

Mood change and perceptions of vitality: a comparison of the effects of relaxation, visualization and yoga

C Wood MSc DPhil *Department of Experimental Psychology, University of Oxford, South Parks Road, Oxford OX1 3UD*

Keywords: affect; energy; relaxation; visualization; yoga

Summary

The effects of three different procedures, relaxation, visualization and yogic breathing and stretch (pranayama) on perceptions of physical and mental energy and on positive and negative mood states have been assessed in a group of normal volunteers ($N=71$, age range 21–76).

Pranayama produced a significantly greater increase in perceptions of mental and physical energy and feelings of alertness and enthusiasm than the other two procedures ($P<0.05$). Relaxation made subjects significantly more sleepy and sluggish immediately after the session than pranayama ($P<0.05$). Visualization made them more sluggish but less content than pranayama ($P<0.05$) and more upset than relaxation after the second session ($P<0.05$).

Thus, a 30 min programme of yogic stretch and breathing exercises which is simple to learn and which can be practised even by the elderly had a markedly 'invigorating' effect on perceptions of both mental and physical energy and increased high positive mood. A more extensive investigation is planned to establish whether such a programme can readily be incorporated into everyday life, and with what long-term results.

Introduction

The capacity of individuals to function effectively and to achieve their desired aims depends not only on their state of physical fitness but also on their perception of whether they possess the requisite levels of mental and physical energy to perform the task in hand. This argument has been developed at greater length elsewhere in this *Journal* by Wood *et al.*¹ The perception of vigour is an emotional or affective state. It results from the integration at a central level of a large number of internal physiological messages which relate to the organism's physical capacity at that moment. Hence, physiological information becomes available for conscious or cognitive evaluation. It is at this cognitive level that it can be measured. This model of the nature of vitality has previously been discussed by Wood and Magnello².

Earlier studies have shown that subjective perceptions of vigour can be easily and reliably measured using visual analogue scales. They show characteristic patterns of diurnal variation, even in patients suffering from chronic fatigue syndrome³, suggesting that at least part of this affective state is due to an

underlying biological component. Wood *et al.*¹ also showed that perceptions of vitality are strongly ($r=0.64$ to 0.70) correlated with high positive affect, as measured by the Positive and Negative Affectivity Schedule of Watson *et al.*⁴ and also with perceptions of subjective well-being ($r=0.58$ to 0.60) as determined by the 'Happiness Measures' of Fordyce⁵. However, the subjective perception of vitality is distinct from that of either positive mood or happiness. It is also clear that most individuals distinguish between their levels of mental and physical energy¹, which, although highly and significantly correlated ($r=0.65$) are accessed by different internal processes.

It is of particular interest to know whether the perception of vitality can be reliably increased, and if so, whether this will result in an actual increase in physical or mental activity. Not only does this appear to be a desirable aim for members of the normal population, it is of particular importance when trying to rehabilitate the growing number of individuals who declare themselves to be 'tired all the time'⁶ and may thus become a concern for general practice. An attempt to increase levels of activity is also one of the main aims of programmes of cognitive-behaviour therapy for patients with chronic fatigue syndrome⁷, but the best way of achieving this outcome is still uncertain⁸.

In treating either mild or severe tiredness, attention must obviously be paid to such physiological parameters as the patient's nutritional and overall health status. However, clinical examination frequently fails to find any objective or remediable medical cause for an individual's fatigue⁹. Cognitive interventions, which seek first to reveal and then to alter the underlying cognitive structures associated with fatigue are currently being explored, but they are time-consuming and sometimes meet with resistance on the part of the subject⁸.

It was therefore decided to compare the influence of three different procedures on perceptions of vitality. The three were chosen so as to be as varied as possible in their respective balance between psychological and physical components.

Visualization or guided imagery is a procedure designed to bring about psychological (and also physiological) change by way of achieving a mental image of the area in which change is sought, and then bringing that change about in imagination. Change in feelings, physiology and behaviour have all been reported to follow¹⁰. However, visualization never seems to have been applied directly to the area of self-perceived vitality in an experimental setting.

Relaxation is a procedure that is very widely practised to reduce subjective arousal. It has been

employed alone, both for the reduction of such aversive conditions as anxiety and 'stress' and as an adjunct to other psychological and physical therapies. Its use for these applications is the subject of an extensive literature (see, for example, Peveler and Johnston¹¹) and it may be used as part of the cognitive-behavioural intervention in fatigued patients. Again however, its direct effects on self-perceived vigour do not seem to have been assessed.

