

4 Emotion, mood and physical activity

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This chapter summarises the evidence on exercise and physical activity (PA) and emotional feelings and mood. Appropriate evidence-based conclusions are drawn and implications for guiding future research and practice in health settings provided. Because the areas of mood and emotion are not easy to delimit, studies investigating clinical depression, self-esteem, and cognitive functioning have not been addressed as these are reviewed elsewhere in this volume. Tension-related mood states will be considered, but not the wider literature on anxiety and stress as this also is covered elsewhere. Only studies investigating exercise and 'lifestyle' physical activity, rather than competitive sport, are considered.

Evidence has been drawn from papers located through electronic searches using *Sport Discus*, *PsychLit*, and *Medline*, as well as searching extensive personal files and references cited in other reviews. Preference was given to papers published since 1987, and particularly meta-analyses, epidemiological surveys, and controlled trials.

Given the potentially disparate nature of the topic being addressed, the review is organised around the themes of emotion (affect) and mood but within the overall context of health-related quality of life (HRQL). Research consensus statements are provided in conclusion.

Health-related quality of life

Rejeski, Brawley and Shumaker (1996) suggest that it is typical for HRQL to be defined in terms of participants' perceptions of function. They outline six types of HRQL measures:

- *global indices of HRQL*. These might include general life satisfaction, or self-esteem.
- *physical function*. Perceptions of function; physical self-perceptions; health-related perceptions.
- *physical symptoms*. Fatigue; energy; sleep.
- *emotional function*. Depression, anxiety, mood, affect (emotion).
- *social function*. Social dependency; family/work roles.
- *cognitive function*. Memory; attention; problem-solving.

Rejeski et al. (1996) state that the National Institutes of Health in the US now mandate researchers to include measures of HRQL in most clinical trials. HRQL outcomes are justified in physical activity research for several reasons. First, health-related perceptions of patients are important in their own right. Second, they may act as a motivator of future participation in physical activity. Third, correlations between HRQL and performance measures of dysfunction, such as perceived ability to climb stairs, are usually stronger than between HRQL and changes in physical fitness, such as aerobic capacity. This suggests that performance measures are much more easily detected and are more salient to patients than objective fitness measures.

HRQL measures, however, are usually viewed simply in terms of physical function. This is a narrow view. This chapter, therefore, will review studies that fall primarily into the emotional function category of HRQL. Chapters elsewhere in this volume cover other aspects of HRQL.

Measurement of HRQL

There are many HRQL instruments and these include affective measures, although agreement over measurement is difficult to come by (see Bennett & Murphy, 1997). Key measures are summarised in Table 4.1 and include the SF-36, The Nottingham Health Profile and the EuroQol. The SF-36 is a 36-item questionnaire designed to assess 8 health dimensions covering functional status, well-being, and overall evaluation of health (Dixon, Heaton, Long, & Warburton, 1994). Dixon et al. (1994) conclude that the SF-36 is not designed for specific patient groups, and that it is not directly based on lay views; also there is little evidence that it detects change.

Indeed, health changes detected through interview by Hill, Harries and Popay (1996) went undetected by the

SF-36 (see also Jenkinson, Layte, Coulter & Wright, 1996). Overall, therefore, an over-reliance on the use of the SF-36 in HRQL studies is not recommended. Where possible, if mood, affect and HRQL are to be assessed in physical activity interventions, more specific measures should be sought.

The Nottingham Health Profile (NHP) (Hunt, McEwan & McKenna, 1986) has been used since the 1970s in intervention and outcome trials and, like the EuroQol (Buxton, O'Hanlon & Rushby, 1990, 1992), assesses six dimensions of HRQL. (See Bowling, 1995, for a review of quality of life measures.)

HRQL and physical activity

Rejeski et al. (1996) provide a comprehensive review of HRQL and physical activity. The present chapter, therefore, will focus on the emotional dimension of HRQL, and specifically mood and affect. Chapters elsewhere in this volume deal with other aspects of HRQL, such as clinical depression (Mutrie), anxiety (Taylor), self-esteem (Fox), and cognitive functioning (Boutcher). Rejeski et al. (1996) offer the following conclusions from their review of physical activity and HRQL studies:

Table 4.1 Common measures of health-related quality of life

- HRQL test batteries should include general and condition- or population-specific measures.
- The degree of change observed in HRQL through PA will depend on baseline levels.
- The degree of impact of PA on HRQL will depend on both the physiological stimulus as well as social and behavioural characteristics of the treatment or intervention.
- People vary in the extent to which they value certain health-related outcomes from physical activity, hence this will affect HRQL perceptions of those in intervention studies.

