

# Introduction

## *Temperament Research: Some Divergences and Similarities*

Jan Strelau and Alois Angleitner

The increasing interest in research on temperament that can be observed in the last decade goes together with the growing variety of theories as well as methodological issues regarding temperament. The book *Explorations in Temperament: International Perspectives on Theory and Measurement* exemplifies, to some extent, the spectrum of these diversities and richness of problems being discussed in the area of temperament. An attempt to summarize the current state of affairs in studies on temperament has been undertaken by Strelau in Chapter 19 of this volume. The aim of the Introduction is to bring into relief some of the actual problems in this field of study, taking as a starting point the contribution of the authors to this book. The following issues will be discussed:)

1. The concept of temperament
2. The structure of temperament
3. Developmental aspects of temperament
4. Biological bases of temperament
5. Diagnosis of temperament
6. Methodological issues in temperament research
7. Importance of temperament for practical application

---

Jan Strelau • Department of Individual Differences, Faculty of Psychology, University of Warsaw, 00-183 Warsaw, Poland    Alois Angleitner • Department of Psychology, University of Bielefeld, D-4800 Bielefeld, Federal Republic of Germany.

## The Concept of Temperament

One of the most controversial problems regarding temperament studies is the notion of "temperament" itself. In a roundtable discussion, eight debaters, mostly experts in child temperament, have given eight different definitions of temperament (Goldsmith *et al.*, 1987). The diversity in the understanding of this notion has also been stressed by many other authors, especially when relating the concept of temperament to personality (e.g., Adcock, 1957; Strelau, 1987a).

The controversy in comprehending temperament is fully reflected in this volume. Some authors regard temperament as a synonym for personality (Eysenck, Gray), the latter concept being at the same time understood in a rather narrow way. The notion "personality" is often limited to dimensions, such as extraversion, neuroticism, and psychoticism (Eysenck), or to impulsivity and anxiety (Gray). The narrow understanding of personality is best exemplified by Eysenck, who writes that "concepts like values, interests, attitudes and others are related to personality but do not usually form part of its central core." Zuckerman, discussing in his chapter so-called basic personality traits, such as, for example, sensation-seeking, extraversion, and impulsivity, does not use the notion "temperament" at all. For him personality dimensions are mediated, however, by biological mechanisms, these being found even in very primitive animals. "A simple organism like a paramecium has two basic 'personality traits': approach and withdrawal" (Zuckerman).

The tradition to confine temperament to the emotional characteristics of behavior, as proposed by Allport (1937), and recently advocated by Goldsmith and Campos (1986), also has its proponents among authors in this volume (Gray, Mehrabian). In his chapter, Mehrabian states that "'Temperament' is defined here as 'characteristic emotion state' or as 'emotion trait.'"

The most typical definition of temperament, which gained the highest popularity among child-centered researchers, especially in the United States, has been proposed by Chess and Thomas. This definition is that temperament should be understood "as the behavioral style or *how* of behavior" (see also Talwar, Nitz, Lerner, & Lerner; Martin & Halverson). The question "how" refers mainly to formal characteristics of behavior, such as reactivity, activity, or self-regulation. According to the definitions of temperament presented by Rothbart and Strelau (see also Van Heck, Angleitner & Riemann) these temperament characteristics are present since early childhood and have a strong biological background. The fact that temperament is present since infancy and has a clear-cut genetic determination has been consequently underlined in the definition of temperament given by Buss and Plomin (1984). In his chapter Buss writes that "temperaments are here regarded as a subclass of personality traits, defined by *appearance during the first year of life, persistence later in life, and the contribution of heredity.*" The fact that temperament should be regarded as a subclass of personality is strongly advocated by Hofstee, who represents a personological approach to personality psychology. Taking as his starting point the definition of "personality as the study of traits," Hofstee argues that "temperament is the core of personality . . . is a proper subset of it."

This brief insight to the understanding of temperament represented by the authors of this volume allows us to conclude that there is no agreement as to what temperament is. The question arises whether lack of consistency in defining temperament is typical for

this phenomenon only; the answer is definitely no. There is no consensus among psychologists in the understanding of most of the concepts in psychology. A shift from theory to the operational level allows us, however, to compare some of the results obtained within different approaches to research on temperament. Data recorded under the "umbrella" of different conceptualizations regarding temperament are admitted, at least to some extent, to enrich our knowledge concerning individual differences in behavior characteristics.