Pranayama (Sanskrit *prana*=vital energy; *ayama*=to expand) is a form of yoga which places particular emphasis on techniques of breathing. It also involves other physical movements, particularly stretching. Although part of a complex oriental philosophy, it has been imported to the West in a much simplified form. As such, it represents a type of physical activity which is considerably less strenuous than aerobic exercise.

In comparing the effects of these three procedures on perceptions of energy and mood, the major hypothesis to be tested was that pranayama would have the most significant effect on perceptions of energy, and possibly positive mood. This hypothesis is based on numerous suggestive findings linking 'invigoration' with physical activity, including those of Theyer¹² showing that a brisk 10 min walk reduced perceptions of fatigue, and those of Steptoe *et al.* who confirmed the mood elevating effects of a more vigorous exercise programme¹³.

We were aware of the desirability of including a placebo procedure in this experimental design. However, no credible procedure which did not contain substantial elements of at least some of the active interventions could be devised. The possibility of asking subjects to do nothing at all for a 30 min session also seemed likely to encounter major problems of compliance. The present study therefore compares the effects of three different active interventions but does not contain a placebo control group.

Materials and methods

Subjects

Subjects were recruited by advertising in the local press and radio for individuals who wanted to learn 'safe and simple techniques that might make them feel more energetic'. They were allocated to one of the three sub-groups (A, B and C, each attending six sessions over a 2 week period). Drop-outs were not replaced after the first session and the final sub-groups contained 22 (A), 25 (B) and 24 (C) subjects, a total of 71. The investigation was presented to the local Ethical Committee and subjects were informed that they could leave the study at any time. They were paid £10 for attendance at all six sessions.

Intervention procedures

Each sub-group of subjects underwent two sessions each of relaxation, visualization and pranayama. Each of the three sub-groups received these procedures in a different sequence, to control for order effects. Each of the three interventions was performed on both occasions by a professional woman practising in each particular area (respectively, a stress counsellor, clinical psychologist and yoga teacher). All interventions were timed to last for 25-30 min, in order to prevent any influence of differences in duration. All procedures were performed with the subjects either sitting or standing, because of limitations of space.

The relaxation procedure involved the progressive relaxation of major muscle groups without previous

or compensating contractions, together with a non-specific imagery exercise in which subjects were invited in their imagination to visit a safe and comfortable place of their own choosing.

Visualization was directed towards the subjects obtaining an image or metaphor of their current energetic state. After a brief period of 'settling down' they were invited to evoke such an image and to discover and explore its meaning and then to decide what changes they would need to bring about in imagination to increase their energy levels. Finally, they were asked, again in imagination, to apply these changes and to assess the outcome. A full account of this imagery procedure will be published elsewhere (Hackmann and Wood, in preparation).

The pranayama exercise consisted of a series of 12 yoga exercises presented in a simplified form so as to be achievable by a class of total beginners, some in late middle-age. After a brief initial period of relaxation and observation of the breath, the session consisted of a series of physical stretching and contraction exercises together with deep breathing and forced exhalation, sometimes accompanied by humming or other vocalization.

Experimental procedure

On arrival at each session, subjects were presented with a series of 10 visual analogue scales indented at five unit intervals^{2,14} for them to record their perceived levels at that moment of physical and mental energy. Positive affect and negative affect were assessed by similarly measuring subject's level of alertness, enthusiasm, sluggishness, sleepiness and the degree to which they felt upset, nervous, content and calm. The order of presentation of these visual analogue scales was changed at each session. The anchor points at 0 and 100 were fully explained (eg, 0=I have no physical energy; 100=I am full of physical energy) and subjects were asked to circle the number on the scale (0, 5, 10, 15, etc.) which best described their current feelings. There is an extensive literature on the reliability of such scales (see, for example, Bond and Lader¹⁵) and their use for the assessment of subjective perceptions of energy has been validated against the Profile of Mood States¹⁶ and by Wood and Magnello².

Subjects then underwent the appropriate intervention procedure. On its completion, they filled out a second set of visual analogue scales to assess their feelings immediately after the intervention. They also completed a short questionnaire to record whether they found the pranayama and relaxation easy and pleasant to do, and whether they achieved an image and were able to transform it during the visualization.

Statistical analysis

Initial differences between groups in sex and age were explored using chi-squared tests and one-way analysis of variance respectively. Pearson correlation coefficients between appropriate mood and energy variables were calculated, together with their statistical significance.

Changes occurring during each session were calculated by subtracting the value of each variable after intervention from that before, a positive sign indicating an increase and a negative sign indicating a decrease in that variable over the session. The effects of the three procedures on each measured parameter were compared using a three-way analysis

of variance with repeated measures and the statistical significance of any difference was determined using Newman-Keuls multiple comparisons. A two-way analysis of variance with subsequent multiple comparisons was performed for times to establish whether the effect of any of these procedures depended on the order of its presentation.