Emotion and mood

The mood states and emotions associated with physical activity have a potentially important role in health promotion. If we believe that physical activity is a positive health behaviour to be encouraged and promoted, how people feel during and after activity may be critical in determining whether they maintain their involvement. Hence, emotion and mood may have motivational properties for an important health-related behaviour. In addition, positive mood and affect are important health outcomes in their own right. For example, Morgan, in the preface to his book on physical activity and mental health stated that 'it is our belief that prevention – not treatment – offers the best solution to the pandemic mental health problems that characterize modern society. This book attempts to demonstrate the extent to which physical activity, a nonpharmacological strategy, can be effective in this regard' (1997, p. xv).

Mood is the global set of affective states we experience on a day-to-day basis. Although mood can be conceptualised in terms of distinct mood states, such as vigour and depression, it differs from emotion, which is normally defined in terms of specific feeling states generated in reaction to certain events or appraisals. However, the distinction between mood and emotion in PA research studies is often not clear.

Measuring emotion and mood

Emotion

Emotion has sometimes been distinguished from 'affect'. Lazarus (1991, p. 6) suggests that emotion is more generic than affect and defines the latter as the subjective experience of emotion, and emotion itself as 'complex, patterned . . . reactions to how we think we are doing in our lifelong efforts to survive and flourish and to achieve what we wish for ourselves'. However, the two terms are sometimes not distinguished from each other, and this is often the case in physical activity research. In the present paper the two terms will be used synonymously.

In psychology, there is a debate concerning the nature of emotion. Some prefer to define emotion in terms of discrete emotional reactions, such as pleasure, fear, happiness, and excitement (Clore, Ortony, & Foss, 1987; Lazarus, 1991; Weiner, 1995). Others suggest that emotions are best defined in terms of their common properties, or dimensions, such as positive and negative affect (Watson & Tellegen, 1985).

Lazarus (1991) argues that the distinct qualities of emotional reactions are lost, or blurred, when reduced to a few dimensions. According to his 'cognitive-motivational-relational' theory of emotion, he argues that each emotion is unique because it is created by a different appraisal of the perceived significance of an event. However, it is also logical to see emotions clustered according to common categories. Watson and colleagues (Watson, Clark, & Carey, 1988; Watson, Clark, & Tellegen, 1988; Watson & Tellegen, 1985) have shown that two major factors emerge from an analysis of emotions – positive affect and negative affect. The former

refers to feelings such as alertness and activeness, whereas negative affect refers to unpleasant affective states such as anger and fear.

Russell and colleagues have also advocated a dimensional approach to the study of emotions (see Russell, 1980). In their 'circumplex' model, they suggest that emotion can best be defined in terms of the two dimensions of valence (i.e. pleasant–unpleasant) and arousal (i.e. high–low). This gives rise to emotions being classified along these two dimensions, such as tense (high arousal/low pleasure), excited (high arousal/high pleasure), relaxed (low arousal/high pleasure), and depressed (low arousal/low pleasure) (see Warr, 1990).

Mood

Measures of mood have typically involved the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971), although McDonald and Hodgdon (1991) also located exercise studies using the Multiple Affect Adjective Check List (MAACL) (Zuckerman & Lubin, 1965). The MAACL, however, assesses only anxiety, depression and hostility and is prone to social desirability distortion. Similarly, the POMS is comprised of five negative mood scales and only one positive scale (vigour). Studies using the MAACL, therefore, cannot be considered adequate for the study of psychological well-being (PWB) or mood, and those using the POMS are limited due to the single positive mood subscale. The POMS can also be varied according to the instructions, such as participants describing how they feel/have felt 'right now' or 'over the past few weeks'.

