

Job Stress on Abdominal Obesity: The Moderating Effects of Anger and Overeating Behaviour

Rosnah I¹, Idris MA², Azmi MT¹ & Noor Hassim I¹

¹ Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Center, Jalan Yaakob Latiff, 56000 Cheras, Kuala Lumpur

² Department of Anthropology and Sociology, Faculty of Arts and Social Sciences Building, University of Malaya, 50603 Kuala Lumpur

ABSTRACT

Introduction: Individual differences pertaining to cognitive and affective processes toward job stress stimuli may influence food choice and intake, leading to overeating and obesity. This study was conducted to determine the relationship between job stress and abdominal obesity with anger as a personality trait and overeating as moderators among male workers in Malaysia. **Methods:** This cross-sectional study involved 492 male employees from 33 private companies in various states in Malaysia. The companies and workers were approached by convenience sampling. Workers who fulfilled the study inclusion criteria completed validated questionnaires assessing job stress, anger as a personality trait and overeating, using the Oldenburg Burnout Inventory-Exhaustion, Spielberger Trait Anger Scale and Three Factor Eating Questionnaire-Uncontrolled, respectively. Weight, height and abdominal circumference were taken for each participant. Moderation effect analyses were conducted based on standard multiple regression. **Results:** For two-way interaction, a significant curvilinear regression equation was found to predict overeating based on job stress as a predictor and anger as a moderator ($\beta=0.93$, $SE=0.46$, $t=2.03$, $p=0.043$). High anger was associated with higher overeating behaviour on exposure to high job stress level ($F(7, 484) = 9.36$, $p<0.001$, $R^2=0.118$). For three-way interaction, a significant curvilinear regression equation was found to predict abdominal obesity based on job stress as a predictor and both anger and overeating as moderators ($\beta= -0.73$, $SE=0.39$, $t=1.87$, $p=0.032$). High anger trait and high overeating behaviour predict lower abdominal obesity upon exposure to high job stress in contrast to the combined moderation effects of low anger trait and high overeating behaviour ($F(14, 477)= 5.93$, $p<0.001$, $R^2=0.123$). **Conclusion:** Effect of job stress on overeating was shown in this study to depend on the level of anger as a personality trait, while the effect of job stress on abdominal obesity depended on the level of anger as a personality trait and overeating behaviour.

Key words: Abdominal obesity, anger trait, job stress, moderation analyses, overeating

INTRODUCTION

Obesity is one of the main public health problems in many parts of the world, particularly in Asia. In Malaysia the national prevalence of overweight and obesity was almost half (Institute for Public Health, 2015). Globally, it is accepted that

the combination of high intake energy-dense foods and physical inactivity are the known causal factors of obesity. On the one hand, epidemiological research strives to explain the prevalence of obesity by taking account of a combination between high calories consumed from energy-

dense foods and low calories expenditure due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanisation, a result of environmental and societal changes (WHO, 2015). On the other hand, job stress research explores constant exposure to stressful job environmental stimuli affecting physical health as a result of central and peripheral biological link factors involving emotional states as hypothesised by Model of Job Stress and Health (Hurrell & Kelloway 2007). The altered emotional state influences food choice and intake leading to overeating and obesity.

Previous research affirmed that human behaviour results from individual differences pertaining to cognitive and affective processes toward environmental stimuli (Kelly & O'Connell, 2015). Job environmental stimuli promote appetite and eating dysregulations by opposing physiological control. It stimulates eating irrespective of satiety, or inhibits eating irrespective of hunger (Petrovich, 2013). Previous studies have demonstrated that job stress is associated with overeating in men with higher BMIs (Takaki *et al.*, 2010). High levels of stress alter eating patterns by influencing food motivation, enhance foods intake (including fast foods and high energy-dense food) and metabolic adaptation related to energy homeostasis (e.g. alterations in glucose metabolism and insulin sensitivity) especially in obese individuals (Lemmens *et al.*, 2011). A recent longitudinal study on BMI found that a stressful job has a dual effect depending on body weight, i.e. stressful job causes weight loss in the thinner group, but weight gain in the weighty group (Kivimäki *et al.*, 2006). This paradoxical finding sparks an interesting hypothesis. We hypothesised that the underlying mechanism for this phenomenon was individual factors such as negative emotions and personality traits.

