Cambridge Handbook of Psychology, Health and Medicine

Second edition

Susan Ayers
Andrew Baum
Chris McManus
Stanton Newman
Kenneth Wallston
John Weinman
Robert West

CAMBRIDGE
UNIVERSITY PRESS

(pp. 117–48). Mahwah, NJ: Lawrence Erlbaum Associates.

Loehlin, J. C. (2000). Group differences in intelligence. In R.J. Sternberg (Ed.). *Handbook of intelligence* (pp. 176–93). New York: Cambridge University Press.

Mackintosh, N. J. (1998). *IQ and human intelligence.* Oxford: Oxford University Press.

Mayer, R. E. (2000). Intelligence and education. In R. J. Sternberg (Ed.). *Handbook of intelligence* (pp. 519–33). New York: Cambridge University Press.

Moore, E. G. J. (1986). Family socialization and the IQ test performance of traditionally and transracially adopted black children. *Developmental Psychology,* **22**, 317–26.

Naglieri, J. A. & Das, J. P. (2002). Practical implications of general intelligence and PASS cognitive processes. In R. J. Sternberg & E. L. Grigorenko (Eds.). *The general factor of intelligence: how general is it?* (pp. 55–86). Mahwah, NJ: Lawrence Erlbaum Associates.

Nisbett, R. (1995). Race, IQ, and scientism. In S. Fraser (Ed.). *The bell curve wars: race, intelligence and the future of America* (pp. 36–57). New York: Basic Books.

Petrill, S. A. (2002). The case for general intelligence: a behavioral genetic perspective. In R. J. Sternberg & E. L. Grigorenko (Eds.). *The general factor of intelligence: how general is it?* (pp. 281–98). Mahwah, NJ: Lawrence Erlbaum.

Roid, G. (2003). *Stanford–Binet Intelligence Scales* (5th edn.). Itasca, IL: Riverside.

Scarr, S. & Weinberg, R. A. (1976). IQ test performance of black children adopted by white families. *American Psychologist,* **31**, 726–39.

Scarr, S., Weinberg, R. A. & Waldman, L. D. (1993). IQ correlations in transracial adoptive families. *Intelligence,* **17**, 541–5.

Schmidt, F. L., Ones, D. S. & Hunter, J. E. (1992). Personnel selection. *Annual Review of Psychology,* **43**, 627–70.

Spearman, C. (1927). *The abilities of man.* London: Macmillan.

Stankov, L. (2002). *g*: A diminutive general. In R. J. Sternberg & E. L. Grigorenko (Eds.). *The general factor of intelligence: how general is it?* (pp. 19–37). Mahwah, NJ: Lawrence Erlbaum Associates.

Steele, C. M. (1997). A threat in the air: how stereotypes shape intellectual identity and performance. *American Psychologist,* **52**(6), 613–29.

Stern, W. (1912). *Psychologische methoden der Intelligenz-Prüfung.* Leipzig, Germany: Barth.

Sternberg, R. J. (1990). *Metaphors of mind: conceptions of the nature of intelligence.* New York: Cambridge University Press.

Sternberg, R. J. (1997). *Successful intelligence.* New York: Plume.

Sternberg, R. J. (1999). The theory of successful intelligence. *Review of General Psychology,* **3**, 292–316.

Sternberg, R. J. (2002). Beyond *g*: the theory of successful intelligence. In R. J. Sternberg & E. L. Grigorenko (Eds.). *The general factor of intelligence: how general is it?* Mahwah, NJ: Lawrence Erlbaum Associates.

Sternberg, R. J. (2004). Culture and intelligence. *American Psychologist,* **59**, 325–38.

Sternberg, R. J. & Detterman, D. K. (Eds.). (1986). *What is intelligence?* Norwood, NJ.: Ablex Publishing Corporation.

Sternberg, R. J., Forsythe, G. B., Hedlund, J. *et al.* (2000). *Practical intelligence in everyday life.* New York: Cambridge University Press.

Sternberg, R. J. & Grigorenko, E. L. (Eds.). (2001). *Environmental effects on cognitive abilities.* Mahwah, NJ: Lawrence Erlbaum Associates.

Terman, L. M. (1916). *The measurement of intelligence: an explanation of and a complete guide for the use of the Stanford revision and extension of the Binet–Simon Intelligence Scale.* Boston: Houghton Mifflin.

Thurstone, L. L. (1938). *Primary mental abilities.* Chicago, IL: University of Chicago Press.

Wagner, R. K. (1997). Intelligence, training, and employment. *American Psychologist,* **52**, 1059–69.

Wahlsten, D. (2002). The theory of biological intelligence: History and a critical appraisal. In R. J. Sternberg & E. L. Grigorenko (Eds.). *The general factor of intelligence: how general is it?* (pp. 245–77). Mahwah, NJ: Lawrence Erlbaum Associates.

Wechsler, D. (1939). *The measurement of adult intelligence.* Baltimore: Williams & Wilkins.

Wechsler, D. (1974). *The measurement and appraisal of adult intelligence.* Baltimore: Williams & Wilkins.

Weinberg, R. A., Scarr, S. & Waldman, I. D. (1992). The Minnesota Transracial Adoption Study: A follow-up of IQ test performance at adolescence. *Intelligence,* **16**(1), 117–35.

Assessment of mood

Michele M. Tugade[1], Tamlin Conner[2] and Lisa Feldman Barrett[3]

[1]Vassar College
[2]University of Connecticut Health Center
[3]Boston College

Theoretical and methodological advances in psychology, physiology and medicine have led to rigorous examinations of the role of affect and emotion in health. In this chapter, we review the role of negative and positive emotions in health research and then discuss some of the most prominent measures currently used to measure mood in this research. We conclude with specific recommendations for the

measurement of mood and emotion in the context of studies of physical health. Across different samples and studies in health psychology, there is little variation in mood assessment procedures. As a consequence, we focus our discussions primarily on the cardiovascular system, with a shorter discussion of relations between cancer and mood.

Negative emotions and health

Much of the research that examines the relation between mood and health addresses the impact of negative or unpleasant affect. Although the experience of negative affect is generally adaptive in preparing the body for fight-or-flight, it can have adverse consequences when the body is continually taxed. In particular, researchers have focused on how particular experiences of negative affect (e.g. anger, anxiety and depression) have emerged as important risk factors in health (see Gallo & Matthews, 2003; Kubzansky & Kawachi, 2000).

