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Maintaining sleep and physical activity alleviate mood instability

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ABSTRACT

Objective. Building on previous work indicating that mood instability is the hallmark of neuroticism, our aim was to examine whether changes in exercise, sleep duration and leisure predicted decreases in mood instability with time.

Methods. We used data from 3374 participants of the British Health and Lifestyle Study who answered the Eysenck Personality Inventory–Neuroticism subscale (EPI-N) and the General Health Questionnaire on two occasions 7 years apart. We predicted mood instability scores derived from the EPI-N at follow-up using self-reported changes in exercise, sleep duration and leisure hours between the two time points as independent variables.

Results. We confirmed the observation that mood instability decreases with age. Maintaining one's exercise at baseline level decreased mood instability (beta = −0.21) while sleeping less increased mood instability (beta = 0.14). Change in leisure time was not independently related to mood instability after accounting for the two other lifestyle factors.

Conclusion. Personality, at least with regard to mood instability, can be modified by lifestyle factors. Exercise and sleep support mood stability and could be important components of preventative mental health (as well as physical health) benefits.

Introduction

Mood disorders are the most common mental health problems and the most prominent cause of adult disability and suicide (Lopez et al., 2006; Prince et al., 2007). Most assessments of mood rely on retrospective recall, despite the knowledge that people with depressed mood recall generalizations about their moods rather than specifics (Williams and Scott, 1988). In contrast to general summaries of depressed mood obtained by retrospective recall, serial prospective measurements in people with mood disorders show that mood actually fluctuates over hours or days (Murray et al., 2002; Solhan et al., 2009). This is referred to as mood instability.

Prospective mood ratings show frequent sudden unexpected shifts that typically last a few hours to a few days (Trull et al., 2008). Combinations of the words "mood," "affective," "emotional" and "variability", "instability" and "dysregulation" have been used to refer to the same phenomenon. We prefer the term mood instability because it refers to a consistent trait based on frequent repeated measurement using visual analogue scales and calculated by the mean square successive difference statistic Jahng et al. (2008)). Mood instability is a continuously distributed transdiagnostic concept, closely related to neuroticism (Bowen et al., 2011). We studied mood instability rather than neuroticism because it is a more empirical concept that does not include mild symptoms of anxiety and depression, as do most neuroticism rating scales (Bowen et al., 2012). Findings related to mood instability are applicable to people with several syndromes and personality disorder diagnoses, particularly anxiety and mood disorders. Mood instability presumably causes distress in depressed people because of the sudden unpredictable descents in mood (Craske et al., 1995; Solhan et al., 2009).

Affective lability and reactivity, which are similar terms to mood instability, are listed as symptoms of personality disorders in DSM-IV (American Psychiatric Association, 1994). The most prominent trait in most theories of personality is neuroticism, which is also a robust predictor of anxiety and depression (Bowen et al., 2012; Caspi et al., 1996). We have shown by factor analyzing the Eysenck Neuroticism Scale that mood instability is the specific and essential component of neuroticism (Bowen et al., 2012). The items with the highest loadings in the mood instability subscale are "mood goes up and down" and "high energy then sluggish" (Bowen et al., 2012). In the present study, we followed previous procedures in defining mood instability as the second of three factors of the Eysenck Personality Inventory–Neuroticism subscale (EPI-N) (Bowen et al., 2012).

Personality traits have been regarded as stable in adults, certainly after the age of 30 years (Costa and McCrae, 1994), but reviews and a meta-analysis clearly indicate that people improve in mood stability over time (Roberts et al., 2006). We were therefore interested in understanding how modifiable behavioral predictors of mood instability such as exercise, sleep and leisure might contribute to the long-term management of anxiety and mood disorders.

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It is well known that exercise occurring at leisure improves anxiety (Conn, 2010) and depression (Mead et al., 2008). Exercise also decreases with age (Kern et al., 2010), and sleep problems increase (Morphy et al., 2007) with age. Neurotic individuals exercise less (Kern et al., 2010) and are more likely to engage in physical activity out of concerns about weight or physical appearance (Courneya and Hellsten L-A, 1998).

Poor subjective sleep quality and more unwanted waking after sleep onset, but not sleep duration, are related to neuroticism (Marwaha et al., 2012; Soehner et al., 2007). This is probably because both shorter and longer sleep can reflect psychological distress. People in western countries have been sleeping less in the last century (Fonken and Nelson, 2011), and there is evidence that both short and long sleep durations are associated with activity limitations and chronic diseases such as anxiety and depression, diabetes, obesity and allostatic load (Batterham et al., 2012; Krueger and Friedman, 2009; McEwen, 2006). Exercise might improve sleep duration and quality, but the literature supporting this effect is sparse (Montgomery and Dennis, 2002).

Leisure is defined as time that is free from work, sleeping, eating and family or other obligations. Leisure contributes to life satisfaction, especially in aging individuals, and most people regard leisure as pleasant (Steinkamp and Kelly, 1987). Individuals with high neuroticism report less satisfaction with leisure but do not necessarily spend less time in leisure (Krueger and Friedman, 2009). Indeed, they often spend more time watching TV (Hills and Argyle, 1998) and using the Internet for social contact (Amiel and Sargentb, 2004).

We used data from the longitudinal UK Health and Lifestyle Survey (HALS) (Cox et al., 1987) to test the prediction that maintaining exercise, maintaining sleep and more leisure over a period of 7 years would result in lower mood instability.