A recent study found that obese

people are more associated with negative emotions (e.g. anger and distress) compared to positive emotions (Pasco *et al.*, 2013). Anger, as a psychobiological state, is associated with activation of the autonomic nervous system (Spielberger & Reheiser, 2009), that induces the adoption of an overeating behaviour (Hunter, 2013). Similarly, distress without adequate resilience leads to inner disturbance such as increased stress sensitivity, negative emotions, depression and anxiety leading to a psychological and emotional overload which in turn initiates a weight gain mechanism through maladaptive eating behaviour (e.g. emotional eating, high intake of comfort foods and appetite up-regulated) and disruption of energy homeostasis (Hemmingsson, 2014). These phenomena may explain that underlying changes in eating behaviour are positively correlated with body mass index, especially among men upon exposure to highly stressful jobs (Takaki *et al.*, 2010).

As studies based on anger as a personality trait remain scarce, we explored how anger as a personality trait would behave as a possible moderator in predicting overeating upon exposure to a stressful job. Anger as a personality trait was chosen because other scholars (Hurrell & Kelloway, 2007) have not specified it as a possible moderator in the workplace, although its manifestations are easily recognisable in organisations (Gibson & Callister, 2010). The trait results in both negative and positive consequences at the intra-individual (Tarfrate, Kassinove & Dundin, 2002) as well as at the inter-individual level (Lemay, Overall & Clark, 2012). Also, we explored how both anger as a personality trait and overeating as a moderator variable predict abdominal obesity upon exposure to a stressful job. In this study, we accept that anger may manifest as individual differences in terms of frequency of anger and intensity, from mild irritation or annoyance to fury

and rage. In addition, anger consists of three dimensions i.e. affective (personal disposition), cognitive (cynical attitudes) and behavioural (expression tendencies) (Suls, 2013). People with anger generally have a high tendency to be emotionally heightened on exposure to angering situations (Wilkowski & Robinson, 2008). Subsequently they engage in problematic health behaviours (Gibson & Callister, 2010), that hypothetically includes unhealthy eating behaviour. Biologically, anger is associated with a low serotonin level (Hemmingsson, 2014; Hurrell & Kelloway, 2007) which may increase consumption of high-energy dense food to increase serotonin level during a stress mood state (Duke *et al.*, 2013) to achieve a calmer state.

METHODS

Study design

This cross-sectional study was conducted in Malaysia over a 6-month period at multiple worksites across the manufacturing, service, and agricultural sectors in Selangor, Negeri Sembilan and Pahang. The names of the companies were obtained from various sources including a city council, Social Security Organisation (SOCSO) and professional connections. The targeted organisations were invited to participate in this study via electronic mail and telephone. All organisations interested in participating were chosen. A total of 33 manufacturing companies agreed to participate. This study was approved by the Research Ethics Committee of the National University of Malaysia (Research code: FF-288-2012)

Study sample

All eligible male employees who were present on recruitment day at their respective organisations were given self-administered questionnaires. The eligible inclusion criteria were apparently healthy, free of cardiovascular disease risks, aged

between 20 and 60 years, and employed in the current company for at least one year. Informed consent was obtained from each employee prior to questionnaire distribution and anonymity was assured. The minimal calculated sample size was 381 respondents after considering three factors such as prevalence of outcomes, the sampled standard deviation and the significance level within $\pm 5\%$ of confidence interval.

Measures

All measures were translated from English to Malay, replicating the translation process of the International Society for Pharmacoeconomics and Outcomes Research taskforce. Malay version questionnaires were used to collect data on socio-demographics (such as age, job title, average household income and marital status), job stress, overeating behaviour and anger as a personality trait. Job stress was measured by the exhaustion domain of the Oldenburg Burnout Inventory (OLBI-Exhaustion) (Demerouti *et al.*, 2003). It consists of eight generic items to measure affective, cognitive and physical exhaustion at work. Some of the examples are as follows: "At work, I often feel emotionally drained", "Usually, I can manage my work well" and "After work, I usually feel worn out and weary." All the items required responses on a Likert-type scale (1= Strongly agree, to 4= Strongly disagree). A total of four out of eight items were reverse-scored. High scores indicated high job stress. In this study, the Cronbach's alpha coefficient was 0.50 with the item reliability set at 0.99. The measurement model provided a good fit to the data (GFI=0.98, CFI=0.92, RMSEA=0.066 and the ratio of Chisq/dif= 3.21).

Overeating behaviour was measured by the uncontrolled eating behaviour domain of the Three-Factor Eating Questionnaire (TFEQ-R21) (Karlsson *et al.*, 2000), which was further improvised.