Anger

Several studies have reported on the negative health consequences of anger on cardiovascular responses (e.g. Kawachi *et al.*, 1996), particularly in relation to incidence of coronary heart disease (CHD). Hostility appeared to be a greater risk factor than smoking, high blood pressure and high cholesterol (Chaput *et al.*, 2002). Hostility is related to heightened cardiovascular stress (Davis *et al.*, 2000; see also 'Hostility, Type A behaviour and coronary heart Disease') and the speed of cardiovascular recovery from evocative situations, increasing the allostatic load or the total time that cardiovascular indices remain elevated, which itself is an important factor in the development of later hypertension and cardiovascular disease (Faber & Burns, 1996; Gerin & Pickering, 1995; Jamieson & Lavoie, 1987; Lai & Linden, 1992). There is also some evidence that inhibiting anger expression is related to heart disease (including essential hypertension and CHD; e.g. Appel *et al.*, 1983; Diamond, 1982; MacDougall *et al.*, 1985; also see Engebretson *et al.*, 1989). It is also consistent with the more general finding that emotional suppression produces increases cardiovascular reactivity (Gross & Levenson, 1993; see 'Emotional expression and health'). Almost all of the studies assessed anger-related experiences using general or summary type self-report measures (detailed below in the 'Mood assessment procedures' section; e.g. the MMPI-2 Anger Content Scale, Hathaway & McKinley, 1989, in Kawachi *et al.*, 1996; the Speilberger Anger-Out Expression scale, Speilberger, 1988, in Eng *et al.*, 2003; dispositional hostility measured by a composite index including cynicism, anger, mistrust and aggression, in Rozanski *et al.*, 1999). Taken together, this body of research suggests that respondents' reports of anger experiences in general are related to cardiovascular functioning.

Anxiety

Most prospective epidemiological studies have found an association between self-reported symptoms of anxiety and risk of developing CHD, even when other factors were considered (e.g. a family history of heart disease; Kubzansky & Kawachi, 2000). This link could exist in individuals who report anxiety symptoms because they have repeated activation of the sympathetic nervous system and suppression of immune system function (Schneiderman, 1987), because they are less likely to engage in health-promoting behaviours (Kubzansky *et al.*, 1998) or because they are more likely to engage in risky health behaviours (e.g. increased smoking, alcohol or drug consumption; Kubzansky & Arthur, 2004). Indeed, individuals who report anxiety are at increased risk of atherosclerosis (Paterniti *et al.*, 2001) and hypertension (Markovitz *et al.*, 1991). These studies assessed anxiety-related experiences using global measures of anxiety and anxiety symptoms, such as: the Framingham Tension Scale (Haynes *et al.*, 1978) in Markovitz *et al.* (1991); the Speilberger State-Trait Anxiety Inventory (Spielberger *et al.*, 1970) in Paterniti *et al.* (2001); and the Hopkins Symptoms Checklist (Derogatis *et al.*, 1973). Taken together, these studies indicate that reports of anxiety-related experiences are associated to CHD.

Depression

Studies provide convincing evidence that clinical depression contributes significantly to the onset of heart disease. Clinical depression is a mood-related disorder that can lead to a three-fold increase in risk for heart disease (see Anderson, 2003) and it is therefore especially dangerous for people with existing heart ailments. Numerous epidemiological studies consistently demonstrate a prospective relation between the occurrence of major depressive episodes and the incidence of myocardial infarction, ischemic heart disease and cardiac death (Anderson, 2003), as well as a dose–response association between the magnitude of depression and future cardiac events (cf. Rosanski *et al.*, 1999; see 'Coronary heart disease: cardiac psychology'). These studies use clinical assessments of depression (as reported in Rozanski *et al.*, 1999), such as the Centre for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), MMPI Depression Scale (Hathaway & McKinley, 1989) and the Beck Depression Inventory (BDI; Beck, 1996). Together, these data suggest that risk for coronary artery disease associated with depression exists along a continuum, according to the magnitude of depressive symptoms.

The assessment of depression also plays an important role in the diagnosis of cancer. Although the direct pathways by which mood might influence cancer etiology remain unclear (Croyle & Rowland, 2003), evidence indicates that self-reported experiences of negative affect (e.g. depression) are related to an increased risk of developing cancer (Pennix *et al.*, 1998). One groundbreaking prospective study examined the links between depression and cancer incidence in 4825 participants. After controlling for factors such as age, sex, race, disabilities, alcohol use and smoking, the researchers found that participants who had been chronically depressed for at least six years had an 88% greater risk of developing cancer within the following four years. In this study, chronically depressed mood was defined as being present when the number of depressive symptoms exceeded 20 on the Centre for Epidemiologic Studies-Depression scale (CES-D; Radloff, 1977) during three timepoints: baseline, 3 years before baseline and 6 years before baseline. The CES-D measures depressive feelings and behaviours experienced during the past week (e.g. feelings of sadness or feelings that life had been a failure, lack of appetite, having a restless sleep, or having crying spells). Although the results of this study are compelling,

the researchers cautioned that further studies are needed to determine the direction of causality in their findings. For instance, it is possible that depressed mood was a consequence of early-stage cancer that had yet to be detected (Pennix *et al.*, 1998).

Previous to the Pennix *et al.* (1998) study, prospective studies used a single measurement occasion to assess depressed mood and the development of cancer. Obtaining only a single measure of depression in the absence of assessment of duration or frequency, however, may be incomplete. A single estimate may classify persons as depressed as a result of temporary stressful life circumstances or health problems present at that moment. There is also variability in the frequency of depression across the cancer disease course (Croyle & Rowland, 2003). Such variability may reflect an inconsistency among several factors, including type of assessment, timing of assessment, type of cancer, concurrent treatment and comorbidity (e.g. Croyle & Rowland, 2003). Moreover, most clinical assessments rely on patient self-report. Although symptoms of depression (e.g. fatigue, reduced appetite, sleep problems, concentration problems) are best reported by the patient, most depressed cancer patients may not be able to complete assessments or may not seek treatment for cancer-related depression at all (Croyle & Rowland, 2003).

Research also indicates that repression of negative affect (i.e. having no cognitive awareness of feelings of anger, sadness, anxiety, worry, or fear related to cancer) has been identified as the single most important predictor of cancer incidence (McKenna *et al.*, 1999). It is also related to faster cancer progression (Jenson, 1987) and is a risk factor for early mortality in women with breast cancer (Giese-Davis *et al.*, 2004). Examining the links between mood and cancer, therefore, can be important in understanding the course of the disease and a cancer patient's overall quality of life.

Positive emotions and health

Just as individuals with a negative affective style are at greater risk for developing health problems, individuals with a positive emotional style (including a tendency to report positive emotions such as feeling happy, pleased and relaxed) experience potential health benefits. Recent research, for instance, has demonstrated that positive emotional experiences serve as a protective factor against the common cold even after controlling for a number of risk factors (e.g. age, sex, education, race, body mass and season; Cohen *et al.*, 2003). Physical health benefits associated with positive emotions are further established in research on optimism, a dispositional attribute associated with positive emotions. For example, optimists (compared with pessimists) are less likely to suffer from angina and myocardial infarction (Kubzansky & Kawachi, 2002) and they show better physical recovery immediately after coronary artery bypass surgery and up to six months post-surgery (Carver & Scheier, 1998). Other research corroborates this pattern, showing that the tendencies to maintain optimistic (even unrealistically optimistic) beliefs about the future act to buffer against the advancement of disease and death (Aspinwall & Taylor, 1997; Taylor & Brown, 1988; Taylor *et al.*, 2000). Taken together, these studies suggest that the relation between physical health and positive dispositional styles (e.g. optimism) may be due in part to the chronic positive emotional states engendered by the personality style.

