

Advances in Personality Psychology

Volume Two

Edited by
Andrzej Elias,
Sarah E. Hampson
and Boele de Raad

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Advances in Personality Psychology:

Volume Two

The second volume in the Advances in Personality Psychology series, this book presents an authoritative collection of works by leading experts in the field. It focuses on three of the major issues in personality psychology: personality, affect and arousal, personality and intelligence, and personality structure.

The first part of the book seeks to analyse cognitive biases dependent on anxiety and the biological foundations of thought and action. It also looks at the influence of temperamental traits on reaction to traumatic events. In the second part, contributions consider the mutual relations between personality and intelligence, the similarities and differences between personality and intelligence, and the cognitive mechanisms of human intelligence and personality. The final part analyses personality structure across cultures and presents a model of personality relevant to situational descriptions.

All the authors are experienced and renowned experts in the field of personality psychology. The volume incorporates critical reviews, bringing the reader up to date with key issues, and unique data from contemporary empirical research projects, reflecting the diversity and vigour of current work on personality psychology.

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Series preface

The aim of *Advances in Personality Psychology* is to be a scholarly source for new theoretical developments, emerging research paradigms, and promising applications of personality psychology. This aim is accomplished by bringing together original reviews and critical evaluations of important new developments in personality psychology. It provides a forum for a variety of contributions: integrative reviews of current developments, overviews of research programmes and international collaborative projects, methodological advances, collaborative papers emerging from conference symposia, and updates on new developments in the application of personality psychology to fields such as psycho-diagnostics, clinical, industrial/organizational and educational psychology. This series is intended to be a valuable resource for researchers, teachers, and students of personality psychology.

Advances in Personality Psychology is an occasional series. The first volume was published in 2000, and subsequent volumes depend on the availability of manuscripts reaching the required standard. The series editors appoint volume editors in consultation with the executive committee of the European Association of Personality Psychology and the publisher. Publication in this series is principally by invitation. All submissions are peer reviewed.

Sarah E.Hampson, Guildford, UK and
Peter Borkenau, Halle, Germany
Series editors

Preface to volume 2

The second volume of the *Advances in Personality Psychology* series contains mostly chapters that constitute developed versions of selected lectures and papers presented during the Tenth European Conference on Personality Psychology that took place in Krakow in 2000. Editors of this second volume have chosen those presentations representing three major issues in personality psychology discussed during the conference: (a) personality, affect, and arousal; (b) personality and intelligence; (c) personality structure.

The volume begins with findings on the impact of cognitive biases on experiencing anxiety as well as on energetic aspects of information processing and influence of temperament on reactions triggered by traumatic events. In Chapter 1 Michael W. Eysenck deals with one of the Big Five dimensions-anxiety/neuroticism. However, Eysenck, contrary to the dominant descriptive approach, presents the underlying role of cognitive biases in experienced anxiety. He identifies two classes of cognitive biases: the first typical of persons with high anxiety, and the other with the opposite biases specific for so-called repressors who are defensive. The repressors tend to score low on trait anxiety, however their defensiveness makes them different from truly low anxiety persons. These two sorts of cognitive biases account for significant differentiation among three types of anxiety measures: self-reports, behaviour, and physiological functioning. Highly anxious individuals tend to report higher anxiety than is measured behaviourally and physiologically. In contrast, repressors' anxiety levels estimated from self-reports are lower than those assessed by behaviour observation or physiological functioning. These high discrepancies among anxiety estimates in the repressors make the study of this group of particular theoretical importance. The author explores the cognitive and emotional mechanisms of anxiety within the framework of his four-factor theory. According to this theory, four sources of information have an impact on the experience of anxiety, namely: (a) the environment; (b) physiological states of the body; (c) one's own behaviour, and (d) negative thoughts concerning threatening future events.

