ORIGINAL COMMUNICATION

Positive and negative mood in the elderly: the ZENITH study

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Objective: To assess the quality of positive and negative affect (mood) in an ageing European sample.
Background: Mood quality has important implications for both physical and mental wellbeing. Poor quality moods are associated with deficits in the diverse areas of cognitive function, health, and social relationships. The ageing process presents a number of potential challenges to successful mood regulation that could have wider implications.
Design and participants: The current study examines the quality of positive and negative affect in 387 healthy participants from three European countries. Moods were measured four times a day for 4–7 d with the Positive and Negative Affect Schedule (PANAS) mood scales. Measures of zinc (Zn) status were taken also.
Setting: Two centres concentrated on 55–70 yr olds (Coleraine, N.Ireland, $n = 93$ and Clermont-Ferrand, France, $n = 95$), and two centres concentrated on 70–87 yr olds (Rome, Italy, $n = 108$, and Grenoble, France, $n = 91$).
Results: Positive affect scores for the centre in Rome were significantly ($P < 0.01$) lower than for the other three centres, and the Grenoble centre had significantly ($P < 0.05$) higher scores on negative affect than the other three centres. Mood was not related to measures of zinc status (all $Ps > 0.05$).
Conclusions: The two centres with the oldest participants showed deficits in mood quality that may have implications for broader well-being.
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Contributors: CM took the lead in writing the report, and carried out the statistical analysis. EEAS, BSK and GR helped develop the methodology and interpret the results. LS collected data in NI and prepared all data for analysis. JOC supervised the NI data collection. MA and NM were responsible for collecting the French data. AMR and CC supervised the collection of the French data and contributed to the protocol of the study and the management of the data collection. AP is responsible for INRAN, and MC is the Italian supervisor for psychological tests. All the authors made a critical revision of the original draft.

Introduction

Moods are fundamental psychological states that can arise endogenously or in response to an event. Mood effects are often more profound than the experienced state, they influence how we interpret the world around us and can even direct our behaviour. For most people old age introduces a period whereby the risk of ill health increases, and it is the time of life most obviously associated with physical decline and deterioration. The potential for loss of personal and familial relationships increases with advanced age, and the temporary nature of life becomes more salient. Yet, a growing body of research is indicating that older people do not inevitably succumb emotionally to the

negative aspects of ageing. For example, self-esteem levels generally improve and then stabilise after adolescence, but reach their peak among those in their 7th decade (Robins et al, 2002).

Recent studies have shown the value of measuring the mood of the elderly using the 2 distinct states of positive and negative affect. Positive affect is a measure of energetic arousal, whereas negative affect relates to feelings of unpleasant arousal. Hill et al (2005) showed that negative affect was not related to cognitive performance (memory tasks) in an elderly Dutch sample, but elevated positive affect accompanied better performance on a free recall task. The benefits of increased levels of positive affect were also shown among elderly Mexican-Americans. Ostir et al (2004) reported higher levels of positive affect were associated with lower risk of physical decline across a 7-year period. Such findings are consistent with those for younger samples (Pettit et al, 2001). Elevated positive affect appears to provide a degree of protection against cognitive and physical decline.

Furthermore, general mood levels for ageing samples have been shown to be consistent with those of younger samples. In developing their widely used Positive and Negative Affect Schedule (PANAS) scales, Watson et al (1988) reported means from a US student sample of 32.0 (s.d. = 7.0) for positive affect, and 19.5 (s.d. = 7.0) for negative affect (as measured over 'the past few weeks'). Hill et al (2005) reported means for a Dutch sample with an average age of 72 (range = 65–82) of 32.18 (s.d. = 6.9) for positive affect and 18.55 (s.d. = 6.12) for negative affect (as measured over 'the past two weeks').

Advancing age presents a diverse range of events and experiences that are not common at earlier stages of life and if ones moods are generally positive on average there is ample evidence to indicate that this will ease the transition into this stage of life. The purpose of the current study was to assess the levels of positive and negative affect in ageing male and female samples from 4 European centres. Two of the samples are aged between 55–70 and two samples are aged between 70–87. Moods were assessed with the PANAS scales with responses based on the current moment, and measured four times a day for several days to allow computation of mean scores. Results reported within the current paper refer to baseline data of a larger study. The means from the interventions measured 3 and 6 months later will be reported at a later stage.

An additional aim of the current study was to investigate the role of zinc (Zn) in the mood experience of the four samples, as there is evidence to indicate that deficient Zn status is linked to poor mood levels. For instance, Maes et al (1997) found that serum zinc levels were characteristic of major depression, and Nowak et al (2003) found that daily zinc supplementation combined with standard anti-depressant therapy induced stronger anti-depressant effects than those receiving a placebo supplement. Whilst the current study is not focused on clinical depression the current mood status of the samples employed here will be correlated with the plasma and erythrocyte levels of Zn.