This domain assessed the tendency to lose control (overeating) when feeling hungry or when exposed to external stimuli. Some of the examples are as follows: "Sometimes, when I start eating, I just can't seem to stop", "I often get so hungry that my stomach feels like a bottomless pit", "I am always hungry enough to eat at any time", "When I smell appetizing food or see a delicious dish, I find it very difficult not to eat - even if I have just finished a meal", and "Being with someone who is eating, often makes me want to eat too." This study used seven out of the nine items based on the preliminary data analysis as two items were found not culturally suitable (Ismail *et al.*, 2015). A four-point Likert scale was used (1= Definitely agree, to 4= Definitely disagree). All items were reverse scored as well. High scores indicated high overeating behaviour. In this study, the Cronbach's alpha value was 0.79 and the measurement model provided a good fit to the data (GFI=0.98, CFI=0.96, RMSEA=0.076 and the ratio of Chisq/dif=3.85).

Anger as a personality trait was measured by the Spielberger Trait Anger Scale (STAS). The scale consists of 10 items for two subscale measurements: angry temperament (an individual's tendency to experience anger in general) and angry reaction (tendency to experience anger when provoked) in relation to its frequency and intensity (Spielberger & Reheiser, 2009). Examples of items for angry temperament measurement are "I am quick-tempered", "I have a fiery temper" and "I am a hot-headed person." Examples of items for angry reaction measurement are "I feel annoyed when I am not given recognition for doing good work", "It makes me furious when I am criticised in front of others" and "I feel infuriated when I do a good job but get poor evaluation." A four-point response Likert scale was used (1= Almost never, 2= Sometimes, 3= Often, and 4= Almost always) on all ten

items. The score range was 10 to 40. In this study, the Cronbach's alpha value was 0.84 and the measurement model provided a good fit to the data (GFI=0.95, CFI=0.95, RMSEA=0.070 and the ratio of Chisq/dif=3.48).

Upon completion of questionnaire administration, each participant underwent a physical examination in a separate space to measure weight, height and waist circumference. Weight was measured without routine working clothing by a mobile scale to the nearest 0.1 kg. Respondents were instructed to open their legs parallel to their shoulders with both hands hanging relaxed at the sides and the palms directed to their thighs. Subjects were instructed to hold their head upright and look forward. Height was measured by a measuring tape to the nearest 0.5 cm without shoes and with the head position at Frankfurt horizontal parallel to the floor. Frankfurt horizontal is the plane of the orbital bone that connects the lower rim of the upper boundary of the auditory meatus. Abdominal obesity was reflected by waist circumference measurement. The measurement was done using measuring tape at the midpoint between the iliac crest and the costal margin in the mid-axillary line, in the standing position. Readings were taken to the nearest 0.5 cm. The body mass index was calculated in weight (kg) divided by height² (m²).

Data analysis

Prior to data analysis, the collected data were checked for misfit respondents using Rasch model analysis. Misfit respondents were those who fulfilled all of the following criteria: (i) point measure correlations were negative value; (ii) outfit MNSQ>2; and (iii) Z-standard>2. All measures in Likert-style response categories, i.e. job stress, overeating and anger as a personality trait, were converted into interval data to ensure correct mathematical equations were applied. The conversion was as follows:

USCALE = (wanted range) / (current range)

UMEAN = (wanted low)-(current low x USCALE)

The effect of job stress on overeating depends on the level of anger as a personality trait. So the moderation analysis replicated a well-known method (Dawson, 2013) using two-way interaction equation as shown below. Only curvilinear interactions are shown in the results because these supersede the linear interaction analysis.

$$Y = b_0 + b_1X + b_2X^2 + b_3Z + b_4XZ + b_5X^2Z + \epsilon$$

(for 2-way interaction)

Y= overeating

X = job stress

Z = anger trait as moderator

As suggested by previous findings (Kivimäki *et al.*, 2006, Lemmens *et al.*, 2011), the effect of job stress on abdominal obesity depends on the level of anger as a personality trait and overeating, so the moderation analysis was used a three-way interaction equation as shown below

$$Y = b_0 + b_1X + b_2X^2 + b_3Z + b_4W + b_5XZ + b_6X^2Z + b_7XW + b_8X^2W + b_9ZW + b_{10}XZW + b_{11}X^2ZW + \epsilon$$

(for 3-way interaction)

Y= abdominal obesity

X = job stress

Z = anger trait as first moderator

W= overeating as second moderator

In this analysis, age, marital status, body mass index and household income were controlled. Age was measured as a continuous variable. Marital status and household income were coded as "Living with someone"=0 and "Living alone"=1; and "RM4000 and less"=0, and "more than RM4000"=1, respectively. All independent moderators and control variables were Z-standardised prior to moderation analysis except for dichotomous variables. The analyses were performed using IBM

SPSS version 21. The moderation effects were visualised graphically using online resources of Microsoft Excel spreadsheet (Dawson, 2013).