Chapter 2, written by Jan Strelau and Bogdan Zawadzki, refers to the relations between two features of temperament with mental health, post-traumatic stress disorder (PTSD) and somatic diseases. All three presented studies were conducted within the Regulative Theory of Temperament (RTT) developed by Strelau. The theory offers a functional approach to temperamental characteristics, and these functions provide the basis for formulating hypothesis concerning emotional reactivity and activity. Research is referred to which examines the role of temperament as a moderator of relations between stressors and mental health, temperament as a predictor of PTSD in response to flood trauma, and temperament as a risk factor of somatic diseases (lung cancer and coronary infarct).

Emotional reactivity is viewed as a temperamental risk factor (TRF) for emotional and somatic disturbances. With high levels of emotional reactivity, a tendency to be depressed when facing stressful life situations is observed, which may lead to somatic

diseases. The role of activity as a temperament dimension is more complex in reaction to difficult life situations, i.e. on the one hand, it helps to cope effectively with life stress, while on the other it may cause overstimulation and eventually lead to emotional and somatic disturbances.

In Chapter 3, Joop Hettema presents a biological model useful for conducting research on energetic aspects of information processing. This chapter introduces specific terminology derived from the proposed model, which identifies biological systems as the basis for social information processing. The model incorporates three different energetic systems (after Pribram and McGuiness): arousal (regulating input processes), activation (preparation of actions through maintaining tonic readiness to continue ongoing behaviour), and effort (co-ordination of the arousal and activation systems, which mostly consists in uncoupling output processes from input processes). Within each system, information processing operates on different dimensions starting from controlled/volitional processes to the automatic/emotional ones. Hettema's research indicates that persons occupy different positions within the dimensions and these particular positions are highly cross-situationally consistent. Moreover, Hettema points out a strong relation between arousal, activation and effort dimensions with data processing on the level of goals and beliefs, which correspond to primary and secondary control, respectively. Primary control lasts as long as the individual dealing with external environment requirements is able to preserve a sense of well-being. When current events disturb one's behaviour and the individual is no longer able to keep a sense of well-being, this implies a loss of control over the environment. As a result, secondary control is activated. This involves cognitive processing by the individual, particularly activation of beliefs and expectations. They serve as a basis for choosing environments, ways of behaving, and interpretation of ongoing events. Complex relations between emotional and volitional information processing form person-specific patterns.

They give rise to individual differences in goals and beliefs about the world. The main conclusion drawn from the research presented is that individual differences in data processing are better viewed as types than as traits. They are not definable in terms of particular, isolated dimensions because they are subject to more complex relations. These differences are person-specific coherent patterns of goals and beliefs determining individual ways of behaving in a social environment. The author stresses that no cross-situational consistency was ascertained, but it was confirmed—in congruence with Cervone and Shoda—that there was coherence in the field of information processing.

In Chapter 4, Błażej Szymura and Edward Nęcka present data concerning the association of attention processes with extraversion, neurotism and psychotism. Studies conducted by the two authors concern the functioning of individuals who show different levels of these personality traits in specific situations requiring strong selective attention, divided attention, or prolonged concentration. They have found that a high level of neuroticism corresponds to decreased accuracy in fulfilling tasks that require selective attention. Differences between extraverts and introverts are found only when participants are asked to do particularly complicated tasks that require divided attention. In these circumstances, extraverts cope with the tasks very well while introverts tend to get easily overstimulated.

Nęcka and Szymura had previously studied the so-called Stroop Effect and obtained similar findings demonstrating that the Stroop Effect also reflects the process of selective

attention. Studies conducted by the authors revealed that psychotic persons could not concentrate on significant information when they needed to divide attention among several actions. The authors interpret the findings in terms of the hypothetical biological mechanisms of the personality traits included in the study. However, they find it difficult to interpret the attention processes typical of the psychotic persons within the biological mechanisms identified for of psychotism. In conclusion, the authors provide the reader with practical tips on how to cope with attention processes deficits characteristic for individuals representing various personality traits.

In Chapter 5, Phillip L.Ackerman questions the validity of individual differences in different domains in isolation and proposes instead research on so-called 'trait complexes', which are combinations that include personality, interests and ability traits. Historically, these domains have been studied separately. However, when Ackerman and colleagues conducted a meta-analysis of personality-intelligence relations and related these results to data on the relations between personality traits and interests, they found evidence for at least four trait complexes (i.e. groups of traits from these three domains with common variance): 'Social,' 'Clerical/Conventional,' 'Science/Math' and 'Intellectual/Cultural.'