Table 4.2 Summary of mood and affect measures commonly used in physical activity research

Abele and Brehm (1993) report a number of studies they have conducted in Germany using the 'Befindlichkeitsskalen' (BFS). This scale places mood states along the continua of high/low activation and positive/negative mood. This is similar to Russell's (1980) circumplex model. For example, one can contrast high activation moods that differ in their positive or negative evaluation. A high activation/negative mood might be 'anger' whereas a high activation/positive mood state might be 'elation'.

Measures of mood and affect in physical activity research

The majority of studies investigating exercise, PA and PWB have assessed mood and affect using scales such as the POMS, MAACL and the PANAS (see Table 4.2). The POMS, in particular, has been criticised mainly on the basis that it is restricted to just one positive factor (vigour). Steptoe (1992, pp. 208–9), for example, argues that 'measures like the POMS . . .

fail to capture the positive feelings of well-being that are more than the mere absence of anxiety, depression or irritation'. The PANAS, while being used increasingly in exercise research, is 'restricted to the assessment of global affect' (Gauvin & Rejeski, 1993, p. 404) and fails to differentiate more specific types of emotion.

Steptoe (1992) reports on his work on mood and exercise by suggesting that 'context-specific' measures might be particularly useful. For example, his research group developed a list of 36 items thought to be associated with exercise and mood. Factor analysis revealed the three factors of 'coping assets', 'coping deficits', and 'physical well-being'. Such a scale (shown in Table 4.3) allows for a more balanced view of PWB in comparison to the POMS. However, Steptoe's scale has not been used by other researchers.

Gauvin and Rejeski (1993) developed the Exercise-induced Feeling Inventory (EFI) in an effort to capture four distinct feeling states in exercise: revitalisation, tranquillity, positive engagement, and physical exhaustion. Psychometric support has been reported for adults (Gauvin & Rejeski, 1993) and children (Vlachopoulos, Biddle, & Fox, 1996).

In a similar vein, McAuley and Courneya (1994) developed the Subjective Exercise Experiences Scale (SEES) comprising three factors of positive well-being, psychological distress, and fatigue and this, too, now has support with children (Markland, Emberton, & Tallon, 1997). Both the SEES and EFI are scales that can easily be used in field assessments of exercise affect.

A summary of key measures of mood and affect in physical activity research is shown in Table 4.2 (see also Gauvin & Spence, 1998).

Emotion, mood and physical activity

There are a very large number of studies investigating the relationship between physical activity and affective states. As such, I will draw my conclusions from three types of studies, as shown in Tables 4.4 and 4.5. Table 4.4 summarises narrative and meta-analytic reviews on PA and mood/affect, as defined for this

review. Only two published meta-analyses were located (McDonald & Hodgdon, 1991; Schlicht, 1994), but neither was in a refereed journal. Table 4.5 summarises large epidemiological surveys conducted in Britain on physical activity and psychological well-being.

Table 4.3 Factors of psychological well-being for physical activity identified by Moses et al. (1989)

Studies of mood, affect and PA involve both acute and chronic effects of PA. Acute effects are assessed in terms of state responses to single exercise or PA sessions. Chronic effects are assessed more in terms of generalised traits from involvement in PA over time. Typically, epidemiological surveys assess chronic PA effects whereas experimental trials measure the effects of acute exercise.

Narrative and meta-analytic reviews

Of the 20 reviews listed in Table 4.4, there is cautious support for the proposition that PA is associated with enhanced affect and mood. The caution comes not from the lack of apparent evidence but from the relatively weak research designs utilised. For example, the comprehensive review by Leith (1994) showed that experimental evidence was less convincing than for pre- or quasi-experimental studies. Similarly, reviews by Berger (1996; Berger & McInman, 1993; Wankel & Berger, 1990) conclude that mood effects can be positive after exercise but causal links cannot be supported, and certain conditions, such as non-competitive aerobic exercise, might need to be met for such effects to occur. However, the cautiously positive conclusions from Table 4.4 are further enhanced by the fact that the reviews span several countries and populations (e.g. workplace, women, people with disabilities) with diverse methods and measuring instruments. Hardly any studies report negative mood effects.