One of the most important functions of positive emotion is to undo the cardiovascular reactivity associated with negative emotion. Recent research indicates that positive emotional experiences may be important in accelerating cardiovascular recovery from stressful experiences. Theory and research have shown that positive and negative emotions have unique and complementary adaptive functions and physiological effects (see Fredrickson, 1998, 2001). Experiences of negative emotions are associated with autonomic nervous system activation, such as changes in heart rate, vascular resistance and blood pressure (for meta-analytic evidence, see Cacioppo *et al.*, 2000) that prepare the body for fight or flight. Experiences of positive emotions function as efficient antidotes for the lingering cardiovascular effects of negative emotions, in a sense 'undoing' the lingering after-effects of negative emotional experiences (Fredrickson & Levenson, 1998; Fredrickson *et al.*, 2000). Experimental evidence suggests that participants induced to experience both high activation positive emotions (i.e. joy/amusement) and low activation positive emotions (i.e. contentment/serenity) exhibited faster cardiovascular recovery after exposure to emotionally evocative films than those in a neutral control condition (Fredrickson & Levenson, 1998; Fredrickson *et al.*, 2000). In this way, positive emotions are not only a form of psychological resilience (Tugade & Fredrickson, 2004) but may also serve as a protective factor for cardiovascular and other stress-related illnesses.

Now that we have provided a brief review of the links between mood and health, in the next section, we will highlight some of the most prominent measures currently used to measure mood in health psychology.

Mood assessment procedures in health psychology

Self-report measures

Self-report methods are popular for measuring mood. Their use is grounded in the first-person perspective that the best way to know how people feel is to ask them. This contrasts with a third-person perspective whereby feeling is inferred from instrument-based observational methods (e.g. using physiological measures, facial affect coding, etc.). Self-report procedures vary in the content of the measures (i.e. the experiences that are sampled) and the timeframe of the assessment period. Moods can be assessed as they are currently experienced, called a 'state' or 'momentary report'; over a specified time frame, called a 'retrospective report'; or in general, often called a 'trait or global report'.

Content

There are numerous self-report measures currently used in the health sciences and each assesses different aspects of mood. Some measures target a single type of mood-related experience, for example, feelings of anxiety, depression, or anger. The most widely-used measure of anxious mood is the Spielberger State–Trait Anxiety Inventory (STAI; Spielberger, 1983; Marteau & Bekker, 1992). Popular measures of depressed mood include the 20-item Centre for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977) and variants of the Beck Depression Inventory (original, Version II and fast screen for medical patients, Beck *et al.*, 1961, Beck *et al.*, 1996; 2000; see also Richter *et al.*, 1998, for a validity review). Commonly used anger-related mood measures include the

MMPI-2 Anger Content Scale (Hathaway & McKinley, 1989) and the Spielberger Anger-Out Expression Inventory (Spielberger, 1988).

Other measures include a wider range of items to sample more than one type of mood-related experience. For example, the widely-used Profile of Mood States (POMS; McNair *et al.*, 1971/1981) is a 65-item rating scale that yields a total mood index, plus a single index of positive mood (Vigour) and five indices of negative mood (tension/anxiety; depression/dejection; anger/hostility; fatigue; and confusion/bewilderment), the latter two presumably measuring more physically-based mood states. Respondents rate the extent to which they are experiencing or have experienced 65 affect states (e.g. sad, tense, energetic, cheerful) using a 5-point scale (0 = not at all, 5 = extremely). There are also several shortened versions, which appear to show adequate internal consistency (see Guadagnoli & Mor, 1989; Shacham, 1983). Similarly, the Mood Adjective Checklist (MACL, Nowlis, 1965) is a 50-item affect rating scale that yields 12 separate mood indices – aggression, anxiety, surgency, elation, concentration, fatigue, social affection, sadness, skepticism, egotism, vigor and nonchalance. It also attempts to differentiate between physical versus emotion-based mood states, although it should be noted that some of the terms are outdated (e.g. 'clutched up' as a marker of anxiety). The 40-item Derogatis Affects Balance Scale (DABS; Derogatis, 1996) measures several positive mood dimensions (joy, contentment, vigour and affection) and several negative mood dimensions (anxiety, depression, guilt and hostility) and is often used in clinical psychology related fields. The Multiple Affect Adjective Check List Revised (MAACL-R; Zuckerman & Lubin, 1985) is a 132-item scale that assesses five dimensions of mood (anxiety, depression, hostility, positive affect and sensation-seeking), and combines these for superordinate measures of dysphoria (sum of anxiety, depression and hostility) and positivity (sum of sensation-seeking and positive affect). All of these scales have shown adequate internal consistency and reliability.

Even though these scales purport to measure distinct mood states, respondents typically have some difficulty distinguishing mood states of the same valence. Reports of negative mood experience tend to correlate so highly that measures of anxiety, sadness, fear and so on, often fail capture any unique variance (e.g. Feldman, 1993; Watson & Clark, 1984; Watson & Tellegen, 1985). Even scales that are explicitly built to measure discrete emotions tend to suffer from high correlations between like-valenced states (e.g. Boyle, 1986; Watson & Clark, 1994; Zuckerman & Lubin, 1985). Individuals also vary a great deal in the tendency with which they represent feelings as distinctive experiences (Carstensen *et al.*, 2000; Lane *et al.*, 1990; Lane & Schwartz, 1987; Larsen & Cutler, 1996), with some individuals making categorical distinctions between like valenced states in their reports of experience and others making fewer distinctions (Barrett, 1998, 2004; Barrett *et al.*, 2001; Feldman, 1995*b*) – an individual difference termed 'emotional granularity' (Barrett, 2004).

Several strategies can address the weak discriminant validity in discrete mood reports and granularity differences across people. Single mood measures (e.g. STAI; BDI) are best used in conjunction with other mood measures to determine whether participants are feeling 'anxiety' or 'depression' per se or whether they using the scales simply to record undifferentiated feelings of negativity (Watson & Clark, 1984) or dysphoric mood (Feldman, 1993; 1995*a*). Measures which sample more than one type of mood-related experience should be analyzed for their psychometric properties, but at minimum can be considered valid measures of positive and negative affective states (Feldman, 1993, 1995*a*; Watson & Tellegen, 1985). Also, regardless of whether people are high or low in emotional granularity, their verbal reports do seem to convey something valid about the two broad dimensions of mood – their feelings of valence (pleasure–displeasure) and arousal (high activation–low activation) (Barrett & Niedenthal, 2004; Barrett *et al.*, 2004).