Ackerman presents construct and criterion-related validity data for trait complexes in the form of associations between trait complexes and related domains of knowledge such as the physical sciences, humanities, and business. For example, the 'Science/Math' trait complex was associated in particular with domain knowledge in the area of physical science, whereas the 'Intellectual/Cultural' trait complex was most strongly associated with domain knowledge in the humanities. Ackerman argues that domain knowledge, unlike intelligence, is a result of a long-term intellectual involvement in a particular field of activity, and reflects the impact of personality and interests. Consequently, trait complexes should prove useful for vocational counselling and occupational selection.

Chapter 6, written by Nathan Brody, discusses the similarities and differences between personality traits and intelligence. The author draws attention to the differences between the methodology of personality trait research and the methodology of general intelligence research, as well as noting the similarities and differences in the genetic roots of personality traits and intelligence. A major difference between the study of personality traits and intelligence is that intelligence is measured behaviourally whereas personality traits are not. Intelligence is measured by level of performance, which is a behavioural measure. In contrast, personality is typically measured by self-reports or reports by others. Brody argues that it would be difficult to measure personality behaviourally. For example, in contrast to performance measures of intelligence, a measure of personality based on a particular behaviour observed in a particular situation may not generalize to other situations. Brody concludes that whereas we can measure intelligence with performance tests that generate what may be regarded as the true score on the underlying latent construct, we can only infer personality and, compared to indicators of intelligence, these inferences are less reliable indicators of the true scores on latent personality traits. He discusses how these differences in measurement affect what we know about intelligence versus personality over the lifespan.

Brody reviews a number of studies from behaviour genetics regarding the heritability of intelligence and personality. He concludes that the evidence from behavioural genetics indicates that there are more similarities than differences between personality and

intelligence. Brody questions the common belief that the heritability of intelligence is greater than the heritability of personality characteristics. Using extraversion, neuroticism, and depression as examples, he shows that the research concerning the genetic background of traits based on complex indices of traits (i.e. based on multi-occasion multimethod measurement) demonstrates heritability rates similar to those observed for intelligence (approximately 0.7). If the usual personality self-ratings or single trait ratings are employed the heritability ratios range from 0.4 to 0.5.

In Chapter 7, Timothy Church and Marcia S.Katigbak present their studies on personality structure in the Philippines. They employed imported measures of the five-factor model as well as indigenous lexical and inventory approaches. The findings indicate that the Big Five personality model is an adequate personality model of the language of personality description in the Philippines. The data are in accordance with other studies, which reflect a certain level of universality of the Big Five model. However, the indigenous approaches to personality structure indicate that it is possible to identify additional personality dimensions, which are different from the Big Five and therefore demonstrate some culturally specific dimensions.

In the last chapter of the volume, Boele De Raad presents analyses of relations between personality traits and situations. The author proposes that personality traits refer to behaviour in situations. In this way, the definition of a particular trait implies a direct reference to the situation. Starting from this principle, De Raad undertook the task of elaborating a taxonomy of situations for the personality traits covered by the Big Five model. He applied three distinct methods for pairing trait descriptors with their relevant situations. All of them yielded similar solutions enabling the selection of four to six categories of situations. These results make finding a taxonomy of Big Five relevant situations likely. The author underlines the importance of further studies in different samples as a desirable continuation of the research. De Raad also shows that the behavioural expression of dimensions of the Big Five with temperamental characteristics, i.e. Extraversion and Emotional Stability, may be more dependent on specific sets of situations, which distinguishes them from the other Big Five dimensions. De Raad concludes that research on situations may help us to develop better tools for personality assessment that incorporate situational information.

The papers collected in the volume have undergone a reviewing process. We want to thank the reviewers who significantly contributed in the preparation of the volume by providing us with their thoughtful comments on earlier drafts of the chapters. Let us mention them here: Michael Ashton, Elizabeth Austin, Dick Barelds, Guus L.van Heck, John A.Johnson, Tatiana Klonowicz, Rainer Riemann, Frank M.Spinath, Magdalena Marszał-Wiśniewska.