Table 4.4 Summary of findings from meta-analytic and narrative reviews investigating the relationship between physical activity, mood and affect

Table 4.5 Summary of findings from British population surveys investigating the relationship between physical activity and psychological well-being

McDonald and Hodgdon (1991) report a meta-analysis on PA and mood. They delimited their review to aerobic fitness training studies and found that researchers used mainly the POMS (tension, depression, anger, fatigue, vigour, and confusion) or MAACL (anxiety, depression, and hostility). Results are shown in Table 4.4 and suggest a clear relationship between exercise and vigour and a lack of negative mood, although the effect sizes are generally small-to-moderate.

Interestingly, Schlicht (1994) reported a brief meta-analytic review of exercise and mental health in which the proposed relationship between physical activity and PWB was not supported. The analyses involved 44 samples from 39 studies and 8,909 research participants. However, the studies selected for the meta-analysis were not listed in his paper and additional information is required on study selection criteria before more can be concluded. Given that the paper was published in German it would be interesting to see how many of the studies included are written in German, and whether many are in English and thus more likely to be included in the North American meta-analyses that have supported a link between physical activity and other indices of mental health (e.g. Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). Nevertheless, Schlicht (1994) reported an overall ES of only 0.15, but with a large range, and the overall ES was not significantly different from zero (see Table 4.4). This may reflect that similar forms of PA are viewed favourably by some individuals but not by others, thus reducing any psychological effect. In other words, the effects of PA on mental health may be quite individual.

Epidemiological surveys

Epidemiological surveys, while often suffering from methodological shortcomings such as lacking internal validity and control (see Chapter 8), have the advantage over some other studies in so far as they usually have large samples, are representative of the population, and hence allow good generalisability of findings. Three such studies from Britain are summarised in Table 4.5 and show clear positive relationships between PA and psychological well-being. Confidence in these results is enhanced by noting that the surveys cover both adolescents and adults, use clinical and non-clinical assessment tools, and cover a total sample of 15,577. However, as noted by Thirlaway and Benton (1996), not all groups seemed to benefit from PA.

The three British studies are comparable to Stephens' (1988) secondary analysis of four North American surveys with over 55,000 people. Across several measures, there was a clear association between PA and psychological well-being. For example, positive affect was associated with PA for both men and women in the two age groups under and over 40 years. Stephens (1988, pp. 41–42) provided the following clear conclusion:

Table 4.6 Controlled experimental trials from Britain investigating physical activity, exercise and psychological well-being

the inescapable conclusion of this study is that the level of physical activity is positively associated with good mental health in the household populations of the United States and Canada, when mental health is defined as positive mood, general well-being, and relatively infrequent symptoms of anxiety and depression. This relationship is independent of the effects of education and physical health status, and is stronger for women and those age 40 years and over than for men and those age under 40. The robustness of this conclusion derives from the varied sources of evidence: four population samples in two countries over a 10-year period, four different methods of operationalizing physical activity and six different mental health scales.

Evidence from experimental trials

Few studies have investigated the effects of PA on affect and mood through controlled experimental trials. Five British studies are summarised in Table 4.6. These show clearly that the intensity of exercise is important in determining the effects of exercise on mood, something not suggested in other types of studies such as epidemiological surveys. The three studies by Steptoe and his colleagues (Steptoe & Bolton, 1988; Steptoe & Cox, 1988; Moses, Steptoe, Mathews, & Edwards, 1989) show that moderate, but not high intensity exercise, has mood enhancing effects. Similarly, Parfitt, Markland, & Holmes (1994) show that feeling states in exercise are significantly worse at a higher intensity for less active individuals. Moreover, Parfitt, Eston and Connolly (1996) showed that low-active women reported more negative affect at a higher exercise intensity than high-active women.

Raglin has suggested that 'sensations associated with exertion and post-exercise fatigue following high-intensity activity *delay, but do not eliminate*, post-exercise anxiety reductions' (1997, p. 117, emphasis added). The increases in negative mood after high intensity exercise reported in Steptoe's research may be due to the higher exertion required, but studies have shown that positive mood is still enhanced some time later. Indeed, Parfitt et al. (1996) showed that for both high-active and low-active women, positive affect was higher 5 minutes after exercise in comparison to the last 20 seconds of the exercise bout, and this was most pronounced for the highest level of exercise intensity, thus supporting Parfitt et al. (1994).