Another option is to measure the broad dimensions of mood more explicitly. One popular measure is the Positive and Negative Activation Schedule (once called the Positive and Negative Affect Schedule; PANAS; Watson, Clark & Tellegen, 1988; Watson *et al.*, 1999). The PANAS is a 20-item scale that assesses positive and negative activation (that is, high arousal positive and negative states; e.g. excited, interested, proud; ashamed, nervous, scared). Importantly, the PANAS is not a measure of both dimensions of affectivity (pleasure–displeasure; high activation–low activation) (Barrett & Russell, 1998; Carroll *et al.*, 1999), although it is often treated as such, because it does not capture lower activation feelings of calmness, depression, sadness, or even happiness. An extended version, the PANAS-X, is available to measure more discrete feelings including some, but not all, lower level activation states (sadness, serenity, fatigue) in addition to the broader positive and negative activation states (Watson & Clark, 1994). In general, both the PANAS and PANAS-X show good validity and reliability for measuring high activation, valenced mood states in a variety of time frame formats (see Watson, 1988; Watson & Clark, 1997). Other measures have been developed to sample the affective space more completely by including items reflecting all combinations of valence and arousal. For examples, see Barrett and Russell (1998), Carroll *et al.* (1999), Larsen and Diener (1992), Mayer and Gaschke, 1988; Russell, Weiss and Mendelsohn, 1989; and Yik *et al.* (1999).

An alternative to the PANAS and other existing measures is to develop (or modify) one's own measure. In doing so, it is advisable to include a broad range of adjectives reflecting all combinations of valence (pleasant–unpleasant) and arousal levels (high activation–low activation) (see Barrett & Russell, 1998). Also, accumulating evidence strongly suggests that all self-report scales of mood should use unambiguously unipolar (rather than bipolar) scales, where respondents first judge the absence or presence of affective feeling, and only then judge the intensity of the feeling if it is present (e.g. 0 = no feeling at all, but if feeling is present, and then 1 = mild intensity to 5 = strong intensity; for a discussion of why this is so, see Russell & Carroll, 1999). Failure to do so can cause systematic artifacts in measurement that can influence, among other things, the extent to which self-reports positive and negative affect are correlated (Russell & Barrett, 1999).

The time frame of mood assessment

Time frame is another important issue in the measurement of self-reported mood. Mood can be measured in the present moment (How do you feel right now?), retrospectively over increasingly extended time intervals (How have you felt this day? week? month? past year?) and globally (How do you feel in general?). Momentary and shorter interval retrospective reports capture immediate affective states which fluctuate in response to changing

events and conditions, and constitute a form of episodic or state mood. In contrast, global or longer term retrospective reports capture enduring beliefs about the types of moods we experience, and constitute a form of semantic or trait mood (for a review, see Robinson & Clore, 2002). Many existing mood measures come in state and trait forms or can be easily adapted to different time frames. Choosing the appropriate time frame in measurement is important because state and trait reports are psychologically distinct and each is suited to different types of health-related investigations.

State mood measures reflect people's transient mood states and should be used when seeking to measure mood as it occurs or how it changes in response to events or situations (e.g. laboratory or real-world stressors). The strictest state format is to ask people how they feel right now (a momentary self-report) either at a single time point (typically in the lab), or on repeated occasions (typically outside the lab) using a method called Ecological Momentary Assessment (EMA) or experience-sampling methods (ESM).[1] These intensive, longitudinal self-report procedures are designed to allow respondents to document their thoughts, feelings and behaviours on repeated occasions within the context of everyday life. Sampling is typically accomplished through the use of a device (like a Palm, a pager, or cell phone) that allows respondents to report their momentary experience multiple times a day (either in response to a random signal, a fixed signal and/or self-initiated). Momentary self-reports, like those used in EMA and ESM, are often considered the gold standard of state mood measurement because they capture mood as it happens in real life, unbiased by memory processes. For these reasons, EMA and ESM are playing increasingly vital roles in the scientific study of health. They have been used to evaluate the efficacy of clinical interventions and health treatments with presumed mood components, and to test the links between mood and important health factors including coping, cardiovascular function and salivary cortisol levels *in situ* (for examples see Steptoe *et al.*, 2000; Stone & Shiffman, 1994). For a full review of these procedures, the interested reader is referred to Barrett and Barrett (2001), Bolger, Davis and Rafaeli, (2003), Conner *et al.* (2003), Reis and Gable (2000) and Stone *et al.* (1999).

Short term retrospective reports also measure state mood and can be used when practicalities prohibit the use of EMA, or when researchers are expressly seeking to measure people's retrospections of their mood states. A short-term retrospective report may ask people how they felt over the past hour, day, or week. When people retrospect over such short time intervals, reports tend to be fairly accurate when they are compared to momentary self-reports averaged over that interval (Thomas & Diener, 1990; Hedges *et al.*, 1985; Parkinson *et al.*, 1995); however, retrospections across a span of a week appear to relate more to averaged end-of-day reports than to averaged momentary reports over the interval suggesting that weekly reports are retrospections on already aggregated memories (Parkinson *et al.*, 1995). Although generally accurate, short-term retrospective reports can reflect several systematic biases, deriving from people's attempts to recall and aggregate past experiences over time. Short-term retrospective reports are often disproportionately influenced by people's affective state at the time of recall (Singer & Salovey, 1988), by the most intense experience that is remembered ('peak effect'), and to a lesser extent by the most recent experience remembered ('end effect') (see Fredrickson, 2000). Also, as a general rule, people tend to over-estimate the intensity of their positive and negative moods in retrospect, in part, because they neglect to incorporate the duration of certain neutral experiences into memory (Barrett, 1997; Thomas & Diener, 1990). These biases should be kept in mind when using short-term retrospective self-reports as proxies for momentary mood.

Despite the biases associated with short-term retrospective reports, there may be times when researchers would want expressly to target these retrospections. Recent research suggests that people make important decisions about their future behaviours based on how they remember their experiences, not necessarily what 'objectively' happened in the moment. For example, retrospective pain, more than momentary pain, has been shown to predict people's decisions about whether to undergo follow-up colonoscopies (Redelmeier, Katz & Kahneman, 2003). The same patterns could hold for other types of decisions regarding mood and health. At the end of a long working week, it may be how people remember their mood – more than an objective average of their moment-to-moment mood – that will predict risky health related behaviours over the weekend (e.g. binge drinking, smoking etc.). Thus, retrospective reports may be the best measure and not simply a more convenient substitute for momentary reports in cases where people retrospect on their mood to make health-related decisions.

When people recollect on their mood over longer time frames (e.g. two weeks or more), they are typically very poor at accurately recalling their states. People forget the details of their original experiences and instead report their beliefs or theories about how they felt during that time (for a review, see Robinson & Clore, 2002). As evidence of this distortion, longer term retrospections of mood are often biased by theories of one's own emotionality (Barrett, 1997; Larsen, 1992), including gender stereotypes (Barrett *et al.*, 1998). For these reasons, longer term retrospections are best considered measures of trait mood and/or recollected experience and should not be used as proxies for actual state experience. While it may be tempting to use long term retrospective reports as a 'short-cut' for measuring state mood over a long time period, such decisions are not justifiable. In that circumstance, researchers would be better served by using a series of daily or weekly reports. Of course, there may be times when it is important and appropriate to measure people's longer term recollections of their mood states (i.e. to the extent that participants use their memories to inform health-related behaviours).