Andrzej Eliaszyk, Sarah E.Hampson, Boele De Raad

Chapter 1

Cognitive approaches to trait anxiety

Michael W. Eysenck

There is increasing evidence that individual differences in the personality dimension of trait anxiety can be understood in part within a cognitive framework. More specifically, individuals high in trait anxiety possess various cognitive biases (e.g. attentional bias; interpretive bias) which lead them to exaggerate the threateningness of external and internal stimuli. These cognitive biases have recently been shown to have causal effects on individuals' level of experienced anxiety. The original cognitive approach to trait anxiety was limited, because no distinction was drawn between two types of individuals scoring low on trait anxiety: (a) the truly low-anxious, who are non-defensive; (b) repressors, who are defensive. There is accumulating evidence that repressors possess opposite attentional and interpretive biases leading them to minimize the threateningness of external and internal stimuli. In contrast, the truly low-anxious do not possess cognitive biases or opposite cognitive biases. The repressor group is of particular theoretical significance, because repressors show large discrepancies across the three major domains in which anxiety is assessed: self-report; behavioural; and physiological. These discrepancies depend on repressors' opposite cognitive biases. It will be important in future research to integrate the cognitive approach to trait anxiety with a biological approach emphasizing the role of genetic factors in producing individual differences in trait anxiety.

INTRODUCTION

For many years, there was a considerable amount of controversy concerning the issue of the number and nature of major personality factors. However, in more recent years, there has been a growing consensus that there are five main personality factors, often referred to as the 'Big Five'. The research of Goldberg (e.g. 1981) was influential in establishing five major factors, but the most influential theorists to emphasize the Big Five have probably been McCrae and Costa (e.g. 1985). According to their approach, the five

factors are neuroticism, extraversion, agreeableness, conscientiousness and openness to experience.

This chapter is concerned with one of the Big Five personality factors, which has been variously described as neuroticism or trait anxiety. Neuroticism and trait anxiety overlap substantially with each other, as a result of which measures of the two dimensions typically correlate about +0.7 with each other (Eysenck and Eysenck, 1985). The key difference between them is that trait anxiety correlates negatively with extraversion, whereas neuroticism typically does not (Eysenck and Eysenck, 1985). More generally, there is convincing evidence that most measures of trait anxiety and neuroticism (as well as measures of depression) correlate highly with a personality dimension sometimes labelled negative affectivity (Watson and Clark, 1984).

The approach adopted by most advocates of the Big Five factor approach to personality has focused on description rather than explanation. In general, there has been more progress in terms of identifying the structure of human personality than there has in terms of understanding the underlying mechanisms associated with individual differences along each of the dimensions identified. However, some progress has been made in recent years, with various researchers conducting twin studies in order to assess the role of heredity. For example, Loehlin *et al.* (1998) found that individual differences in all five personality factors were determined to a moderate extent by genetic factors.

Historically, the main attempts to explain individual differences in trait anxiety or neuroticism were provided by H.J.Eysenck (1967) and by Gray (1982), both of whom emphasized the role of genetic influences in determining individual differences in personality. For example, according to Eysenck (1982, p. 28), 'genetic factors contribute something like two-thirds of the variance in major personality dimensions'. Genetic factors exert their influence by affecting the responsiveness of various parts of the physiological system. More specifically, H.J.Eysenck (1967) argued that those high in neuroticism have greater activity than those low in neuroticism in the visceral brain, which consists of several parts of the brain (hippocampus, amygdala, cingulum, septum and hypothalamus). In similar fashion, Gray (1982) argued that anxiety depends on the workings of a septo-hippocampal system.