The temporal nature of changes in mood after different intensities of exercise requires further investigation. However, even if the post-exercise negative mood effect is transitory, it may be enough to affect adherence and reduce physical activity participation.

In a controlled trial of healthy American adults, King, Taylor, Haskell and DeBusk (1989) found that participants assigned to a 6-month PA intervention, in comparison to controls, showed significant improvements in body appearance satisfaction, perceived physical fitness, and satisfaction with weight. No differences, however, were found for depressed mood, tension/anxiety, or confidence/well-being. These results suggest that psychological changes are more likely if they are closely linked to the physical changes associated with an exercise programme.

Exercise and sub-clinical depression

Exercise and clinical depression is covered by Nanette Mutrie in this volume. However, many studies have investigated participants who have not reached clinically defined levels of depression, but may be suffering transitory negative depressive mood. McDonald and Hodgdon (1991) identified five measures of depression in their meta-analysis of aerobic training studies. These were the BDI, the Centre for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977), Lubin's (1965) Depression Adjective Check List (DACL), the Symptom Check List 90 (SCL-90) (Derogatis, Lipman, & Covi, 1973), and Zung's (1965) Self-Rating Depression Scale (SDS). In addition, the POMS depression subscale has been used (see Leith, 1994) although McDonald and Hodgdon used this as part of their analysis of mood rather than depression per se.

Meta-analytic reviews

Two meta-analyses have been conducted on exercise and depression. McDonald and Hodgdon (1991) have also meta-analysed depression as an outcome variable for their study of aerobic fitness training. In addition,

North et al. (1990) reported a meta-analysis of 80 studies yielding 290 effect sizes on exercise and depression. The mean ES was 0.53. Similarly, McDonald and Hodgdon found an overall ES of 0.55 for their 'depression cluster', which included various depression and related mood scales.

Although these meta-analyses probably constitute the best evidence available to date, there are a number of issues that should caution overconfidence. Many of these are argued well by Dunn and Dishman (1991) and Dishman (1995). For example, some studies in the meta-analyses may have included individuals suffering from depression with a primary anxiety component. Dunn and Dishman argue this point on the basis of evidence that shows a large number of people meeting Diagnostic and Statistical Manual (DSM-II-R) criteria for agoraphobia and panic attacks also suffer from depression or have a history of depression, hence exercise may reduce state anxiety and elevate mood which could then produce changes in depression. North et al.'s (1990) meta-analysis is also questioned on the basis of non-uniformity in defining depression, as well as the discrepancy between the results of the meta-analysis and other studies.

Epidemiological surveys

The large-scale survey analysis reported by Stephens (1988) provides evidence at the level of epidemiological data. Concerning depression assessed with the CES-D, results for over 3,000 North American adults from the first National Health and Nutrition Examination Survey (NHANES-I) showed that depression was highest for those reporting 'little/no exercise' in comparison to those classified in the 'moderate' and 'much' exercise categories. Interestingly, this difference is suggestive that only moderate exercise may be sufficient for anti-depressant effects and that additional activity yields no additional benefit. Further support was provided in follow-up data in NHANES-II (Farmer, et al., 1988).

Evidence from experimental trials

Leith (1994) reports 42 studies investigating exercise and depression and 81% show anti-depressant effects. Of these, 25 appear to deal with subclinical depression and 84% show positive effects for exercise. Of the 6 subclinical studies Leith classifies as experimental, all but one reported positive changes in depression.

Do mood and emotion effects vary across people and settings?

There is some evidence in epidemiological surveys (e.g. Stephens, 1988) that more positive affect results from physical activity for women and those over 40 years of age. However, when specific aspects of affect are studied, such as depression, the picture is not clear. Similarly, it is not known whether specific forms of exercise, such as aerobic exercise, are more beneficial than others when affect is considered. Some might argue that we will never resolve this issue since people will 'feel good' after exercise they prefer, and feel 'less good' after exercise that is not to their liking. Such individual differences will mask any population trends linking PA and affect. However, this has yet to be shown.