For other investigations, it may be important to tap people's trait beliefs about their mood-related experiences using global self-reports (e.g. How one feels in general). Trait beliefs are typically stable and shaped by a multitude of factors, including one's actual experience. As such, these reports can be strong predictors of

[1] The term 'experience-sampling' is used more in social and clinical psychology, whereas the term 'ecological momentary assessment' is used more in health-related fields, referring to procedures that may also incorporate the ambulatory monitoring of physical states, like blood pressure, in addition to self-report.

enduring health related risk factors. For example, people who describe themselves as generally anxious or high in hostility tend to show a higher risk for coronary heart disease and hypertension, presumably because their global self-reports are tapping something about their enduring affective reactions. But trait beliefs are also shaped by other factors beyond actual experience, including cultural norms (e.g. gender or cultural stereotypes) and personal values. Trait beliefs are also limited by how people filter and label their past experiences. As such, it is important not to use trait ratings as proxies for state mood or to assume that trait ratings will necessarily predict affective experience in a given instance.

A final consideration occurs when adapting an existing measure to alternate time frames. Some measures, like the STAI, the POMS and the PANAS and PANAS-X, already exist in various state and trait forms, which have been validated and found to be reliable. Other measures have only been validated in one form or the other. Most mood measures are robust enough to be adapted to state and trait forms simply by changing the nature of the instructions. Past research has shown that psychometric properties for trait adjective rating scales are typically preserved across time frames (e.g. mood adjectives correlate in the same fashion in both state and trait formats) (Watson & Clark, 1994). This bodes well for adaptive other measures with generally similar formats. Of course, it is crucial to run comparative psychometric analyses for any adapted measure. It is also essential to remember that state and trait forms are not interchangeable and neither is inherently 'better' than the other – they measure different types of mood-related experiences and are suited to different types of research questions.

Psychophysiological measures

William James (1884) proposed one of the most compelling ideas in the science of emotion – that emotional states have specific and unique patterns of somatovisceral changes, and the perception of these bodily events constitutes an emotion. As a result, many researchers have assumed that it is possible to measure anger, sadness, fear and other emotional states more objectively by assessing their psychophysiological correlates. According to this approach, specific emotions are comprised of unique patterns of behavioural and physiological activation and these specific patterns underlie distinct subjective experiences of emotion. Theories which propose emotion-specific physiological patterning often examine cardiovascular (e.g. heart rate, finger pulse amplitude, blood pressure), electrodermal (e.g. digital skin temperature) and facial (e.g. facial electromyography) indices. Despite rigorous research efforts, consistent evidence for emotion-specific patterning of peripheral nervous system responses remains elusive. Certainly, people have well developed beliefs about the patterns of bodily cues that distinguish discrete emotional episodes and these beliefs display great stability across individuals within a culture, as well as across cultures (e.g. see Pennebaker, 1982; Scherer *et al.*, 1986; Wallbott & Scherer, 1986). Despite the intuitive appeal, research has not produced a strong evidentiary basis for distinctive physiological patterns that characterize anger, sadness, fear and so on. Although individual studies sometimes report distinct autonomic correlates for different emotion categories (e.g. Christie & Friedman, 2004; Ekman *et al.*, 1983; Levenson, Ekman & Friesen, 1990), meta-analytic summaries generally fail to find distinct patterns of peripheral nervous system responses for each basic discrete emotion (Cacioppo *et al.*, 2000). Peripheral nervous system responses do appear to configure for conditions of threat and challenge, however (Quigley *et al.*, 2002; Tomaka *et al.*, 1993, Tomaka *et al.*, 1997), and for positive versus negative affect (Cacioppo *et al.*, 2000; Lang *et al.*, 1993) suggesting that patterns of cardiovascular responding can be used to characterize appraisals (threat, challenge) and affect (positive, negative), but not necessarily discrete emotions per se. Facial electromyography and vocal acoustic assessments generally produce the same findings as the cardiovascular measures. Facial electromyography measurements coordinate around positive versus negative affect (Cacioppo *et al.*, 2000) or intensity of affect (Messinger, 2002). A similar case holds for vocal acoustics, which indicate a person's arousal level (e.g. Bachorowski 1999; Bachorowski & Owren 1995; Kappas *et al.*, 1991), but do not indicate discrete emotional states per se (for a review, see Russell *et al.*, 2003). The fact that people can automatically and effortlessly perceive anger, sadness, fear and so on, in others suggests the hypothesis that they are imposing, rather than detecting, categorical distinctions in the facial configurations or vocal signals that they rate (Barrett, 2005).

Recommendations for measurement

Based on the evidence summarised here, it is possible to offer several recommendations when measuring affect and emotion in health-related research. First, although many scientists continue to assume that each category of discrete or 'basic' emotion, referred to by such English words as 'anger', 'sadness' and 'fear', is an inherited, reflex-like module that causes a distinct and recognizable behavioural and physiological pattern, the empirical evidence does not strongly support this view. Self-reports of experience, cardiovascular measures, facial and vocal measurements, reliably and validly seem to index something about a person's affective state, so it may make the most sense to address the role of affective functioning (e.g. affective reactivity, propensity to be threatened or challenged) in questions about health and human functioning. Second, in the face of evidence that people vary in the granularity of their emotion reports, and in general tend to use discrete emotion scales to report positive and negative affect, it is important to assess the discriminant validity in reports of anger, sadness, fear and so on. Scientific studies that include only one measure of emotion (e.g. hostility) in the absence of others (e.g. anxiety) may mistakenly assume that there is a specific emotional effect driving health effects when in fact it is something about affect more broadly defined. Finally, momentary (state) and summary (trait) reports of emotion are not synonymous, and whether a researcher uses one over the other should not be a matter of convenience, but rather should depend on whether episodic or semantic representations of experience are of interest.

Acknowledgements

Preparation of this chapter was supported by NSF grants SBR-9727896, BCS 0074688, BCS 0092224, and NIMH grant K02 MH001981 awarded to Lisa Feldman Barrett.

REFERENCES

Anderson, N.B. (2003). *Emotional longevity.* New York: Viking.

Appel, M.A., Holroyd, K.A. & Gorkin, L. (1983). Anger and the etiology and progression of physical illness. In L. Temoshok, L. van Dyke & L.S. Zegans (Eds.). *Emotions in health and illness: theoretical and research foundations.* Orlando, FL: Grune und Stratton.

Aspinwall, L.G. & Taylor, S.E. (1997). A stitch in time: self-regulation and proactive coping. *Psychological Bulletin,* **121**, 417–36.

Bachorowski, J.-A. & Owren, M.J. (1995). Vocal expression of emotion: acoustic properties of speech are associated with emotional intensity and context. *Psychological Science,* **6**, 219–24.

Bachorowski, J.-A. (1999). Vocal expression and perception of emotion. *Current Directions in Psychological Science,* **8**, 53–7.