Results

Patient population

A chi-squared test for sex differences in the three sub-groups showed that group allocation made on a consecutive basis had led to sub-group A containing a significantly ($P < 0.05$) higher proportion of men (68%) than sub-groups B (32%) or C (33%). However, in the subject group as a whole, the sex distribution was more equal with 40 women (56%) and 31 men (44%).

One way analysis of variance showed that there was no significant difference in mean age between the three sub-groups. The mean age of the total group was 50 ± 13.02 (range 21-76).

Ability to perform the intervention exercises

Over 90% of subjects said that they had found the pranayama exercise both easy and pleasant to do on both occasions. For relaxation, over 80% found it easy and 95% found it pleasant. With visualization however, 20% of subjects failed to obtain an image on the first occasion and by the second session this figure had risen to 29%. Kruskal-Wallis analysis of the three sub-groups showed that significantly fewer images were obtained in sub-group A ($P < 0.01$), the group which contained the highest proportion of men.

Energy and mood variables

Correlation of the energy and mood variables, both before and after intervention, showed that levels of physical energy were highly and significantly correlated with mental energy ($r = 0.74$ to 0.83). Both were correlated with high positive affect (directly, $r = 0.53$ to 0.69) and with high negative affect (inversely, $r = -0.18$ to -0.27 , all $P < 0.05$).

Effects of intervention

Increment scores (values measured after each intervention minus values measured before) for each of the

Table 1. Increment scores (levels after minus levels before intervention) for two energy and eight mood variables following three different interventions (mean for two sessions each)

	Pranayama	Relaxation	Visualization
Physical energy	9.54 ^a	-3.02	-5.18
Mental energy	9.36 ^a	-2.66	-4.41
Alert	6.50 ^a	-2.77	-6.81
Enthusiastic	7.05 ^b	2.09	-12.36
Sluggish	-10.41 ^c	8.45	3.90
Sleepy	-9.74 ^d	14.65	10.69
Upset	-0.74 ^e	-1.18	4.03
Nervous	-5.86	-1.96	-1.09
Content	7.52 ^f	6.79	-4.85
Calm	5.70	10.87	1.65

^a $P > R$ or V (time 1 and 2); ^b $P > V$, $R > V$ (time 1 and 2), $P > R$ (time 1); ^c $R > P$, $V > P$ (time 1); ^d $R > P$ (time 1 and 2), $V > P$ (time 2), $R > V$ (time 1); ^e $P > R$ (time 2), $V > R$ (time 2); ^f $P > V$ (time 1 and 2), $R > V$ (time 1 and 2); All $P < 0.05$

energy and mood variables for each intervention procedure are given in Table 1. Three-way analysis of variance with repeated measures by type of intervention showed significant differences for physical and mental energy, alert and enthusiastic, upset, sluggish, sleepy and content. Newman-Keuls multiple comparisons revealed that the effects of pranayama were significantly greater than those of either relaxation or visualization (all $P < 0.05$) during both intervention sessions for physical energy, mental energy and feeling alert.

Both pranayama and relaxation made subjects significantly more enthusiastic than did visualization at both time points, and pranayama had a significantly greater effect than relaxation on enthusiasm in the first intervention session. Relaxation made subjects significantly more sleepy than pranayama on both occasions.

Visualization made subjects more sleepy than pranayama in session 2. Both relaxation and visualization made them feel significantly more sluggish than pranayama in session 1. Visualization made them significantly more upset than relaxation at time 2. Both pranayama and relaxation made subjects more content than visualization at both time points. Finally, although relaxation had the greatest calming effect, differences from pranayama and visualization were not significant.

Analysis of variance and post hoc comparison with time revealed only one significant difference. Subjects were significantly less enthusiastic on the second occasion than the first when the treatment being offered was visualization ($P < 0.05$).

Discussion

Relationship between mood and energy variables

As previous investigations have shown^{1,2} perceptions of mental and physical energy are strongly correlated with each other and show similar patterns of diurnal change. None the less, they can be distinguished by volunteers and appear to represent separate areas of human subjective experience. The present investigation confirmed these findings. Correlations between mental and physical energy were all highly significant ($P < 0.01$).

The present investigation also explored both the 'high' and the 'low' poles of positive and negative affect¹⁷. Thus, the adjectives *alert* and *enthusiastic* are characteristic of high levels of positive affect in contrast to *sluggish* and *sleepy* which represent the low pole of positive affect. *Upset* and *nervous*, markers for high negative affect, contrast with *content* and *calm* which represent the low pole of the negative affectivity dimension.