## The Structure of Temperament

Questions regarding the structure of personality have gained most popularity since the introduction of factor analysis to this field of study. The leaders in trait-oriented personality psychology have offered different solutions concerning the number and quality of traits (factors). In most considerations regarding the structure of personality the number of factors varies from three, as proposed by Eysenck, to sixteen, as suggested by Cattell. For several years past the so-called Big Five robust factors—Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness (Intellect or Culture)—as introduced by Norman (1963) and Costa and McCrae (1985) have gained high popularity among trait-oriented personality psychologists. Angleitner (1990) emphasizes that the Big Five considered as broad dimensions for the classification of individual differences in behavior rating studies are now consensually acknowledged.

The question arises as to how the above-mentioned personality factors relate to the structure of temperament. Because of the differentiated view of the notions "temperament" and "personality," the answer cannot be unequivocal. If we take the position represented by Eysenck, for whom temperament and personality are synonyms (assuming that abilities are extracted from personality), it has to be stated that the structure of temperament may be described by three superfactors: extraversion, neuroticism, and psychoticism. A similar position is represented in this volume by Gray and Zuckerman. The former author proposes describing temperament, treated interchangeably with personality, by means of three dimensions which correspond with the three neurological constructs underlying emotion systems—Behavioral Inhibition System (BIS), Behavioral Approach System (BAS), and Fight/Flight System (F/FLS). Mehrabian, who, like Gray, limits the temperament domain to emotions, has also distinguished three basic traits: Pleasure–Displeasure, Arousal–Nonarousal and Dominance–Submissiveness. His bipolar characteristics, by means of which he describes the structure of temperament, have, however, little in common with Gray's theory. Zuckerman offers support for the three superdimensions, as proposed by Eysenck, and suggests adding to this model two further dimensions, namely Activity and Aggression/Hostility.

The opinion, found in many studies and by means of several methods (Digman, 1990), that the Big Five have much in common with temperament is not a novelty. A suggestion that the Big Five factors, with the exclusion of the latter—openness (Intellect or Culture)—be treated as temperament characteristics is expressed in Hofstee's chapter. They form the central variables in the personality domain and, as mentioned earlier, for Hofstee temperamental traits constitute a central subset of personality. A similar view has been presented recently by Angleitner (1990), who sees the first four factors of the Big Five as primarily temperamental dimensions. A temperament structure similar to

this proposed by Eysenck, as well as the structure proposed by authors of the Big Five, has been postulated by Buss and Plomin (1984). The three basic temperament dimensions—Activity, Emotionality, and Sociability—have much in common with such factors as Extraversion, Neuroticism, and, to some extent, Agreeableness (Digman, 1990).

The Big Five, as well as the three superfactors, represent the broadest level in a hierarchical structure of traits. Temperament researchers, especially those who study temperament in children and/or who make a distinction between the notions “temperament” and “personality,” delineate the structure of temperament using more specific dimensions. For example, Chess and Thomas, as well as Lerner and Windle (see Talwar *et al.*), describe temperament by means of nine traits. Among them, only four—Activity, Approach/Withdrawal, Quality of Mood, and Distractability—are to some extent identical in both theories. The temperament traits, as proposed by Windle and Lerner (1986), tend to describe behavior characteristics in a still more specific way. This is expressed in the distinction of three kinds of Rhythmicity: Rhythmicity–Sleep, Rhythmicity–Eating, and Rhythmicity–Daily Habits. Martin, who has taken the Thomas and Chess (1977) model as a starting point, has reduced the number of traits from nine to six: Activity Level, Adaptability, Approach/Withdrawal, Emotional Intensity, Distraction, and Persistence (Martin & Halverson).

The structure of temperament, as proposed by Thomas and Chess (see Chess & Thomas), Windle and Lerner (see Talwar *et al.*), and Martin (see Martin & Halverson), is based on a descriptive approach to temperament. The hypothetical–deductive strategy is an example of a different way in which the structure of temperament may be built. This strategy, applied by several temperament researchers (e.g., Eysenck, 1970, Strelau, 1983; Strelau, Angleitner, Bantelmann, & Ruch, 1990), is represented in this volume by Rothbart. Taking as a point of departure two basic temperament characteristics—Reactivity and Self-Regulation, which evoke to some extent Strelau’s (1974) temperament concepts of Reactivity and Activity, Rothbart describes temperamental individuality by introducing such traits as Negative Reactivity, Positive Reactivity, Duration of Orienting, Behavioral Inhibition, and Effortful Control. Rothbart explains individual differences in these traits by appealing to given biological mechanisms as well as to developmental regularities.