The biological approach adopted by H.J.Eysenck (1967) and by Gray (1982) has received inconsistent support from psychological research. So far as the hypothesis that two-thirds of individual differences in neuroticism or trait anxiety are attributable to heredity is concerned, one of the most thorough studies (with many twins brought up apart) was the one reported by Pedersen *et al.* (1988). They assessed neuroticism in 95 monozygotic twin pairs brought up apart, 150 monozygotic twin pairs brought up together, 220 pairs of dizygotic twins brought up apart, and 204 pairs of dizygotic twins brought up together. They found that monozygotic twins brought up together had a correlation of +0.41, against +0.24 for dizygotic twins brought up together. For twins brought up apart, the correlations were +0.25 for monozygotic twins and +0.28 for dizygotic twins. These figures suggest that about 31 per cent of individual differences in neuroticism depend on genetic influences. However, the mean age of Pedersen *et al.*'s sample (58.6 years) was higher than in most other studies, and a recent review has suggested that about 40 to 50 per cent of individual differences in neuroticism depend on genetic influences (Bouchard and Loehlin, 2001).

The findings from twin studies indicate that genetic influences account for half (or a little less than half) of individual differences in neuroticism or trait anxiety. Thus, it is clearly important to consider environmental factors in order to achieve a good understanding of neuroticism or trait anxiety. What about the second hypothesis of the biological approach, namely, that individual differences in trait anxiety or neuroticism depend on individual differences in the responsiveness of the visceral brain or septo-hippocampal system? The evidence is almost uniformly negative. Fahrenberg (1992, pp. 212–213) carried out a review of all of the available evidence, and came to the following pessimistic conclusion: ‘Over many decades research has failed to substantiate the physiological correlates that are assumed for emotionality and trait anxiety. There is virtually no distinct finding that has been reliably replicated across studies and laboratories.’

The evidence from empirical research demonstrating the limitations of the biological approach produced a situation in which there was no overall theory of trait anxiety and neuroticism which appeared adequate. However, the situation has changed to some extent in recent years. One of the main themes of this chapter is to argue that many of the limitations of the biological approach stem from its failure to consider seriously the role played by the cognitive system. It is increasingly recognized by personality researchers that an understanding of cognitive processes and structures can serve to enrich theories of personality (McCann and Endler, 2000).

As will be seen, there is compelling evidence that there are systematic differences in cognitive functioning between individuals high and low in trait anxiety. More speculatively, these individual differences in cognitive functioning can be regarded as providing a partial explanation for the limitations of the biological approach. The remainder of this chapter is devoted to a consideration of cognitive approaches to trait anxiety, with the ultimate goal being to combine such approaches with the earlier biological approach.

RECENT RESEARCH

During the 1980s and 1990s, several theorists argued that a cognitive approach can play an important part in providing an understanding of individual differences in trait anxiety or neuroticism. Examples of such theories include those of Williams *et al.* (1988, 1997), Wells and Matthews (1994) and Eysenck (1992). There are many important differences among these theories, but they do share some major assumptions. Of particular importance, it was assumed in all of these theories that individuals high in trait anxiety or neuroticism possess a range of cognitive biases which lead them to exaggerate the threateningness of many stimuli. It was also assumed that individuals low in trait anxiety or neuroticism lack such cognitive biases. We turn now to a consideration of some of the evidence relating to these assumptions.

Cognitive biases

Several reviews of the literature on trait anxiety and cognitive biases have been published (e.g. Eysenck, 1992; Williams *et al.*, 1997), and so only a brief description of some of the

main findings will be attempted here. In essence, the main focus has been on three cognitive biases. First, there is *attentional bias*, which is defined as a tendency to pay attention to threat-related rather than to neutral stimuli. There is convincing evidence that individuals high in trait anxiety have an attentional bias, and this bias tends to be stronger when the situation is stressful. For example, MacLeod and Mathews (1988) found that high-anxious students had an attentional bias for examination-related words shortly before an important examination, but did not do so several weeks beforehand. There was no evidence for an attentional bias among individuals scoring low on trait anxiety.

Second, there is *interpretive bias*, which can be defined as the tendency to interpret ambiguous stimuli and situations in a threatening fashion. There is convincing evidence that high-anxious individuals have an interpretive bias whereas low-anxious individuals do not. For example, Eysenck, MacLeod and Mathews (1987) and Byrne and Eysenck (1993) studied the interpretations given to auditorily presented homophones (e.g. PANE, PAIN) possessing a threat-related and a neutral interpretation and spelling. In both studies, it was found that individuals high in trait anxiety interpreted more of the homophones in a threatening way than did individuals lower in trait anxiety.