Nevertheless, one area of research in sport psychology may shed some light on contextual factors influencing exercise affect. The approach people have in some physical activities (their goals), and the environment perceived by the participants (climate) may be important. We have studied two main achievement goals in PA. A task goal orientation is held when success is defined primarily in terms of self-improvement and task mastery. It is highly correlated with the belief that effort will bring success. An ego goal orientation is held when success is defined in terms of winning and demonstrating superiority over others. This correlates highly with the belief that ability is necessary for success (see Duda, 1993).

We conducted a meta-analysis of 37 studies, with a total of 41 independent samples ($n = 7,950$), investigating the relationship between task and ego goals and positive (PA) and negative affect (NA) (Ntoumanis & Biddle, 1999a). After correcting for measurement and sampling error, the correlation between task orientation and positive affect was moderate-to-high (0.55). The other correlations were generally small: task – NA = -0.18; ego – PA = 0.10; ego – NA = 0.04. These results suggest that adopting a task goal orientation in exercise will lead to more positive affective reactions. This may be due to greater perceptions of control and higher intrinsic motivation.

In another review, we calculated effect sizes for the relationship between task and ego climates in PA and positive and negative affect (Ntoumanis & Biddle, 1999b). Climates refer to the perception of contextual cues in a situation (e.g. exercise class) that may emphasise more of a task climate or an ego climate. In the former,

group members perceive they have greater decision-making involvement, success is defined and evaluated in terms of individual effort and improvement, and new learning strategies are encouraged. An ego climate, on the other hand, emphasises interpersonal comparison, and evaluation is based on normative standards.

Calculations from 14 studies ($n = 4,484$) revealed that a task climate was associated quite strongly with positive affective and motivational outcomes, such as satisfaction and intrinsic motivation (Effect Size [ES] = 0.71). Conversely, an ego climate was associated with positive outcomes in a negative direction (ES = -0.30). Negative outcomes, such as worry, were negatively associated with a task climate (ES = -0.26) and positively with an ego climate (ES = 0.46). These results suggest that a task climate is associated with greater positive and less negative affect. Of course we cannot conclude whether those in a task climate, or those with a task goal, are better off than non-participants, but given the evidence presented elsewhere in this review, it seems highly likely that they will be.

A brief overview of possible mechanisms

The review so far suggests that physical activity is associated with positive mood and affect. However, this is not enough. We also need to know more about *why* and *how* such effects occur. This necessitates a brief discussion on the mechanisms of the links between PA and PWB, although a more generic discussion is provided in the final chapter.

Mechanisms for the effects of PA on mood and affect have not been clearly identified. Several proposed mechanisms are plausible, including biochemical, physiological, and psychological (see Biddle & Mutrie, 1991; Boutcher, 1993; Morgan, 1997). Possible biochemical and physiological mechanisms include changes associated with an increase in core body temperature with exercise (thermogenic hypothesis; see Koltyn, 1997), increase in endorphin production following exercise (endorphin hypothesis; see Hoffmann, 1997), changes in central serotonergic systems from exercise (serotonin hypothesis; see Chaouloff, 1997), and the effects of exercise on neurotransmitters (e.g. norepinephrine hypothesis; see Dishman, 1997). In addition, the 'feel better' effect from PA may result from changes in self-esteem from mastering new tasks, or from time away from negative or more stressful aspects of our lives.

In an elegant analysis of possible mechanisms and their interaction with exercise experience, Boutcher (1993) proposes that for those just starting exercise (i.e. in the 'adoption phase'), greater emphasis should be placed on psychological mechanisms since the exerciser had not adapted, physiologically, to the PA stimulus. In the maintenance phase, Boutcher suggests that both psychological and physiological mechanisms are likely to be important, and in the final habituation phase, he suggests that emphasis should be placed on physiological mechanisms and the influence of behavioural conditioning.

Guidelines for research and practice in health settings

It is clear from this review that physical activity is associated, in a positive way, with emotion, mood and psychological well-being. Despite methodological difficulties in this area, health professionals should have some confidence in the promotion of physical activity for the purposes of enhancing psychological well-being, however defined.