Barrett, L.F. (1997). The relationships among momentary emotion experiences, personality descriptions, and retrospective ratings of emotion. *Personality and Social Psychology Bulletin,* **23**, 1100–10.

Barrett, L.F. (1998). Discrete emotions or dimensions? The role of valence focus and arousal focus. *Cognition and Emotion,* **12**, 579–99.

Barrett, L.F. (2004). Feelings or words? Understanding the content in self-report ratings of emotional experience. *Journal of Personality and Social Psychology,* **87**, 266–81.

Barrett, L.F. (2005). Feeling is perceiving: core effect and conceptualization in the experience of emotion. In L.F. Barrett, P. Niedenthal & P. Winkielman (Eds.). *Emotions: conscious and unconscious.* (pp. 255–84). New York: Guilford.

Barrett, L.F. & Barrett, D.J. (2001). Computerized experience-sampling: how technology facilitates the study of conscious experience. *Social Science Computer Review,* **19**, 175–85. (Invited contribution).

Barrett, L.F. & Niedenthal, P.M. (2004). Valence focus and the perception of facial affect. *Emotion,* **4**, 266–74.

Barrett, L.F., Pietromonaco, P.R. & Eyssell, K.M. (1998). Are women the "more emotional sex?" Evidence from emotional experiences in social context. *Cognition and Emotion,* **12**, 555–78.

Barrett, L.F. & Russell, J.A. (1998). Independence and bipolarity in the structure of current affect. *Journal of Personality and Social Psychology,* **74**, 967–84.

Barrett, L.F., Gross, J., Conner, T. & Benvenuto, M. (2001). Emotion differentiation and regulation. *Cognition and Emotion,* **15**, 713–24.

Barrett, L.F., Quigley, K., Bliss-Moreau, E. & Aronson, K.R. (2004). Arousal focus and interoceptive sensitivity. *Journal of Personality and Social Psychology,* **87**, 684–97.

Beck, A.T. (1996). *Beck depression inventory.* New York: Harcourt.

Beck, A.T., Steer, R.A. & Brown, G.K. (1996). *Beck depression inventory – Second edition manual.* USA: Harcourt Assessment/The Psychological Corporation.

Beck, A.T., Steer, R.A. & Brown, G.K. (2000). *Beck depression inventory – fast screen for medical patients.* USA: Harcourt Assessment/The Psychological Corporation.

Beck, A.T., Ward, C.H., Mendelson, M., Mock, J. & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry* **4**, 561–71.

Bolger, N., Davis, A. & Rafaeli, E. (2003). Diary methods: capturing life as it is lived. *Annual Review of Psychology,* **54**, 579–616.

Boyle, G.J. (1986). Higher-order factors in the differential emotions scale (DES-III). *Personality and Individual Differences,* **7**, 305–10.

Cacioppo, J.T., Bernston, G.G., Larsen, J.T., Poehlmann, K.M. & Ito, T.A. (2000). The psychophysiology of emotion. In R. Lewis & J.M. Haviland-Jones (Eds.). *The Handbook of Emotion* (2nd edn.). (pp. 173–191). New York: Guilford

Carroll, J.M., Yik, M.S.M., Russell, J.A. & Barrett, L.F. (1999). On the psychometric principles of affect. *Review of General Psychology,* **3**, 14–22.

Carstensen, L.L., Pasupathi, M., Mayr, U. & Nesselroade, J.R. (2000). Emotional experience in everyday life across the adult life span. *Journal of Personality and Social Psychology,* **79**(4), 644–55.

Carver, C.S. & Scheier, M.F. (1998). *On the self-regulation of behavior.* New York: Cambridge University Press.

Chaput, L.A., Adams, S.H., Simon, J.A. *et al.* (2002). Hostility predicts recurrent events among postmenopausal women with coronary heart disease. *American Journal of Epidemiology,* **156**, 1092–99.

Christie, I.C. & Friedman, B.H. (2004). Autonomic specificity of discrete emotion and dimensions of affective space: A multivariate approach. *International Journal of Psychophysiology,* **51**, 143–53.

Cohen, S., Doyle, W.J., Turner, R., Alper, C.M. & Skoner, D.P. (2003). Sociability and susceptibility to the common cold. *Psychological Science,* **14**(5), 389–95.

Conner, T., Feldman Barrett, L., Bliss-Moreau, E., Lebo, K. & Kaschub, C. (2003). A practical guide to experience-sampling procedures. *Journal of Happiness Studies,* **4**, 53–78.

Croyle, R.T. & Rowland, J.H. (2003). Mood disorders and cancer: a national cancer institute perspective. *Biological Psychiatry,* **54**, 191–4.

Davis, M.C., Matthews, K.A. & McGrath, C. (2000). Hostile attitudes predict elevated vascular resistance to interpersonal stress in both men and women. *Psychosomatic Medicine,* **62**, 17–25.

Derogatis, L.R. (1996). *Derogatis affects balance scale (DABS): Preliminary scoring, procedures & administration manual.* Baltimore, MD, Clinical Psychometric Research.

Derogatis, L.R., Lipman, R.S. & Covi, L. (1973). SCL-90, an outpatient psychiatric rating scale – preliminary report. *Psychopharmacology Bulletin,* **9**, 13–28.

Diamond, E.L. (1982). The role of anger and hostility in essential hypertension and coronary heart disease. *Psychological Bulletin,* **92**, 410–33.

Ekman, P., Levenson, R.W. & Friesen, W.V. (1983). Autonomic nervous system activity distinguishes among emotions, *Science,* **221**, 1208–10.

Eng, P.M., Fitzmaurice, G., Kubzansky, L.D., Rimm, E.B. & Kawachi, I. (2003). Anger expression and risk for stroke and coronary heart disease among male health professionals. *Psychosomatic Medicine,* **65**, 100–10.

Engebretson, T.O., Matthews, K.A. & Scheier, M.F. (1989). Relations between anger expression and cardiovascular reactivity: Reconciling inconsistent findings through a matching hypothesis. *Journal of Personality and Social Psychology,* **57**, 513–21.

Faber, S.D. & Burns, J.W. (1996). Anger management style, degree of expressed anger, and gender influence cardiovascular recovery from interpersonal harassment. *Journal of Behavioral Medicine,* **19**, 31–59.

Feldman, L.A. (1993). Distinguishing depression from anxiety in self-report: evidence from confirmatory factor analysis on nonclinical and clinical samples. *Journal of Consulting and Clinical Psychology,* **61**, 631–8.

Feldman, L.A. (1995*a*). Variations in the circumplex structure of emotion. *Personality and Social Psychology Bulletin,* **21**, 806–17.

Feldman, L.A. (1995*b*). Valence focus and arousal focus: individual differences in the structure of affective experience. *Journal of Personality and Social Psychology,* **69**, 153–66.

Fredrickson, B. L. (1998). What good are positive emotions? *Review of general psychology: special issue: new directions in research on emotion*, **2**, 300–19.