Third, there is *memory bias*, in which memory performance is better for negative or threatening information than for positive or neutral information. This memory bias has been found in tests of explicit memory depending on conscious recollection (explicit memory bias) and tests of implicit memory in which conscious recollection is not involved (implicit memory bias). Williams *et al.* (1997, pp. 285–288) discussed studies on explicit and implicit memory biases in anxious and depressed individuals, and came to the following conclusion:

Out of nine studies using indirect [implicit] tests of memory in anxious subjects or patients, seven have found significant bias towards negative material...no study has yet found word congruent bias in implicit memory in depression...all published studies appear to find explicit memory biases in depression, yet only a third of the studies on trait anxiety or GAD [generalized anxiety disorder] find explicit memory biases.

There are various reasons why these memory biases are discussed much less than attentional and interpretive biases in the remainder of this chapter. First, it is not altogether clear why there are differing effects of anxiety on explicit and implicit memory bias, or why there are systematic differences between anxious and depressed individuals. Second, the findings seem less consistent than was suggested by Williams *et al.* (1997). For example, Richards *et al.* (1999) carried out three experiments to study implicit memory bias in high-anxious individuals. They failed to replicate previous findings, concluding: 'None of the experiments offered any support for the prediction of a threat-related implicit memory bias in high-trait anxiety' (Richards *et al.*, 1999, p. 67). Third, there is a lack of persuasive theoretical reasons for assuming that memory biases (whether explicit or implicit) play a major role in accounting for individual differences in trait anxiety. As we will see, the situation is very different so far as attentional and interpretive biases are concerned.

Pre-attentive vs. attentional processes

An issue of theoretical importance is whether the attentional and interpretive biases exhibited by individuals high in trait anxiety involve pre-attentive processes. Most of this research has focused on attentional processes, and the majority of the relevant studies have uncovered evidence that pre-attentive processes are important. For example, Mogg, Kentish and Bradley (1993) carried out a study using the emotional Stroop task, in which attentional bias is revealed by slower colour naming in the presence of threat-related words than of neutral words. The words were presented either subliminally or supraliminally. The high-anxious participants showed a selective bias when the threat-related words were presented subliminally, but they failed to do so when the words were presented supraliminally.

Van den Hout *et al.* (1995) also used the emotional Stroop task under subliminal and supraliminal conditions. They found that the high-anxious participants showed a significant selective bias effect when the threat-related words were presented subliminally, and the same was also the case when the words were presented supraliminally.

The available evidence suggests that interpretive biases probably do not involve only automatic or pre-attentive processes. There have been several studies (e.g. Calvo, Eysenck and Castillo, 1997; Calvo and Castillo, 1998; Calvo and Eysenck, 2000) in which the time course of the development of an interpretive bias for ambiguous material has been assessed. The consistent finding has been that it takes of the order of several hundred milliseconds for an interpretive bias to develop. The finding that interpretive bias does not develop rapidly makes it unlikely that the bias depends primarily on automatic or pre-attentive processes.

Causality

One of the major problems with most of the research on cognitive biases is that the evidence obtained is essentially correlational in nature, and thus precludes assignment of causality. More specifically, it has been found repeatedly that individuals who report high levels of anxiety typically have various cognitive biases, but it is not clear whether the cognitive biases play a part in producing the anxiety, whether anxiety produces cognitive biases, or whether the causality is bidirectional. However, some recent research (discussed below) has shed light on this important issue.

Mathews and Mackintosh (2000) carried out a study in which a number of different procedures were used in order to produce an interpretive bias in the participants. In essence, the situation was set up so that ambiguous material would predominantly be interpreted in a negative fashion. The key findings revolved around the discovery that state anxiety was increased when the procedures used necessitated the generation of personally relevant meanings, but this did not happen when personally relevant meanings were not constructed. According to Mathews and Mackintosh (2000, p. 602): These findings provide evidence consistent with a causal link between the deployment of interpretative bias and anxiety.'