RESULTS

Characteristics of the respondents

A total of 509 out of 519 questionnaires were completed, giving a response rate of 98.1%. Of the 509 returned questionnaires, only seven were excluded from the analysis because they showed a misfit pattern in at least three constructs. The misfit respondents were comparable to fit respondents pertaining to age ($p=0.764$), body mass index ($p=0.220$), overeating behaviour ($p=0.924$), anger as a personality trait ($p=0.416$), job stress ($p=0.912$) and waist circumference ($p=0.511$). A total of 10 additional respondents were discarded for anger scores of 14 and below to enhance valid contrast. The number of employees surveyed was 5 to 17 per company. They were a homogenous group of working professionals with a range of job titles. The age range was between 20 and 59 years, with a mean (SD) of 34.92 (9.68) years old. The means (SD) of job stress, overeating behaviour, anger as a personality trait and abdominal obesity were 21.84 (1.41), 42.58 (13.54), 21.83 (3.49) and 90.46 (12.89), respectively. Abdominal obesity with a waist circumference of 90 cm and above was 48.6%. Overeating was positively correlated with anger as a personality trait ($r=0.25$, $p<0.001$) and abdominal obesity ($r=0.11$, $p=0.014$).

The 2-way moderation effects upon exposure to job stress

The effect of job stress on overeating was moderated by the level of anger as a personality trait. High anger was associated with higher overeating behaviour. The overeating score increased from low to high job stress exposure. Low anger was associated with lower overeating behaviour. The overeating score reaches

Table 1. Moderation effects in the prediction of overeating and abdominal obesity

Standardised variables	<i>b</i>	SE	<i>t</i> test	<i>p</i>
DV= Overeating				
Intercept, b_0	40.94	0.81	50.54	<0.001
Job stress, b_1	0.19	0.61	0.31	0.756
Job stress ² , b_2	-0.45	0.36	1.18	0.238
Anger, b_3	2.60	0.81	3.22	0.001
Job stress x Anger, b_4	1.14	0.63	1.81	0.071
Job stress ² x Anger, b_5	0.93	0.46	2.03	0.043
Body mass index	1.90	0.58	3.26	0.001
Living alone	4.85	1.24	3.92	<0.001
Adjusted $r^2=0.118$, $F(7, 484)= 9.36$, $p<0.001$				
DV= Abdominal Obesity				
Intercept, b_0	89.15	0.755	118.00	<0.001
Job stress, b_1	1.12	0.59	1.88	*0.030
Job stress ² , b_2	0.46	0.37	1.24	0.107
Anger, b_3	-0.88	0.79	1.12	0.133
Uncontrolled eating, b_4	2.05	0.74	2.78	*0.003
Job stress x Anger, b_5	-0.75	0.66	1.13	0.129
Job stress ² x Anger, b_6	0.18	0.48	0.38	0.351
Job stress x overeating, b_7	-0.08	0.57	0.15	0.443
Job stress ² x overeating, b_8	-0.12	0.41	0.30	0.382
Anger x overeating, b_9	1.03	0.68	1.51	0.066
Job stress x Anger x overeating, b_{10}	-1.01	0.49	-2.05	*0.021
Job stress ² x Anger x overeating, b_{11}	-0.73	0.39	1.87	*0.032
Age	4.39	0.72	6.13	<0.001
Household income >RM4000	3.94	1.26	3.13	*0.001
Age x Household income >RM4000	-2.68	1.21	2.21	*0.014
Adjusted $r^2=0.123$, $F(14, 477)= 5.93$, $p<0.001$				

DV= Dependent variable (all measured at the individual level), *b*=coefficient value, SE= standard error, * one-tailed *p* value

its optimal score at moderate job stress exposure then decreased on high job stress exposure (Figure 1).