High and low positive affect were found to be highly and significantly correlated in an inverse direction ($r = -0.46$ to -0.48 , $P < 0.01$). Thus, subjects did not report feeling both alert and enthusiastic as well as sluggish and sleepy at the same time. This highly significant negative correlation gives confidence in the accuracy of the reporting of their mood states. Similarly, high and low levels of negative affect showed a significant inverse correlation ($r = -0.41$ to -0.53 ; $P < 0.01$). Subjects similarly denied feeling both upset and nervous as well as content and calm at the same time.

Exploring the relationship between energy and mood variables, it becomes clear that the subjective

sense which we have called 'vitality' is characterized by high levels of positive and low levels of negative affect.

What can be concluded more generally about the relationship between perceptions of energy and mood state? We have argued elsewhere² that perceptions of physical and mental energy represent the

integration at an affective level of a large amount of physiological information about the person's capacity to function, sensory data of which the individual might not be directly conscious.

We have also argued³ that increasing the subjective perception of mental and physical energy must be a primary consideration in helping to rehabilitate individuals suffering from chronic fatigue.

Since the links between perceptions of energy and positive affect are so strong, techniques of mood elevation such as verbal or musical induction^{18,19} might represent an indirect means of boosting perceived energy levels. However, the present investigation shows that both energy perceptions and mood states can be elevated simultaneously by the simple and more directly physical procedure known as pranayama.

Effects of intervention on energy and mood

Pranayama, a combined stretch and breathing exercise, produced a marked increase in perceptions of mental and physical energy, alertness and enthusiasm. It was significantly better than either relaxation or visualization for increasing perceptions of mental and physical energy ($P < 0.05$). It was also significantly superior ($P < 0.05$) to either of the other procedures for making subjects feel both alert and enthusiastic, the two mood states used to define the high pole of positive affect. By contrast, pranayama produced a marked reduction in the extent to which subjects felt sluggish and sleepy, the two adjectives defining low positive affect.

These results therefore support the initial hypothesis that the most physically active intervention of the three would be the one to have the most marked influence on perceptions of energy and positive affect. Pranayama appears to represent an excellent invigorating procedure which is of short duration, is easy to learn and can be performed by people of a wide age range.

By contrast, the immediate effect of relaxation was to produce a reduction during the session in levels of physical and mental energy and alertness. There was also a striking increase in the extent to which they felt increasingly more sluggish and sleepy, the two adjectives defining low positive affect. The increase in sleepiness is statistically significant compared to the other two procedures, and the effect of relaxation in making subjects more sluggish was significantly greater than those of pranayama ($P < 0.05$). Relaxation also made volunteers feel more content and calm at the end than at the beginning of the session.

The 'stress relieving' potential of relaxation probably results from the increase in contented and calm feelings generated during the session, which presumably persist into later periods of activity. Whilst such relaxation periods may well improve perceptions of energy and positive affect in the longer term, their effects observed immediately after the session are the reverse. Perceptions of physical

energy, mental energy and alertness all showed a reduction over the course of the intervention period.

The effects of visualization are more difficult to interpret. This seems to be the first published investigation to explore the effects of visualization on measured perceptions of energy or mood. The procedure produces marked falls in mental and physical energy and perceptions of alertness and enthusiasm during the course of the session across the group as a whole. However only about 75% of subjects in session 1 and 50% in session 2 were able both to obtain and transform an image. A separate analysis of results for those who were or were not able to do so will be presented elsewhere (Hackmann and Wood, in preparation).

In common with relaxation, visualization also makes subjects more sluggish and sleepy. However, after the second session, it made them significantly ($P < 0.01$) more upset than did relaxation. Finally, it left them feeling significantly less content ($P < 0.01$) than did pranayama or relaxation at the end of both intervention sessions. Coupled with this is the finding that the measures of enthusiasm before the second session of visualization (when subjects knew what to expect) were significantly lower ($P < 0.05$) than before the first, whereas no such time effects were found for either of the other two procedures.

Visualization therefore produced no short-term invigorating effects for the group as a whole (indeed rather the reverse), in addition to which it reduced high positive and increased low positive affect. It made subjects more upset and less content during the session. Finally, its performance in a second session was not widely welcomed by the subjects concerned.

There are several possible reasons for this. It may be that asking them to visualize their energy gives them internal access to broader aspects of their life situation, and particularly to problems which some subjects have difficulty in either facing or resolving. The net result may be a fall in self-perceived energy and positive affect (particularly enthusiasm), together with a moderately decreased sense of contentment and an increased feeling of being upset.