Methods

Participants

The four samples were recruited through local media, and contacts made with community groups and organisations. Two centres sought to recruit equal numbers of males and females aged between 55 and 70 yr (Coleraine, Northern Ireland and Clermont-Ferrand, France). In actuality, a Northern Irish sample of 45 males and 48 females (mean age = 62.4 yr), and a French sample of 48 males and 47 females were recruited (mean age = 61.3 yr). Two centres sought to recruit equal numbers of males and females aged between 70–87 yr (Rome, Italy and Grenoble, France). In actuality, an Italian sample of 56 males and 52 females (mean age = 74.5 yr), and a French sample of 47 males and 44 females (mean age = 74.2 yr) were recruited. The recruitment and screening procedures, inclusion/exclusion criteria, and ethical considerations for volunteers participating in this study are described elsewhere in this Supplement (Polito et al, 2005).

Materials and procedure

Each participant received multiple copies of the PANAS (Watson et al, 1988) printed on A5 size paper. This questionnaire was used to measure the two overarching mood factors of positive and negative affect. Whilst a range of time frames can be used with the PANAS scale, the instructions for the present study requested participants to report how they currently felt in relation to each item. Each subscale consists of 10 adjectival items, with a 5-point response format ranging from 1 = 'not at all' to 5 = 'extremely'. Each participant from the Northern Irish sample received 28 PANAS scales, four per day for seven days. The participants from the other three groups were asked to complete 16 PANAS scales, four per day for four days. The longer period for the Northern Irish sample was designed to accommodate further analyses not pertinent to the current paper. The four daily reports were to be completed in the morning upon awakening, just after lunch, after evening meal, and before retiring to bed at night. Short, intense mood sampling methods such as this have been shown to provide good approximations to sampling over longer periods (McConville & Cooper, 1997).

The psychometric properties of the English language version of the PANAS have been shown by Watson & Clark (1994) to be highly impressive for a range of purposes. Currently, there is no such data on the French version (supplied by the MAPI Research Institute), but the Italian version has strong evidence of its comparability with the original version and equally impressive psychometric properties (Terracciano et al, 2003). Bilingual speakers on the research team confirmed that the translations were faithful representations of the original form.

Measures of plasma and erythrocyte Zn status were obtained. The details concerning these biological measures

and the procedures for obtaining them are published elsewhere in this Supplement (Andriollo-Sanchez *et al*, 2005).

Results

Table 1 presents descriptive data for all centres. Cronbach's alpha coefficients were computed to ascertain the internal consistency of the mood scales. For the French and Italian samples this meant 16 individual coefficients for both scales and 28 coefficients for the Northern Ireland sample. For ease of interpretation, the means and ranges for these are shown in Table 1. Mean levels of Cronbach's alpha for both positive and negative affect from each centre are all high and above 0.7. This is new information for the French version of this scale, and an indication of the usefulness of the PANAS in cross-cultural research can be seen from the high degree of internal consistency across all centres.

For positive affect, analysis of variance showed main effects for centre (F(3,374) = 36.15, P < 0.01) and gender (F(1,374) = 5.84, P < 0.05), but there was no significant centre X gender interaction. Males scored significantly higher than females in positive affect. However the biggest difference in mean levels occurred between the groups. Scheffé's tests for significance showed that the sample from Rome scored significantly lower on positive affect than all of the other centres, Similarly, for negative affect ANOVA showed a significant main effect for centre (F(3, 374) = 76.84, P < 0.05), and marginal significance for gender (F(3, 374) = 7.70, P = 0.055). There was no significant interaction. In this case the Grenoble sample scored significantly higher on negative affect than each of the other centres. The means for each centre are shown in Table 1. No other centre differences were significant. Table 2 shows comparisons of gender means within centres. Males scored significantly higher than females on positive affect in Clermont-Ferrand (t(91) = 3.73, P < 0.01). No other gender comparisons were significant for positive affect. In Rome, females scored significantly higher than males in negative affect (t(89.6) = 2.20, P < 0.05, for samples with unequal variances). No other gender comparisons were significant for negative affect.

Table 3 shows the Pearson correlations between the two measures of mood and the two measures of Zn status. None of the relationships were significant, and all correlations were trivial in magnitude.

Discussion

These data were gathered as repeated measurements over a number of days and refer to averages of multiple reports each day. This is a more accurate means of gathering mood data than the common approach of asking people to search their memory over some extended period of time, introducing unwanted memory biases. On most measurements the means reported here are consistent with those found

Table 2 Means (s.d.) for positive and negative affect by gender within each centre

	Positive affect		Negative affect	
	Male	Female	Male	Female
Centre	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)
N.Ireland	28.36 (5.86)	27.73 (5.38)	11.40 (2.08)	11.09 (1.79)
C-Ferrand	28.94 (5.15)	25.12 (4.68)**	11.59 (2.13)	12.39 (2.81)
Rome	20.68 (8.01)	19.07 (6.66)	11.40 (2.25)	12.60 (3.27)*
Grenoble	26.30 (6.81)	26.19 (5.97)	13.13 (4.08)	13.76 (4.18)

*P < 0.05, **P < 0.01 (*t*-tests).