There is also evidence that inducing an attentional bias can increase experienced anxiety. For example, MacLeod *et al.* (2002) compared individuals who received training designed to produce an attentional bias with other individuals who did not receive such training. They found that the individuals with an induced attentional bias had a more negative mood state than the individuals in the control when both groups were given a stressful anagram task.

If inducing an attentional bias can increase individuals' level of experienced anxiety, then inducing an opposite attentional bias (i.e. avoidance of processing threat-related stimuli) should lead to a reduced level of anxiety. This prediction was supported in a number of experiments reported by Mathews and MacLeod (2002) in which the participants consisted of individuals with initially high levels of trait anxiety. In one of their experiments, one group of participants high in trait anxiety received a total of 7500 training trials designed to induce an opposite attentional bias, in which they were trained to selectively avoid attending to threat. A second group of participants high in trait anxiety also received 7500 training trials. However, no attempt was made during these training trials to change their pre-existing attentional bias. The group receiving training to produce an opposite attentional bias showed a highly significant reduction in trait anxiety when tested after training. In contrast, the control group showed only a small and non-significant change. This is the most direct evidence available to date that cognitive biases can change levels of trait anxiety as well as having more transient effects on state anxiety.

Evaluation

The research discussed in this section of the chapter has revealed clearly that there are important differences between individuals high and low in trait anxiety or neuroticism in terms of their cognitive functioning. More specifically, those high in trait anxiety typically have attentional and interpretive biases which are not found in those low in trait anxiety, and there is some evidence that the same is the case with respect to implicit memory bias. In addition, there is recent evidence indicating that some of these cognitive biases (i.e. attentional and interpretive bias) have causal effects on the level of experienced anxiety. This is important, in part because it suggests the potential value of a cognitive approach to the personality dimension of trait anxiety. However, as discussed below, the main theoretical and empirical approaches that have dominated this area until comparatively recently are limited in a number of ways.

One of the major limitations of the theoretical approaches of Williams *et al.* (1988, 1997), Wells and Matthews (1994), and Eysenck (1992) is that they are based on the assumption that individuals scoring low on trait anxiety form a homogeneous group. However, there is compelling evidence that there are clear subgroups among those scoring low on trait anxiety. For example, some individuals with low scores on trait anxiety have low levels of physiological reactivity in stressful situations, whereas others have very high levels of reactivity. This pattern has been found in several studies (see Weinberger, 1990, for a review).

Another important limitation of previous theoretical approaches is that the focus was almost exclusively on the functioning of the cognitive system. This is a limited approach, because it is clear that there are various response systems involved in anxiety. For example, Lang (e.g. 1985) identified separate behavioural, physiological and verbal

response systems. Most early theories assumed (explicitly or implicitly) that there would be high levels of concordance or agreement among these response systems. In fact, the typical finding is that there is a lack of concordance. For example, Craske and Craig (1984) studied pianists who were performing in public. Their key finding was that measures of anxiety from different response systems typically failed to correlate significantly with each other. The widespread lack of concordance which has been observed seems important theoretically, and can only be understood if one adopts an approach broader than the purely cognitive.

FOUR-FACTOR THEORY

Eysenck (1997) put forward a four-factor theory of trait anxiety which incorporated some of the theoretical ideas and empirical research discussed in the previous section. However, the theory is intended to be much more comprehensive in scope than previous theoretical models, and some of the assumptions on which it is based differ from those of other theories in the area. The four-factor theory of trait anxiety is based on the assumption that the following question is of fundamental importance to an understanding of trait anxiety: What are the major sources of information which jointly determine an individual's level of experienced anxiety? In other words, it is assumed that we need to have a theory of anxiety as an emotional state as a prerequisite for developing an adequate theory of trait anxiety as a personality dimension.

The theory is called the four-factor theory because it is assumed within the theory that there are four main sources of information which influence experienced anxiety. Before discussing these four sources of information, it is important to note that the impact of each informational source on anxiety depends on the amount of attention it receives and on how it is interpreted rather than on the 'objective' characteristics of the information source per se.