The 3-way moderation effects upon exposure to job stress

The effect of job stress on abdominal obesity was moderated by the level of anger as a personality trait and overeating behaviour. The combined moderation effects of low anger as a personality trait and high overeating behaviour predicted higher abdominal obesity upon exposure to high job stress compared to low anger trait and low overeating. In contrast, high anger as a personality trait and high

overeating behaviour predicted lower abdominal obesity upon exposure to high job stress compared to high anger trait and low overeating (Figure 2).

DISCUSSION

The primary purpose of this study was to examine how anger as a personality trait would behave as a possible moderator in predicting overeating upon exposure to a stressful job and how both anger as a personality trait and overeating as moderator variables predict abdominal obesity upon exposure to a stressful job. This is the first study of its kind to provide

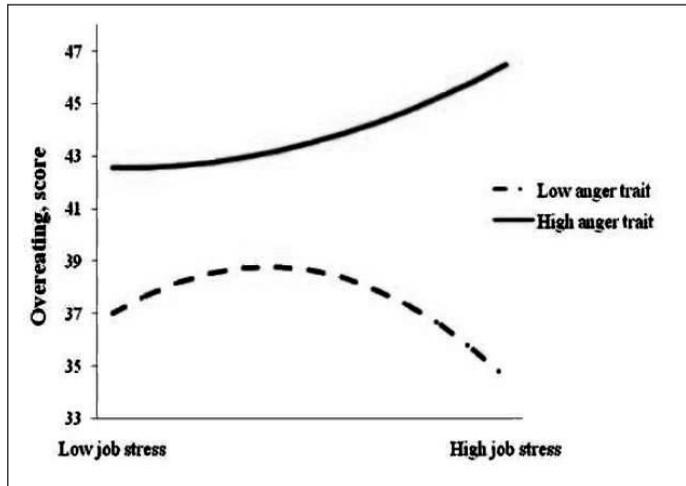


Figure 1. The 2-way moderation effects on exposure to job stress

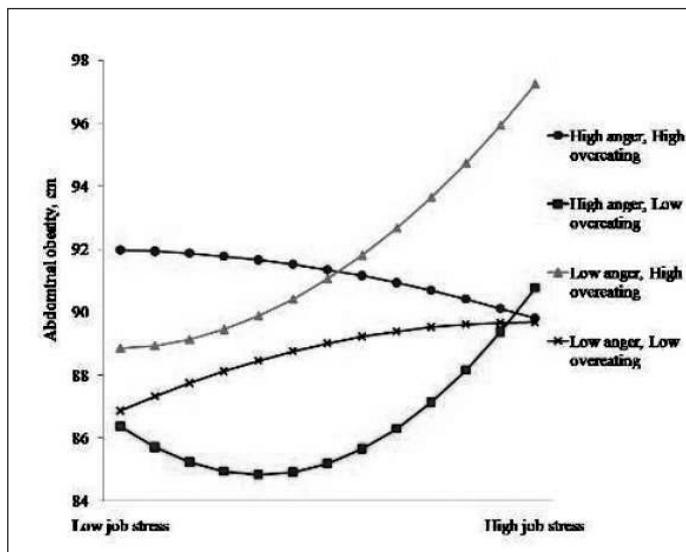


Figure 2. The 3-way moderation effects on exposure to job stress

evidence on the moderation effect among male workers from multiple worksites. Of particular importance is that this study highlights anger as a personality trait that is susceptible or resistant to overeating behaviour. This study also highlights a significant joint effect of anger as a personality trait and overeating on abdominal obesity upon exposure to high

job stress. It means those individuals with a low level of anger as a personality trait and responded to stressful job exposure by adopting high overeating may have a larger waistline.

This study found that job stress scores were higher than those reported among construction and mining employees in South Africa (Demerouti *et al.*, 2010), using

a similar questionnaire. Although the current study asked respondents to endorse a level of agreement on job stress statements since the start of their employment without taking into account specific time of initial exposure, the information on job stress exposure is still relevant because of a long window of activity. Stress occurs within four weeks of first experiencing the initial stressor and lasts for a minimum of two days to a maximum of four weeks (Giaquinto, 2009). The initial stress may impair sympathovagal equilibrium. The speed of recovery from the initial stress is further influenced by traits, which in turn determine maladaptive unhealthy behaviour such as food consumption (Boehm & Kubzansky, 2012).

