factors, including stress, consideration is seldom given to the potential involvement of day-to-day variation in psychosocial work characteristics. The aim of this study was to investigate whether acute levels of anticipatory work-related demand influence the CAR among higher education employees.

METHODS

Fifteen participants (8 male, 7 female) aged 38.2 ± 9.6 years, provided saliva samples immediately upon awakening and thirty minutes thereafter on three separate occasions (Fig. 1). The response was compared on a single weekend day and two work days of differing levels of anticipatory demand (high/low). Salivary free cortisol concentrations were measured using a commercially available enzyme linked immunosorbent assay (Salimetrics, Newmarket). Absolute measures of salivary free cortisol were determined as the concentration of cortisol (nmol/l) present in saliva samples on awakening and at 30 minutes post awakening. A repeated measures ANOVA was performed to investigate whether time of awakening differed between days and a paired-samples t-test was performed to test for differences in anticipatory demand between work days. The effects of sampling time and day were investigated by means of a repeated measures ANOVA with two within person factors: day (less demanding work day/more demanding work day/weekend) and time of day (awakening and 30 minutes post-awakening) controlling for the effects of gender.

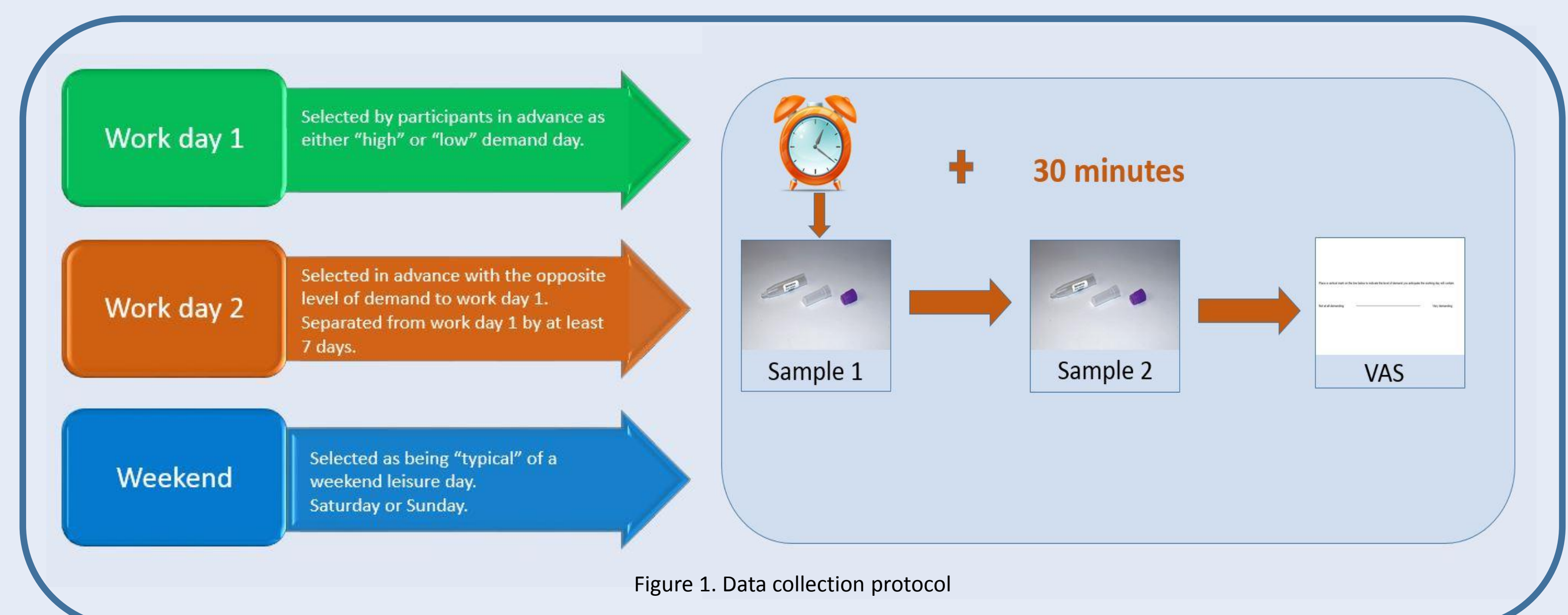


Figure 1. Data collection protocol

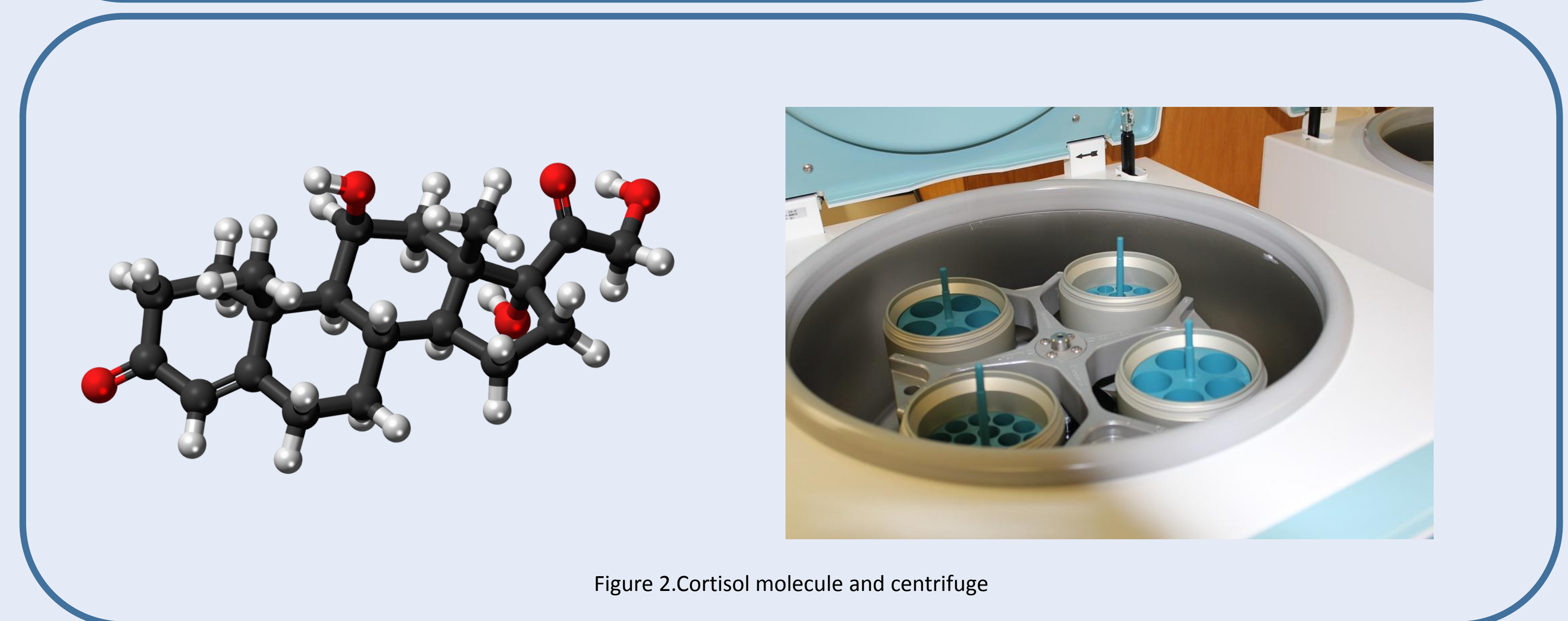


Figure 2. Cortisol molecule and centrifuge

RESULTS

Table 1. Mean self-reported salivary cortisol sampling times by day

Day	Sample 1	Sample 2
Less Demanding	07:08 ± 34	07:49 ± 33
More Demanding	07:04 ± 32	07:33 ± 32
Weekend	07:28 ± 31	07:58 ± 24

Time in hours and minutes ± SD in minutes, sample 1: awakening sample, sample 2: 30 minutes post-awakening.