What are the four sources of information? First, and most important, there is the external environment. As Lazarus (1991) has emphasized, the experience of most emotional states is heavily dependent on the cognitive appraisal of the immediate situation. Second, there is attention to, and interpretation of, one's own physiological activity. The importance of this source of information in producing the experience of anxiety is revealed most clearly in patients suffering from panic disorder. Such patients are far more likely than normal controls to experience extreme anxiety and a panic attack under biological challenge (e.g. lactate infusion), even though the physiological responses of both groups are typically rather similar (e.g. Gaffney *et al.*, 1988; Schmidt *et al.*, 2002; Yeragani and Pohl, 1989).

The third source of information is one's own behaviour. At an anecdotal level, it is often reported by public speakers that they experience much more anxiety when they become self-conscious and start attending to their own behaviour. More direct evidence was reported by Derakshan and Eysenck (2001a). In their study, the participant remained silent while a confederate of the experimenters either spoke about his own behaviour in the situation, or he spoke about the behaviour of the participant. The key finding was that the participants' level of experienced anxiety was substantially higher when their behaviour was the focus of discussion than when it was not.

The fourth source of information consists of negative cognitions about possible threatening future events (e.g. worries). Borkovec and Inz (1990) considered the effects of worrying on emotional state. Generalized anxiety disorder patients and normal controls relaxed for some time and then engaged in worrying. Both groups exhibited large increases in rated anxiousness and unpleasantness between the relaxation and worry time periods. Similar findings were reported subsequently by East and Watts (1994) in a study on normal individuals who rated themselves as chronic worriers and by Wells (2002) in research on patients with generalized anxiety disorder.

Repressors vs. low-anxious

It is assumed within most theories of trait anxiety (including those of H.J. Eysenck and Gray) that low scorers on trait anxiety form a homogeneous group. However, this assumption is not incorporated into the four-factor theory. According to that theory, individuals scoring low on trait anxiety should be divided into two groups on the basis of their level of defensiveness. Individuals who are low in trait anxiety but high in defensiveness are categorized as repressors or as having the repressive coping style, whereas individuals who are low in trait anxiety and low in defensiveness are categorized as low-anxious. These categories were first popularized by Weinberger, Schwartz and Davidson (1979), who used the Marlowe-Crowne Social Desirability Scale as a measure of defensiveness. They found substantial differences between repressors and low-anxious individuals when placed in a moderately stressful situation. For example, they found that repressors' physiological and behavioural responses indicated much higher levels of anxiety than did those of low-anxious individuals.

The differences between repressors and the low-anxious reported by Weinberger *et al.* (1979) have been repeated several times (see Eysenck, 1997). The most thorough study to compare repressors and low-anxious individuals with respect to physiological, behavioural, and self-report measures associated with anxiety was reported by Derakshan and Eysenck (2001b). They obtained all three types of measure in a moderately stressful situation in which the participants were videotaped. All of the data were then converted to standard scores for purposes of comparison. As had been found in previous research, repressors had relatively high physiological anxiety but low self-reported state anxiety. In contrast, the low-anxious participants had relatively low levels of physiological anxiety and/or self-reported state anxiety. The pattern was similar when behavioural anxiety (based on ratings of the videotape evidence by independent judges) was considered. Repressors had relatively high levels of behavioural anxiety, whereas the low-anxious had a low level of behavioural anxiety.

What is of most theoretical interest from the evidence discussed in this section so far is the fact that the repressors showed large discrepancies between their self-reported anxiety on the one hand and their physiological and behavioural anxiety on the other hand. One possible explanation of these discrepancies is simply that repressors deliberately distort their self-reports to claim low levels of experienced anxiety even though they actually experience high levels. If that were the case, then the discrepancies would be illusory rather than genuine. This issue has been addressed in several studies. For example, Derakshan and Eysenck (1999) assessed levels of trait anxiety on the Spielberger State-Trait Anxiety Inventory on two occasions separated by approximately two months: (a)