The effect of job stress on overeating behaviour differs according to the level of anger as a personality trait. This is because those with high anger as a personality trait perceive surrounding stimuli or situations as anger-inducing. Therefore, they experience more negative outcomes than people who exhibit little anger (Sliter *et al.*, 2011). In fact, high anger as a personality trait is one of the toxic emotions associated with both excessive and restrictive eating disorders as manifestations of self-injurious behaviours, especially among those who suppress their expression of emotion toward others. Anger increases motivation to eat, increases the amount ingested and increases the frequency of binge eating (Macht, 2008). Then, the eating behaviour is maintained due to lack of ability to regulate the emotion (Gianini, White & Masheb, 2013) or vice versa (Macht, 2008). On the other hand, low anger is associated with a high level of cognitive control abilities to suppress hostile thoughts, unpleasant memories, inappropriate stimulus interpretation and feelings of anger that may override automatic tendencies to execute behavioural signs of anger (e.g. overeating) and use more constructive coping strategies in potentially angering

and challenging situations (Wilkowski & Robinson, 2008).

Since this study was cross-sectional in nature, adoption of overeating behaviour upon exposure to job stress among overweight respondents cannot be confirmed. However, others found job stress to be associated with overeating among obese male employees in a longitudinal study (Takaki *et al.*, 2010) as well as female employees in a randomised controlled intervention trial (Nevanpera *et al.*, 2012). In those persons, stress augmented "wanting" for snacks high in fat/carbohydrate content despite the absence of hunger (Lemmens *et al.*, 2011).

This study also found that those employees with both high anger and overeating behaviour had slimmer abdomens compared to those with low anger but high overeating behaviour upon exposure to high job stress. The hypothesized mechanism for the phenomena may be the disequilibrium between stress-induced and stress-suppressed appetite with stimulation of energy substrate mobilisation as previously described (Kivimäki *et al.*, 2006) or presence of sympathetic activated thermogenic responses to glucose load and high metabolic rate or energy expenditure effectiveness (Pandalai, Schulte & Miller, 2013). An important point to stress is that uncontrolled eating behaviour may or may not result in increased abdominal obesity depending on the individual characteristics, e.g., anger as a personality trait.

Upon exposure to increasing job stress, those with high anger may adopt overeating of carbohydrate-rich but protein-poor foods to replace "used up" natural mood-enhancers (e.g. serotonin, dopamine, adrenaline and noradrenalin) to improve mood and stress coping (Lemmens *et al.*, 2011). On experiencing calming effects, the stress-induced overeating behaviour may prevent further intake of energy-

dense foods probably due to increased levels of brain tryptophan and serotonin, hypothetically preventing weight gain and, thus, contributing to a slimmer abdomen. Considering previous study results, we believe that job stress associated with overeating in the absence of hunger may lead to abdominal obesity among those with low anger. The underlying mechanism for this phenomenon warrants future research. What is currently known is that exposure to psychological job stress has resulted in overeating behaviour adoption, which is difficult to change in the long term (Nevanpera *et al.*, 2012). Other studies have found that the effect of job stress on weight changes depends on the initial weight of the employees. Weight gain was observed among employees with initial obesity while weight loss was observed among employees with initial lean weight upon exposure to job stress (Kivimäki *et al.*, 2006). These differences may explain how the stimuli lead to emotion-induced changes of eating behaviour via five mechanisms i.e. emotional control of food choice, emotional suppression of food intake, impairment of cognitive eating controls, eating to regulate emotions, and emotion-congruent modulation of eating (Macht, 2008).

The significance of the study

This study showed a perspective that may more accurately reflect the current state of knowledge concerning the role of anger as a personality trait and overeating behaviour upon exposure to daily job stress. This current knowledge opens an opportunity for more effective dual interventions at the individual and organisational level. This study proposes high anger as a personality trait is a significant individual factor influencing behaviour, i.e. overeating behaviour, which has a significant correlation to abdominal obesity. Hence, identifying workers with the trait may help healthcare practitioners to assess

proactively these patients in regard to what triggers the trait-related emotions, why the trait-related emotion is manifested and how one experiences the trait-related emotions leading to overeating behaviour. Lastly, one should be aware of the importance of work environment factors, such as job stress conditions, and individual trait interaction in considering psychosocial hazard as a causal risk factor for abdominal obesity development. Thus, recognition of the importance of personality traits would allow more accurate identification of high-risk employees most likely to adopt an unhealthy lifestyle. Only then can effective planning be initiated to prevent development of common chronic risk factors for cardiovascular diseases.