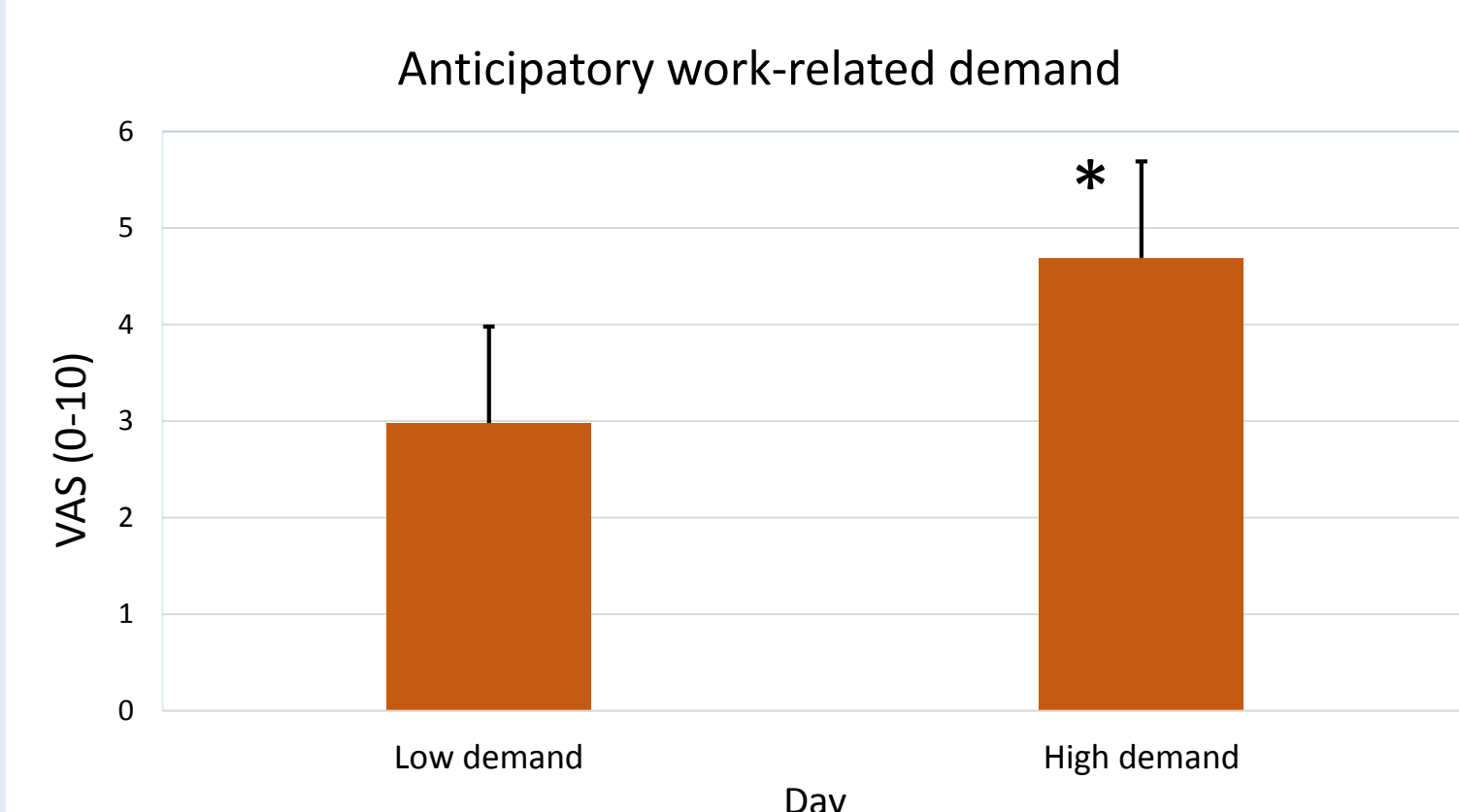


Figure 3. Anticipatory work-related demand (n=15) * denotes statistical difference ($p < .05$)