Fredrickson, B. L. (2000). Extracting meaning from past affective experiences: the importance of peaks, ends, and specific emotions. *Cognition and Emotion*, **14**(4), 577–606.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: the broaden-and-build theory of positive emotions. *American Psychologist: Special Issue*, **56**, 218–26.

Fredrickson, B. L. & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition and Emotion*, **12**, 191–220.

Fredrickson, B. L., Mancuso, R. A., Branigan, C. & Tugade, M. M. (2000). The undoing effect of positive emotions. *Motivation and Emotion*, **24**, 237–58.

Gallo, L. C. & Matthews, K. A. (2003). Understanding the association between socioeconomic status and health: do negative emotions play a role? *Psychological Bulletin*, **129**, 10–51.

Gerin, W. & Pickering, T. G. (1995). Association between delayed recovery of blood pressure after acute mental stress and parental history of hypertension. *Journal of Hypertension*, **13**, 603–10.

Glose-Davis, J., Sephton, S. E., Abercrombie, H., Duran, R. E. F. & Spiegel, D. (2004). Repression and high anxiety are associated with aberrant diurnal cortisol rhythms in women with metastatic breast cancer. *Health Psychology*, **23**, 645–50.

Gross, J. J. & Levenson, R. W. (1993). Emotional suppression: physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, **64**, 970–86.

Guadagnoli, E. & Mor, V. (1989). Measuring cancer patients' affect: revision and psychometric properties of the profile of mood states (POMS). *Psychological Assessment*, **1**, 150–54.

Hathaway, S. R. & McKinley, J. C. (1989). *Minnesota multiphasic personality inventory-2 (MMPI-2): manual for administration and scoring*. Minneapolis: University of Minnesota Press.

Haynes, S. G., Levine, S., Scotch, N., Feinleb, M. & Kannel, W. B. (1978). The relationship of psychological factors to coronary heart disease in the Framingham study: methods and risk factors. *American Journal of Epidemiology*, **107**, 362–83.

Hedges, S., Jandorf, L. & Stone, A. (1985). Meaning of daily mood assessments. *Journal of Personality and Social Psychology*, **48**, 428–34.

James, W. (1884/1969). *What is an emotion?* In *William James: Collected essays and reviews* (pp. 244–80). New York: Russell and Russell.

Jamieson, J. L. & Lavoie, N. P. (1987). Type A behavior, aerobic power and cardiovascular recovery from a psychosocial stressor. *Health Psychology*, **6**, 361–71.

Jenson, M. R. (1987). Psychobiological factors predicting the course of breast cancer. *Journal of Personality*, **55**, 317–42.

Kappas, A., Hess, U. & Scherer, K. R. (1991). Voice and emotion. In B. Rime & R. Feldman (Eds.). *Fundamentals of nonverbal behavior* (pp. 200–38). Cambridge: Cambridge University Press.

Kawachi, I., Sparrow, D., Spiro, A., Vokonas, P. & Weiss, S. T. (1996). A prospective study of anger and coronary heart disease: the normative aging study. *Circulation*, **94**(9), 2090–5.

Kubzansky, L. D. & Arthur, C. M. (2004). Anxiety, heart disease, and mortality. In N. Anderson (Ed.). *Emotional longevity* (pp. 55–59). New York: Viking.

Kubzansky, L. D. & Kawachi, I. (2000). Going to the heart of the matter: Do negative emotions cause coronary heart disease? *Journal of Psychosomatic Research*, **48**, 323–37.

Kubzansky, L. D., Berkman, L. F., Glass, T. A. & Seeman, T. E. (1998). Is educational attainment associated with shared determinants of health in the elderly? Findings from the MacArthur studies of Successful aging. *Psychosomatic Medicine*, **60**, 578–85.

Kubzansky, L. D. & Kawachi, I. (2002). Affective states and health. In L. F. Berkman & I. Kawachi (Eds.). *Social epidemiology* (pp. 213–41). New York: Oxford University Press.

Lai, J.Y. & Linden, W. (1992). Gender, anger expression style, and opportunity for anger release determine cardiovascular reaction to and recovery from anger provocation, *Psychosomatic Medicine*, **54**, 297–310.

Lane, R. D. & Schwartz, G. E. (1987). Levels of emotional awareness: A cognitive–developmental theory and its application to psychopathology. *American Journal of Psychiatry*, **144**(2), 133–43.

Lane, R. D., Quinlan, D. M., Schwartz, G. E., Walker, P. A. & Zeitlin, S. B. (1990). The Levels of emotional awareness scale: a cognitive-developmental measure of emotion. *Journal of Personality Assessment*, **55**(1–2), 124–34.

Lang, P. J., Greenwald, M. K., Bradley, M. M. & Hamm, A. O. (1993). Looking at pictures: affective, facial, visceral and behavioural reactions. *Psychophysiology*, **30**, 261–73.

Larsen, R. J. (1992). Neuroticism and selective encoding and recall of symptoms: evidence from a combined concurrent–retrospective study. *Journal of Personality and Social Psychology*, **62**(3), 480–8.

Larsen, R. J. & Cutler, S. E. (1996). The complexity of individual emotional lives: a within-subject analysis of affect structure. *Journal of Social and Clinical Psychology*, **15**(2), 206–30.

Larsen, R. & Diener, E. (1992). Promises and problems with the circumplex model of emotion. In M. S. Clarke (Ed.). *Emotion* (pp. 25–59). Newbury Park, CA: Sage.

Levenson, R. W., Ekman, P. & Friesen, W. V. (1990). Voluntary facial action generates emotion-specific autonomic nervous system activity. *Psychophysiology*, **27**, 363–84.

MacDougall, J. M., Dembroski, T. M., Dimsdale, J. E. & Hackett, T. P. (1985). Components of Type-A, hostility and anger-in: further relationships to angiographic findings. *Health Psychology*, **4**, 137–52.

Markovitz, J. H., Matthews, K. A., Wing, R. R., Kuller, L. H. & Meilahn, E. N. (1991). Psychological, biological, and health behavior predictors of blood pressure change in middle-aged women. *Journal of Hypertension*, **9**, 399–406.

Marteau, T. M. & Bekker, H. (1992). The development of a six-item short-form of the state scale of the spielberger state–trait anxiety inventory (STAI). *British Journal of Clinical Psychology*, **31**(3), 301–6.

Mayer, J. D. & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology*, **55**(1), 102–11.

McKenna, M. C., Zevon, M. A., Corn, B. & Rounds, J. (1999). Psychosocial factors and the development of cancer: A meta-analysis, *Health Psychology*, **18**, 520–1.

McNair, D., Lorr, M. & Droppleman, L. F. (1971/1981). *EITS manual for the profile of mood states*. San Diego, CA: educational and industrial testing service.

Messinger, D. S. (2002). Positive and negative: infant facial expressions and emotions. *Current Directions in Psychological Science*, **11**, 1–6.

Nowlis, V. (1965). Research with the mood adjective checklist. In S. S. Tomkins & C. E. Izard (Eds.). *Affect, cognition, and personality*, (pp. 352–89). New York: Springer.