Guidelines for research

This review has drawn evidence from numerous narrative reviews, two meta-analytic reviews, several large-scale surveys, and a few well-designed experimental trials. Despite this, research into emotion, mood and PWB and physical activity is fraught with difficulties. First, the measurement of PWB has been inconsistent or restrictive in nature. Affect and mood are difficult to define, at least in operational terms, and when they have been assessed, many different instruments have been used. In the assessment of mood, the POMS has been the dominant instrument, yet, as already alluded to, this is narrow and allows for the assessment of only one positive factor. In short, generalised measures of affect and mood are in need of development to be suitable for physical activity research.

To this end, two recent measures of exercise-related affect have been developed (EFI and SEES). These allow for the acute effects of exercise to be assessed and should be tested further in this country during exercise trials. However, they present difficulties when assessing the effects of alternative treatments and do not solve the problem of using a consistent measurement technology for assessing the chronic effects of physical activity and exercise.

The work of Steptoe and his colleagues (see Steptoe, 1992) has demonstrated that moderate rather than

high intensity exercise is associated with positive well-being. This requires further testing with more varied intensities and activities, as well as investigating whether high intensity exercise is associated with PWB but only after some delay.

It is not possible, at this stage, to draw clear conclusions concerning the characteristics of participants or exercise modalities. Some surveys have suggested that women and older individuals gain most from physical activity, and that aerobic over anaerobic exercise produces superior psychological effects. However, these trends have not always been confirmed and further work is required.

Guidelines for practice

It has been concluded that physical activity is consistently associated with positive affect and mood. Although we are unable to state with confidence that physical activity *causes* positive affect, it is clear that an association exists for both acute and chronic involvement. Health professionals can, with confidence, promote moderate physical activity in the knowledge that 'good mental health' will be correlated with such behaviours. The current message associated with the *Active for Life* campaign in England is wholly consistent with this approach. Advocating more vigorous exercise appears to be less easy to justify, except in fitter individuals.

If positive affect is a desired outcome of physical activity promotion by health professionals, evidence supports the use of moderate aerobic PA and the adoption of a task goal orientation. Moderate PA, such as walking and cycling, are currently promoted as key activities in *Active for Life*. These types of activities have the added advantage of being possible to fit into a typical daily schedule with minimal disruption and thus aid adherence.

As far as task orientation is concerned, this means that individuals playing sport or taking part in a physical activity where some form of 'achievement' is salient, should adopt reference standards that are internally focused. In other words, success should be judged in terms of personal progress and effort. Similarly, a mastery (task-oriented) motivational climate is associated with greater PWB. Promotion of this group environment entails promoting individual challenges, involving group members in decision making, recognising individual progress, having evaluation based on individual progress, and providing opportunities for practice and improvement (Ames, 1992).

Although there will be a wide variety of types of physical activities that are associated with PWB, the promotion of moderate aerobic PA, emphasising personal effort, progress and participation, seems an appropriate strategy at this point in our knowledge.

What we know

Based on the evidence reviewed, the following statements are offered for what we currently know about the relationship between affect, mood and physical activity:

- Physical activity is consistently associated with positive affect and mood.
- Where quantified trends have been identified, aerobic exercise has a small-to-moderate effect on tension (–), depression (–), vigour (+), fatigue (–), and confusion (–), and a small effect on anger (–).
- A positive relationship between physical activity and psychological well-being has been confirmed in several large epidemiological surveys, including in the UK, using different measures of activity and well-being.
- Experimental trials support a positive effect for moderate intensity exercise on psychological well-being.
- Meta-analytic evidence shows that adopting a goal in exercise that is focused on personal improvement, effort, and mastery has a moderate-to-high association with positive affect.
- Meta-analytic evidence shows that a group climate in exercise settings focused on personal improvement and effort has a moderate-to-high association with positive affect.

What we need to know

Our knowledge is far from complete. The following questions address key concerns and represent what we need to know:

- Are the associations between physical activity and psychological well-being causal?
- Do different types of physical activity produce different affective responses?

- Is physical activity likely to produce superior psychological effects for some groups, such as women?
- When might high intensity exercise produce positive affective responses?
- Are current psychometric measures of HRQL and exercise-related affect adequate for capturing the range of affective responses in physical activity?
- Are current psychometric measures of HRQL and exercise-related affect adequate for assessing change over time?
- What mechanisms explain the link between PA, affect and mood?

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