Table 3 Pearson correlations between baseline zinc status (Zn) and mean levels of positive affect (PA) and negative affect (NA)

Centre/mood	Plasma Zn	Erythrocyte Zn
N. Ireland PA	0.04	−0.01
N. Ireland NA	0.07	0.00
C-Ferrand PA	−0.18	0.13
C-Ferrand NA	0.08	0.18
Rome PA	−0.09	0.16
Rome NA	−0.11	0.07
Grenoble PA	−0.19	−0.14
Grenoble NA	−0.11	0.08

Table 1 Descriptive statistics and means (s.d.) for positive and negative affect for each participating centre

	N. Ireland	C-Ferrand	Rome	Grenoble
Total N	93	95	108	91
Male N	45	47	56	47
Female N	48	48	52	44
Mean age	62.4	61.3	74.5	74.2
Mean α PA (range)	0.91 (0.84–0.94)	0.93 (0.90–0.96)	0.91 (0.88–0.92)	0.93 (0.89–0.95)
Mean α NA (range)	0.80 (0.64–0.90)	0.83 (0.75–0.90)	0.82 (0.69–0.86)	0.87 (0.83–0.91)
PA mean (s.d.)	28.03 (5.59)	27.09 (5.26)	19.90 (7.40)*	26.24 (6.38)
NA mean (s.d.)	11.24 (1.93)	11.97 (2.50)	11.97 (2.80)	13.44 (4.11)*

Note: PA = positive affect, NA = negative affect, α = Cronbach's alpha coefficient.
*P < 0.05.

elsewhere (Watson & Clark, 1994). However, one striking exception among these data was the relatively low positive affect mean among a Rome sample with an average age of 74.5 yr. Evidence to indicate that this may be an age related deficit rather than some unusual national characteristic is available from Terracciano *et al* (2003), who reported mean levels of 27.6 (in state format) and 33.0 (measured in a trait format) in a relatively young Italian sample (mean age = 27.9 yr), which are consistent with that found elsewhere. Nonetheless, low levels of positive affect were not found for the French sample with a similar mean age, indicating that some other factors must also be involved. Mean positive affect scores as low as that found for Rome in this study are uncommon in any age group. Interestingly, Watson & Clark (1994) reported a mean of 20.1 for a small sample of US chronic fatigue sufferers, and as positive affect is a measure of the uplift one gets from life, it raises some concerns for the Rome sample. Some demographic differences exist between this sample and those from the other centres. For example, 10% of the Rome participants reported their marital status as single (whilst the next highest for this characteristic was 4% in Grenoble). In the current study Rome provided the highest percentage of smokers (15% compared to the next highest of 9% in N. Ireland), and the lowest percentage from the professional classes (15% compared to the next lowest of 30% in Clermont-Ferrand). Whilst these differences are not directly translatable into differences in mood levels, it does highlight some areas that could be investigated further. For example Pettit *et al* (2001) found increased smoking and drinking were negatively correlated with low positive affect in young adults. Low positive affect is particularly problematic for individuals of this age group. Deficits in this state have been shown to be associated with poorer cognitive functioning (Hill *et al*, 2005) and poorer health outcomes (Ostir *et al*, 2004).

The other significant difference between centres concerned higher negative affect among the participants in the other older sample at Grenoble. High negative affect is a key component of depression, which is also characterised by low positive affect (Mineka *et al*, 1998). Neither the Rome nor the Grenoble samples indicate depression as a general trend, but each has evidence of lower psychological well-being than for the two younger samples. Screening for depression took place prior to data collection, and only those in the non-depressed range of scores were included in the study. In the case of Grenoble, the participants displayed elevated levels of anxious states, not actual depression. Evidence for the negative health consequences of higher scores on negative affect is not compelling (Pettit *et al*, 2001), although Westerbotn *et al* (2005) noted a positive association between negative affect and the use of some cardiovascular drugs among an elderly Swedish sample.

The current study did not reveal any substantial relationship between mood and Zn status among the four samples. Andriollo-Sanchez *et al* (2005), in this Supplement, have shown that Zn status among the samples here are all within normal ranges. Findings in this area have pinpointed noticeable depletions in Zn during extreme poor moods of depression (Maes *et al*, 1997). Yet, the consistently low correlations here indicate that any potential influences of Zn on moods will be small when Zn status is within normal levels. The longitudinal aspect of the ZENITH study will provide a further test of this relationship, which involves 2 levels of supplementation and placebo.

The ZENITH study is designed to assess the effects of zinc supplementation in ageing European citizens. The current report has defined the baseline levels of positive and negative affect, and shown that for the most part the samples here are concordant with those found elsewhere. It has, however, identified two exceptions to this trend among older participants in Italy and France. If nutritional supplementation is important for mood regulation these two exceptions should provide good tests of efficacy.

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