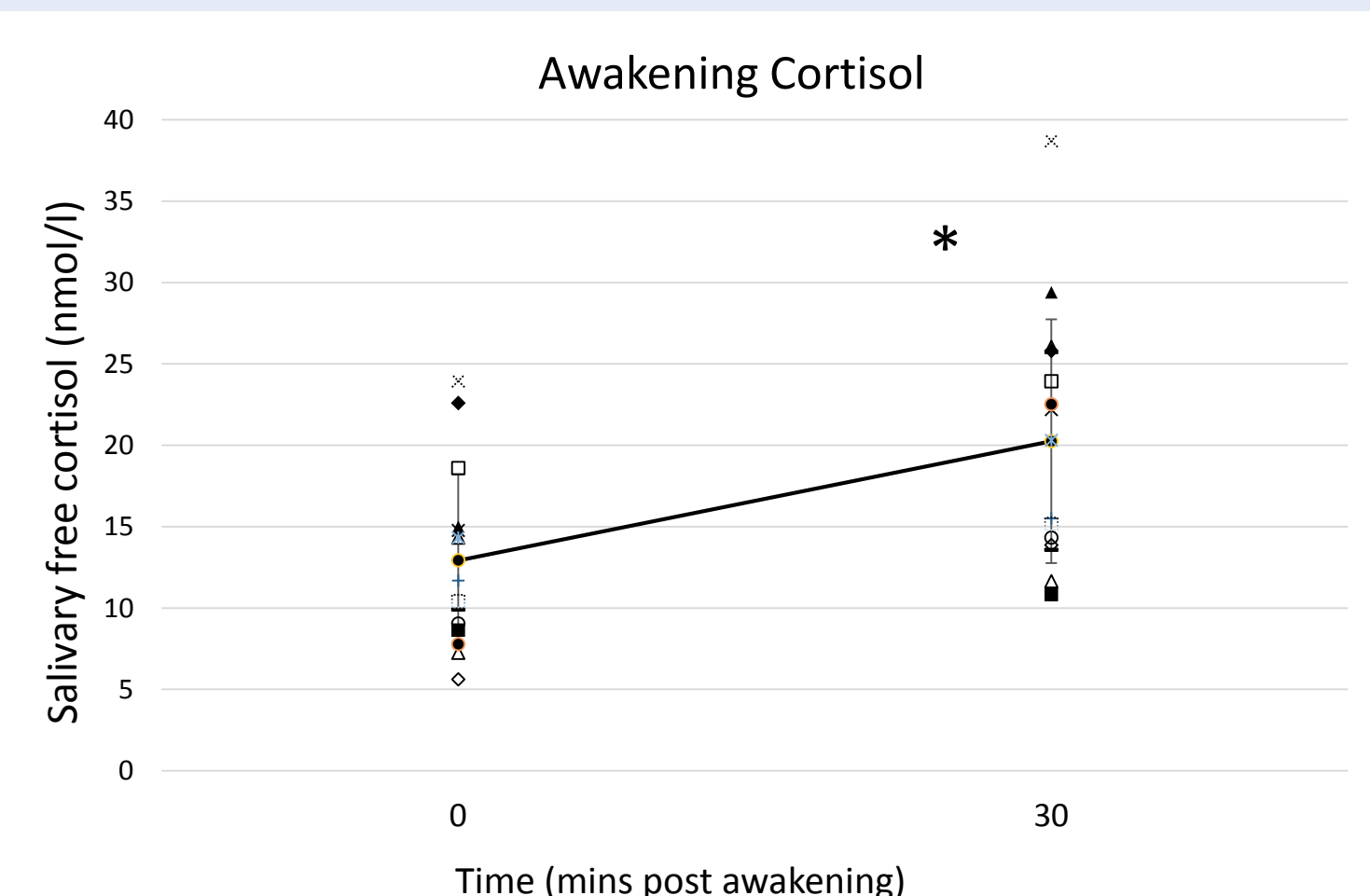


Figure 4. Mean values for participants salivary free cortisol by sample time. * denotes significant difference ($p < .01$).