Methods

Description of the sample

The sample used in this study is a subset of questionnaire respondents from the 1984 and the 1991 British Health and Lifestyle Survey (HALS) (Cox et al., 1987). The goal of the HALS was to examine the influence of various lifestyle patterns and physiological and socio-demographic variables on health (Shipley et al., 2007). The sample was broadly representative of the population in England, Scotland and Wales as measured by the census of 1981. Of the original 9003 respondents from 1984, 6124 completed both the Eysenck Personality Inventory (EPI) and the General Health Questionnaire (GHQ) at baseline and 3374 in 1991. Except for the fact that the youngest respondents were 25 years old, the HALS follow-up sample compares well with the 1991 census data.

Variables of interest

The EPI is a questionnaire that retrospectively measures neuroticism and extraversion. HALS used the 57-item version of the EPI that includes 24 neuroticism items (EPI-N) (Eysenck and Eysenck, 1969). Eysenck determined that items of the EPI Neuroticism factor were similar to items in corresponding factors in the Cattell and Guilford Personality Inventories (Eysenck and Eysenck, 1969), and self-ratings on the EPI-N have been validated by spousal ratings (Goma-i-Freixanet, 1997). The 1-month test–retest reliability of the EPI-N scale has been found to be 0.87 (Knowles and Kreitman, 1965), and the Kuder–Richardson Formula 20 reliability score in this study is 0.736.

The GHQ 30-item version is designed to distinguish people with psychological distress from those who are relatively healthy (Goldberg and Williams, 1988; Shipley et al., 2007). The questions inquire about recent symptoms, and the subject endorses one of four responses. Four to 6 factors are usually found, consisting of a general factor plus depression, anxiety, somatic, sleep and social functioning factors (Werneke et al., 2000). The 1-month test–retest reliability was found to be as high as 0.895 (DePaulo and Folstein, 1978), and the KR 20 reliability score of the GHQ in this study is 0.906. Reviews have supported the validity of the GHQ compared with other appropriate measures (LoBello, 1995). The GHQ items cover most of the conditions of which neuroticism is a predictor.

Our dependent variable was the mood instability score in 1991 derived from factor analyzing the 24-item EPI-N subscale. The complete rationale and method of the factor analytic study are described in a previous paper (Bowen et al., 2012). Our predictors of interest were self-reported changes in three lifestyle factors—sleep, leisure and exercise. Respondents who were followed in 1991 indicated whether they spent more, less or the same time as compared with 7 years earlier in exercise or leisure. Subjects were first presented with a list of exercises (e.g., cycling, golf, yoga, etc.) and asked about the number of hours spent in each in the last fortnight. Then they were also asked about whether they spent time in leisure activities (e.g., fishing, parties, knitting etc.), but the hours were not recorded. This minimized the chance that any particular activity would be classified as exercise by some participants and as leisure by others. With sleep, we compared the self-reported number of sleeping hours in 1991 with that of 1984. Dummy variables were created to indicate whether sleep, exercise or leisure hours increased, stayed the same or decreased, to serve as predictors in the regression analysis.

Confounding variables

To account for the net effect of changes in lifestyle Time 1, age, gender, marital status, mood instability score, GHQ score, self-rated health and smoking status were entered in the model. For mood instability, GHQ and self-rated health, higher scores indicate worse function.

Statistical analysis

The demographic and psychometric profiles of the 3374 respondents with EPI and GHQ data in 1991 were compared to those who were lost to follow up. For this purpose, we performed *t*-tests on continuous variables, chi-square tests for dichotomous variables and Cochrane–Armitage tests for ordered categorical variables. Inverse-probability weights were then constructed from the variables that predicted loss to follow-up. Individuals who were retained were more likely to be married and living with a spouse, better educated and belong to a middle- or high-income category compared to those lost to follow-up (see Table 1). They tended to have better GHQ and neuroticism scores compared with those who were lost but had similar mood instability scores. Gender and age were similar in both groups.

We calculated each respondent's mood instability factor score at Time 2 using confirmatory factor analysis (CFA). Here, we specified the EPI questions that loaded on a mood instability factor as reported in our previous paper (Bowen et al., 2012). Goodness of fit was assessed using confirmatory fit index (CFI), which determines whether the hypothesized model is supported by the data. The CFA result had a CFI of 0.97, which consistency of our model

Table 1
Baseline characteristics of respondents of the British Health and Lifestyle Study in 1984 by follow-up status.

	(A) Included ($n = 3374$)	(B) Lost to follow-up/ missing ($n = 2750$)	p (A vs. B)
	n (%)	*n* (%)	
Age, mean (SE)	44.69 (0.26)	44.58 (0.35)	0.79
Female	1889 (55.99)	1474 (53.60)	0.06
Civil status			
No spouse/not living with spouse	815 (24.16)	960 (34.91)	<0.001
Married living with spouse	2559 (75.84)	1790 (65.09)	
Household income			
Up to £415	816 (24.18)	930 (33.82)	<0.001
£416 to £995	1483 (43.95)	1021 (37.13)	
£996 above	1075 (31.86)	799 (29.05)	
Last highest qualification			
No qualification	1466 (43.48)	1299 (47.25)	<0.001
O level or equivalent	634 (18.80)	521 (18.95)	
A level or equivalent	162 (4.80)	163 (5.93)	
Technological	431 (12.78)	307 (11.17)	
Diploma/degree	679 (20.14)	459 (16.70)	
GHQ, mean (SE)*	54.40 (0.17)	55.97 (0.22)	<0.001
Eysenck Neuroticism, mean (SE)	9.91 (0.09)	10.40 (0.10)	<0.001

**Eysenck Neuroticism scores range from 0 to 24 and are in lower is better form.
* GHQ scores range from 30 to 120 and are in lower is better form.