Parkinson, B., Briner, R. B., Reynolds, S. & Totterdell, P. (1995). Time frames for mood: relations between momentary and

generalized ratings of affect. *Personality and Social Psychology Bulletin*, **21**(4), 331–9.

Paterniti, M., Zureik, M., Ducimetiere, P., Feve, J.M. & Alperovitch, A. (2001). Sustained anxiety and 4-year progression of carotid atherosclerosis. *Atherosclerosis, Thrombosis and Vascular Biology*, **21**, 136–41.

Pennebaker, J.W. (1982). *The psychology of physical symptoms.* New York: Springer-Verlag.

Pennix, B.W.J.H., Guralnik, J.M., Pahor, M. et al. (1998). Chronically depressed mood and cancer risk in older persons. *Journal of the National Cancer Institute*, **90**, 1888–93.

Quigley, K.S., Barrett, L.F. & Weinstein, S. (2002). Cardiovascular patterns associated with threat and challenge appraisals: a within-subjects analysis. *Psychophysiology*, **39**, 292–302.

Radloff, L.S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385–401.

Redelmeier, D.A., Katz, J. & Kahneman, D. (2003). Memories of colonoscopy: a randomized trial. *Pain*, **104**(1–2), 187–94.

Reis, H.T. & Gable, S.L. (2000). Event sampling and other methods for studying daily experience. In H.T. Reis & C.M. Judd (Eds.). *Handbook of research methods in social and personality psychology* (pp. 190–222). New York: Cambridge University Press.

Richter, P., Werner, J., Heerlien, A., Kraus, A. & Sauer, H. (1998). On the validity of the beck depression inventory: a review. *Psychopathology* **31**(3), 160–8.

Robinson, M.D. & Clore, G.L. (2002). Belief and feeling: evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, **128**(6), 934–60.

Rozanski, A., Blumenthal, J.A. & Kaplan, J. (1999). Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation*, **99**, 2192–217.

Russell, J.A. & Barrett, L.F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, **76**, 805–19.

Russell, J.A. & Carroll, J.M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, **125**(1), 3–30.

Russell, J.A., Bachorowski, J. & Fernandez-Dols, J. (2003). Facial and vocal expressions of emotions. *Annual Review of Psychology*, **54**, 329–49.

Russell, J.A., Weiss, A. & Mendelsohn, G.A. (1989) Affect Grid: a single-item scale of pleasure and arousal. *Journal of Personality and Social Psychology*, **57**(3), 493–502.

Scherer, K.R., Wallbott, H.G. & Summerfield, A.B. (1986). *Experiencing emotion. A cross-cultural study.* Cambridge, UK: Cambridge University Press.

Schneiderman, N. (1987). Psychophysiologic factors in atherogenesis and coronary artery disease. *Circulation*, **76**, 141–7.

Seyfarth, R.M. & Cheney, D.L. (2003). Signalers and receivers in animal communication. *Annual Review of Psychology*, **54**, 145–73.

Shacham, S. (1983). A shortened version of the Profile of Mood States. *Journal of Personality Assessment*, **47**(3), 305–6.

Singer, J.A. & Salovey, P. (1988). Mood and memory: evaluating the network theory of affect, *Clinical Psychology Review*, **8**(2), 211–51.

Spielberger, C. (1988). *State–Trait Anger Expression Inventory, (Res. edn.). Professional Manual.* Odessa, FL: Psychological Assessment Resources.

Spielberger, C.D. (1983). *Manual for the State-trait anxiety inventory.* Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C.D., Gorsuch, R.L. & Lushene, R.D. (1970). *Manual for the State–Trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists Press.

Steptoe, A., Cropley, M. & Joekes, K. (2000). Task demands and the pressures of everyday life: associations between cardiovascular reactivity and work blood pressure and heart rate. *Health Psychology*, **19**(1), 46–54.

Stone, A.A. & Shiffman, S. (1994). Ecological momentary assessment (EMA) in behavioral medicine. *Annals of Behavioral Medicine*, **16**, 199–202.

Stone, A.A., Shiffman, S.S. & DeVries, M.W. (1999). Ecological momentary assessment. In D. Kahneman & E. Diener (Eds.). Well-being: the foundations of hedonic psychology (pp. 26–39). New York: Russell Sage Foundation.

Taylor, S.E. & Brown, J.D. (1988). Illusion and well-being: a social psychological perspective on mental health. *Psychological Bulletin*, **103**, 193–210.

Taylor, S.E., Kemeny, M.E., Reed, G.M., Bower, J.E. & Gruenewald, T.L. (2000). Psychological resources, positive illusions, and health. *American Psychologist*, **55**, 99–109.

Thomas, D.L. & Diener, E. (1990). Memory accuracy in the recall of emotions. *Journal of Personality and Social Psychology*, **59**(2), 291–7.

Tomaka J., Blascovich, J., Kelsey, J. & Leitten, C. (1993). Subjective, physiological, and behavioural effects of threat and challenge appraisal. *Journal of Personality and Social Psychology*, **65**, 248–60.

Tomaka, J., Blascovich, J., Kibler, J. & Ernst, J.M. (1997). Cognitive and physiological antecedents of threat and challenge appraisal. *Journal of Personality and Social Psychology*, **73**, 63–72.

Tugade, M.M. & Fredrickson, B.L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology*, **86**, 320–33.

Wallbott, H.G. & Scherer, K.R. (1986). Stress specificities: differential effects of coping style, gender, and type of stressor on autonomic arousal, facial expression, and subjective feeling. *Journal of Personality and Social Psychology*, **61**, 147–56.

Watson, D. & Clark, L.A. (1984). Negative affectivity: the disposition to experience aversive emotional states. *Psychological Bulletin*, **96**(3), 465–90.

Watson, D. & Clark, L.A. (1994). *The PANAS-X:* Manual for the positive and negative affect schedule – Expanded form. Cedar Rapids: University of Iowa.

Watson, D. & Clark, L.A. (1997). Measurement and mismeasurement of mood: recurrent and emergent issues. *Journal of Personality Assessment*, **68**(2), 267–96.

Watson, D. (1988). The vicissitudes of mood measurement: effects of varying descriptors, time frames, and response formats on measures of positive and negative affect. *Journal of Personality and Social Psychology*, **55**(1), 128–41.

Watson, D., Wiese, D., Vaidya, J. & Tellegen, A. (1999). The two general activation systems of affect: structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, **76**(5), 820–38.

Watson, D., Clark, L. & Tellegen, A. (1988). Development and validation of a brief measure of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, **54**, 1063–70.

Watson, D. & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, **98**, 219–35.

Yik, M.S.M., Russell, J.A. & Barrett, L.F. (1999). Integrating four structures of current mood into a circumplex: integration and beyond. *Journal of Personality and Social Psychology*, **77**, 600–19.

Zuckerman, B. & Lubin, B. (1985). *Manual of multiple affect adjective check list revised.* San Diego: edITS.