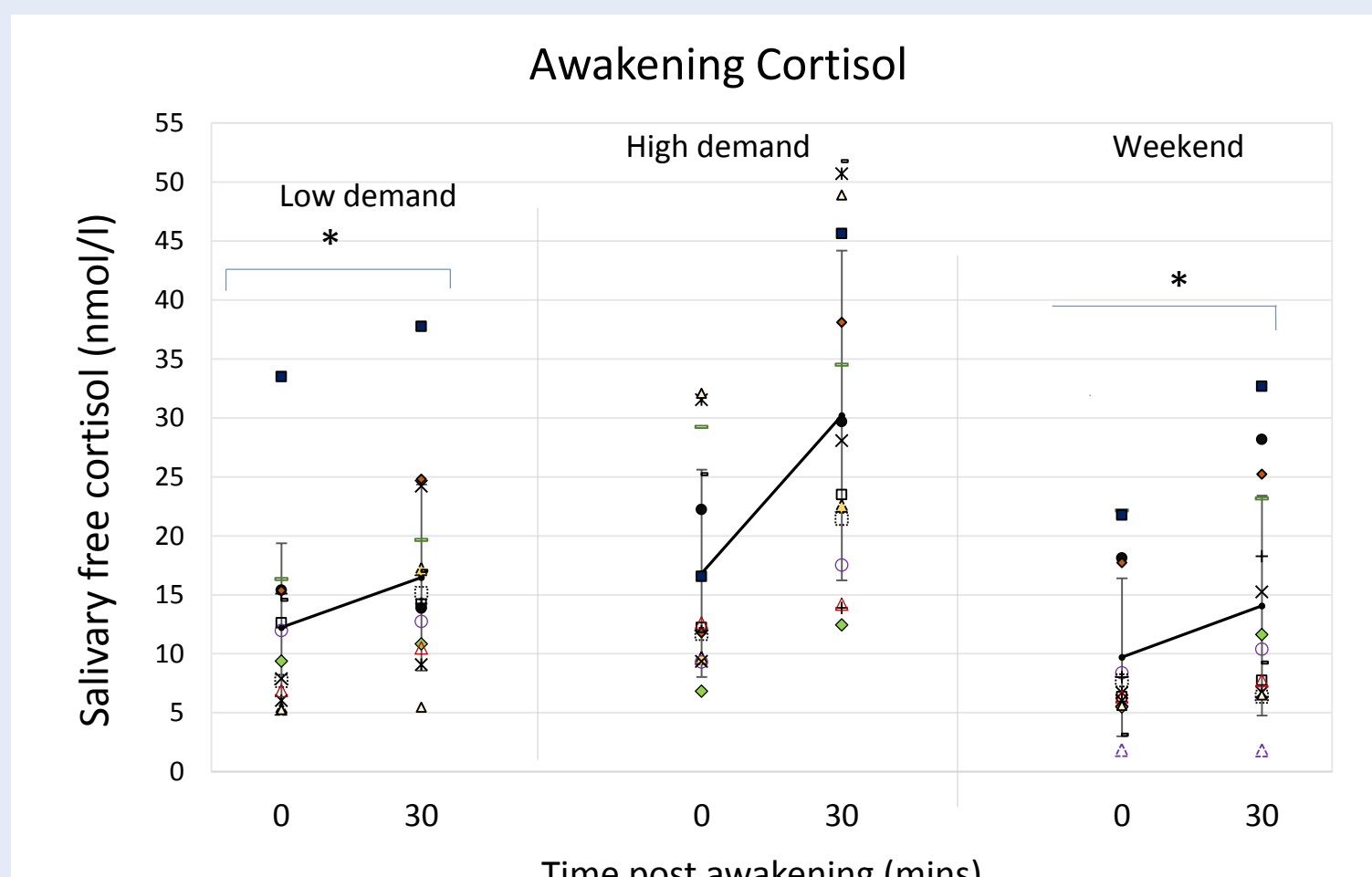


Figure 5. Cortisol awakening response by day. * denotes significant difference from high demand work day ($p < .05$)

CONCLUSION

The dynamic release of salivary free cortisol over the awakening period varies according to the relative degree of anticipatory work-related demand present. This may have implications for both employee health and for work design. While psychoneuroendocrinological assessment of employees via the CAR may well provide a meaningful insight into the effects of the psychosocial work environment upon health, it is important to attend to the acute characteristics of the day upon which any assessment is performed. Considering this variation in work-related demand to be meaningful, as opposed to simply 'noise' in the data, may elicit a greater understanding of the extent to which employees react and cope with the pressures of their work. This could provide a rudimentary starting point from which it is possible to move towards a model which combines subjective psychosocial questionnaires and ambulatory physiological measures into a coherent assessment of employee well-being. A longer term investigation over a greater number of sampling occasions should provide further understanding of the extent to which the cortisol awakening response is influenced by naturally occurring variance in work-related characteristics.

REFERENCES

- Powell and Schlotz (2012) Daily life stress and the cortisol awakening response: testing the anticipation hypothesis. *PlosOne*, 7(12), 1-10.
- Wilhelm, I., Born, J., Kudielka, B.M., Schlotz, W. and Wust, S. (2007) Is the cortisol awakening rise a response to awakening. *Psychoneuroendocrinology*, 32, 358-366.
- Fries, E., Dettenborn, L. and Kirschbaum, C. (2009) The cortisol awakening response: facts and future directions. *International Journal of Psychophysiology*, 72(1), 67-73.

- Awakening time did not vary significantly across the three assessment days (Table 1).
- There was a significant difference in anticipatory demand between the two work days (Fig. 3)
- There were significant main effects of time ($F [1, 13] = 23.54, p < .01$) (Fig. 4) and day ($F [2, 26] = 5.70, p < .01$) (Fig. 5) upon salivary cortisol.
- The cortisol awakening response was significantly greater on the "high demand" work day compared to both the "low demand" workday and the "weekend" day (Fig. 5).