Strengths and limitations

One of the strengths of this study was the high response rate due to the following reasons: (1) the current study focused on a small group of employees per organisation at one time; (2) the completed questionnaires were thoroughly checked for missing answers before proceeding to physical examination on the same day; (3) the researcher was easily accessible to explain difficult items; and (4) both organisational and respondent confidentiality were well maintained, as both were given secret codes during data entry, with only the primary researcher privy to identities of respondents and their employers. This study was conducted with a homogenous group of working professionals across a range of job levels and types, thereby enhancing the generalisability of the findings to other work environments.

Furthermore, this study used validated measurements. The questionnaires were arranged in decreasing trend for construct difficulty to ensure more important information was captured within the first 30 minutes of the assessment. The objective physical measures of abdominal obesity rather than self-reporting measures

were used, which helped alleviate concerns regarding recall bias. The use of multivariable analysis allowed the interaction between job stress and anger as a personality trait to be evaluated and the model to be tested as a whole. Furthermore, this study provides a preventative model, based on modifiable predictors, in order to identify the risk before the actual cardiovascular disease event occurs.

This study was cross-sectional in nature, which precludes causality and might not adequately capture the time sequence of the relationship between emotional job demands and employees' health or assess eventual cardiovascular disease events. The study population was predominantly Malays and, thus, our results might not be generalisable to non-Malay males. The study was provincial in focus, predicting only job stress to lead to cardiovascular risk and neglected other stress-related health outcomes such as depression. In the same vein, the study did not assess organisational outcomes such as work engagement, job performance, turnover and absenteeism. In the present study, practical constraints prevented the collection of certain data thought to be important in the study of job stress and cardiovascular risk such as style of coping, religious practices, financial problems and work-family balance.

Implications for future research and practice

This study introduced anger as a personality trait that is a potential moderator in predicting other employees' behavioural coping-related outcomes, such as aggressive driving in motor-vehicle accidents or unsafe behaviour in industrial injury. Future research in Malaysia should consider cardiovascular reactivity or responses (such as blood pressure and heart rate variability) in studying job stress-related health outcomes especially among individuals with unique personality traits.

This study suggests the presence of a unique relationship between the degree of anger trait and overeating. Those with low anger trait and high overeating behaviour are shown to be susceptible to development of abdominal obesity compared to high anger trait and high overeating behaviour. Perhaps, overeating due to emotional cues is healthier in high anger trait than in the low anger trait individual.

CONCLUSION

In Malaysian male employees, the effect of job stress on overeating behaviour and abdominal obesity differs according to anger as a personality trait profile. This study adds to the previous body of knowledge, suggesting the joint effect of anger trait and overeating behaviour upon exposure to high job stress, predicting abdominal obesity that should be taken into account in primary occupational health care initiatives.

ACKNOWLEDGMENTS

This study was supported by the National University of Malaysia grant project code FF-288-2012. Thanks are extended to all participating organisations and their officers, all trainers who were involved in safety driving training and all participating employees who made the study possible.

REFERENCES

- Boehm JK & Kubzansky LD (2012). The heart's content: the association between positive psychological well-being and cardiovascular health. *Psychol Bull* 138(4): 655-691.
- Dawson JF (2013). Interpreting interaction effects. From <http://www.jeremydawson.co.uk/slopes.htm> [Retrieved 21 July 2017].
- Demerouti E, Bakker AB, Vardakou I & Kantas A (2003). The convergent validity of two burnout instruments: A multitrait-multimethod analysis. *Eur J Psychol Assess* 19(1): 12-23.