In addition, some of the reduced sense of contentment may arise from an inability to obtain an image at all, producing a boring or frustrating experience. Finally, some subjects suggested that the procedure would have been more successful if it had been briefer, as it might be in an individual rather than a group session.

In summary then, it is clear that a 30 min session of yogic stretching and breathing exercises produces a marked augmentation in perceptions of physical and mental energy. Such exercises also increase feelings of alertness and enthusiasm, and make subjects feel distinctly less sluggish and sleepy than before the session began. Overall, it represents a distinctly more 'invigorating' procedure than either relaxation or visualization, at least when delivered in a group and when assessing the changes achieved immediately after the session.

It remains to be seen whether this simple and easily learned technique (which is far more acceptable to many subjects, particularly the elderly, than a more vigorous exercise programme) can be readily incorporated into the daily routine. If so, will it be sufficiently enjoyable in the longer term to ensure its continued practice and will its benefits, in terms of perceptions of increased energy and well-being,

generalize into other aspects of life with consequent effects on mental and physical health and/or productivity? The procedure may prove to be especially useful for the management of fatigue, for example in general practice. A large-scale investigation into the use of pranayama among individuals in the community is currently being planned.

Acknowledgments: It is a pleasure to acknowledge the valuable contributions made by the following people: Eileen Magnello for statistical analysis; Dr Chris Saunders, Ann Hackmann and Sissel Fowler for leading the intervention sessions; David Hay and Margot Long for assistance in managing the project. The encouragement of Dr Michael Argyle and Professor Geoffrey Harrison and the financial support of St Ivel Ltd are noted with particular gratitude.

References

- 1 Wood C, Magnello ME, Jewell T. Measuring vitality. *J Roy Soc Med* 1990;**83**:486-9
- 2 Wood C, Magnello ME. Diurnal changes in perceptions of energy and mood. *J Roy Soc Med* 1992;**85**:191-4
- 3 Wood C, Magnello ME, Sharpe MC. Fluctuations in perceived energy and mood among patients with chronic fatigue syndrome. *J Roy Soc Med* 1992;**85**:195-8
- 4 Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *J Pers Soc Psychol* 1988;**54**:1063-70
- 5 Fordyce WM. A review of research on the Happiness Measures: a 60 second index of happiness and mental health. *Soc Indic Res* 1988;**20**:355-81
- 6 Chen NK. The epidemiology of self-perceived fatigue among adults. *Prev Med* 1986;**15**:74-81
- 7 Wessley S, David AS, Butler S, Chalder T. Management of chronic (post-viral) fatigue syndrome. *J Roy Coll Gen Pract* 1989;**39**:26-9
- 8 Sharpe MC. Psychiatric management of PVFS. *Br Med Bull* 1991;**47**:989-1005
- 9 Lewis G, Wessley S. The epidemiology of fatigue: more questions than answers. *J Epidemiol Commun Hlth* 1992;**46**:92-7
- 10 Sheikh AA. *Imagination and healing*. Farmingdale, New York: Baywood Publishing Co, 1984
- 11 Peveler RC, Johnston DW. Subjective and cognitive effects of relaxation. *Behav Res Ther* 1986;**24**:413-19
- 12 Theyer RE. Energy, tiredness and tension effects of a sugar snack versus moderate exercise. *J Pers Soc Psychol* 1987;**52**:119-25
- 13 Steptoe A, Edwards S, Moses J, Matthews A. The effects of exercise training on mood and perceived coping ability in anxious adults from the general population. *J Psychosom Res* 1989;**32**:537-47
- 14 Eastwood MR, Whitton JL, Kramer PM. A brief instrument for longitudinal monitoring of mood states. *Psychiatry Res* 1984;**11**:119-25
- 15 Bond A, Lader M. The use of analogue scales in rating subjective feelings. *Br J Med Psychol* 1974;**47**:211-18
- 16 McNair DM, Lorr N, Droppleman LF. *Profile of mood states*. San Diego, California: Educational and Industrial Testing Service, 1971
- 17 Watson D, Tellegen A. Towards a consensual structure of mood. *Psychol Bull* 1985;**98**:219-35
- 18 Clark DM. On the induction of mood in the laboratory. *Adv Behav Res Ther* 1983;**5**:27-49
- 19 Lenton SR, Martin PR. The contribution of music vs instructions in the Musical Mood Induction Procedure. *Behav Res Ther* 1991;**29**:623-5

(Accepted 12 October 1992)