- Demerouti E, Mostert K & Bakker AB (2010). Burnout and work engagement: a thorough investigation of the independency of both constructs. *J Occup Health Psychol* 15(3): 209–222.
- Duke AA, Bègue L, Bell R & Eisenlohr-Moul T (2013). Revisiting the serotonin-aggression relation in humans: a meta-analysis. *Psychol Bull* 139 (5): 1148–1172.
- Giaquinto S (2009). Psychological Factors and Cardiovascular Disorders: The Role of Stress and Psychosocial Influences: Spiritual Influences on Cardiovascular Risk. Sher L (ed) Nova Biomedical, New York.
- Gibson DE & Callister RR (2010). Anger in organizations: Review and integration. *J Manage* 36(1): 66–93.
- Gianini LM, White MA & Masheb RM (2013). Eating pathology, emotion regulation, and emotional overeating in obese adults with binge eating disorder. *Eat Behav* 14: 309–313.
- Hemmingsson E (2014). A new model of the role of psychological and emotional distress in promoting obesity: Conceptual review with implications for treatment and prevention. *Obes Rev* 15(9): 769–779.
- Hunter L (2013). Diet Quality. Springer New York.
- Hurrell J & Kelloway EK (2007). *Environmental and Occupational Medicine: Psychological Job Stress*. Rom WN & Markowitz S (eds). Lippincott Williams & Wilkins, USA.
- Institute for Public Health (2015). National Health and Morbidity Survey 2015. Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems.
- Ismail R, Noh MZM, Ismail NH & Tamil AM (2015). A tale of two construct validation analysis: Rasch model and exploratory factor analysis approach for Three-Factor Eating Questionnaire (TFEQ-R21) among Malaysian male workers. *Med J Malaysia* 70(3): 169–176.
- Karlsson J, Persson LO, Sjöström L & Sullivan M (2000). Psychometric properties and factor structure of the Three-Factor Eating Questionnaire (TFEQ) in obese men and women. Results from the Swedish Obese Subjects (SOS) study. *Int J Obes Relat Metab Disord* 24(12): 1715–1725.
- Kelly SP, O’Connell RG (2015). The neural processes underlying perceptual decision making in humans: Recent progress and future directions. *Journal of Physiology* 109 (1-3): 27-37.
- Kivimäki M, Head J, Ferrie JE, Shipley MJ, Brunner E, Vahtera J & Marmot MG (2006). Work stress, weight gain and weight loss: evidence for bidirectional effects of job strain on body mass index in the Whitehall II study. *Int J Obes (Lond)* 30(6): 982–987.
- Lemmens SG, Martens EA, Born JM, Martens MJ & Westerterp-Plantenga MS (2011). Lack of effect of high-protein vs. high-carbohydrate meal intake on stress-related mood and eating behavior. *Nutr J* 10(1): 136.
- Lemay EP, Overall NC & Clark MS (2012). Experiences and interpersonal consequences of hurt feelings and anger. *J Pers Soc Psychol* 103(6): 982–1006.
- Macht M (2008). How emotions affect eating: a five-way model. *Appetite* 50(1): 1–11.
- Nevanpera NJ, Hopsu L, Kuosma E, Ukkola O, Uitti J & Laitinen JH (2012). Occupational burnout, eating behavior, and weight among working women. *Am J Clin Nutr* 95: 934–943.
- Pandalai SP, Schulte PA & Miller DB (2013). Conceptual heuristic models of the interrelationships between obesity and the occupational environment. *Scand J Work Environ Health* 39(3): 221–232.
- Pasco JA, Williams LJ, Jacka FN, Brennan SL & Berk M (2013). Obesity and the relationship with positive and negative affect. *Aust NZ J Psychiatry* 47(5): 477–82.
- Petrovich GD (2013). Forebrain networks and the control of feeding by environmental learning cues. *Physiol Behav* 72 (2): 181–204.
- Spielberger CD & Reheiser EC (2009). Assessment of Emotions: Anxiety, Anger, Depression, and Curiosity. *Appl Psychol Heal Well-Being* 1(3): 271–302.

- Sliter MT, Pui SY, Sliter KA & Jex SM (2011). The differential effects of interpersonal conflict from customers and coworkers: trait anger as a moderator. *J Occup Health Psychol* 16(4): 424-440.
- Suls J (2013). Anger and the heart: perspectives on cardiac risk, mechanisms and interventions. *Prog Cardiovasc Dis* 55(6): 538-547.
- Takaki J, Minoura A, Irimajiri H, Hayama A, Hibino Y, Kanbara S, Sakano N & Ogino K (2010). Interactive effects of job stress and body mass index on over-eating. *J Occup Health* 52: 66-73.
- Tarfrate RC, Kassinove H & Dundin L (2002). Anger episodes in high anger and low anger community adults. *J Clin Psychol* 58(12): 1573-1590.
- WHO (2015). Obesity and overweight. From <http://www.who.int/mediacentre/factsheets/fs311/en/>. [Retrieved 25 April 2015].
- Wilkowski BM & Robinson MD (2008). The cognitive basis of trait anger and reactive aggression: An integrative analysis. *Personality and Social Psychology Review* 12(1): 3-21.