As can be seen from this review, we are far from possessing a commonly accepted structure of temperament. The number of traits as well as proposed structures of temperament mentioned here are nowhere near exhausted. In the Addendum, Strelau has listed over 80 traits (factors) used in studies aimed at describing temperament in adults. To bring us closer to the solution regarding the structure of temperament, more systematic factor-analytic as well as cross-cultural studies are required in which different concepts are studied together and in which the developmental and cultural specificity of human beings is taken into account.

## **The Developmental Aspects of Temperament**

Research on temperament in children gained high popularity, especially in the United States, due to the pioneering studies conducted by Thomas and Chess. The authors’ New York Longitudinal Study (NYLS) on temperament, which began in 1956

and continues into the present, has thrown some light on the developmental aspects of human temperament. The NYLS experience, summarized after 20 years of studies in Thomas and Chess' monograph *Temperament and Development* (1977), allowed the authors to arrive at the following conclusion:

As regards temperament specifically, the behavioral criteria for any temperamental trait must necessarily change over time as the child's psychological functioning develops and evolves. What remains consistent over time is the *definitional identity* of the characteristic (p. 159).

In other words, according to the authors, it is not the tendency to react in a given way (the temperament trait) that changes over time, but the developmentally determined kind of behavior in which the temperamental traits (the tendencies) are expressed. The view that temperamental traits are characterized by low changeability during ontogenesis can be found in many chapters of this volume (e.g., Hofstee, Mehrabian, Van Heck). According to Mehrabian, "environmental influences on temperament are hypothesized to be gradual and to be possible only when these influences are consistent and highly repetitious (amounting to hundreds of thousands of trials) over the course of the first dozen years of development."

The developmental psychologist Rothbart (Chapter 4) underlines the fact that temperament traits develop in ontogenesis (see also Goldsmith & Rothbart, Chapter 15). Under maturation, due to changes in the physiological mechanisms underlying temperament, the quality as well as the number of temperamental traits undergo changes (see also Goldsmith & Rothbart, Chapter 15). For example, such a temperamental trait as Effortful Control, present in preschool children, yet cannot be found in infants. The developmental specificity in temperamental characteristics is due mainly to the fact that during development the processes of self-regulation, as well as the child's own activity, reach continuously higher levels, thus resulting in qualitative and quantitative changes in temperament.

According to many conceptualizations of temperament also presented in this volume, the importance of temperament is mainly expressed in the fact that psychological development is the result of interaction between temperament, other characteristics of the individual, and the environment—primarily the social one. This idea is clearly expressed in the chapters by Chess and Thomas, Talwar *et al.*, and Van Heck. According to Talwar *et al.*, the significant increase in studies on child temperament has its roots in "the theoretical role that individual differences in temperament have been given in accounts of variations in person–social context relations." Developmental contextualism is the approach that underlies the research on temperament conducted by Lerner and his associates (Talwar *et al.*).

Even if one shares the position that temperament traits are relatively stable, their importance in the determination of human development is evident if we consider them within an interactionist approach. Thus, for example, behavior modification can be achieved when given temperament characteristics interact with adequate situational changes (Mehrabian). Van Heck and Buss, in their chapters, go one step further in considering the temperament–environment interaction by stressing the importance of genotype–environment interaction. Individuals with given temperament traits select situations that correspond with their temperament and undertake activities in order to

modify situations in such a way as to match their temperament. The kinds of temperament–environment interactions cannot be neutral for human development.

To conclude, it might be stated that the developmental approach to temperament leads to different solutions. The one delineated in this volume by Rothbart consists of producing evidence that changes in temperament are in essence mainly developmental. The second outcome, represented by many authors in this volume, postulates that temperament (whether prone to changes or not) plays a significant role in psychological development. Both solutions are rather complementary to rather than competitive with each other.

## Biological Bases of Temperament

Most temperament researchers agree that temperament, whatever the traits and structure to which this concept refers, has a strong biological determination. The biological mechanisms underlying temperament serve as the explanatory concepts by means of which individual differences in temperament characteristics are interpreted.

The biological determination of temperament and/or basic personality dimensions is one of the most crucial assumptions in temperament theories. This assumption has its roots in the facts that temperament characteristics can be observed from the first weeks of life (see, e.g., Rothbart) and individual differences in temperament traits have a strong genetic determination (in this volume, Buss, Eysenck, Zuckerman). To avoid oversimplification, the temperament/personality “traits are not directly inherited, but are only a manifestation of particular combinations of inherited biological traits” (Zuckerman). This idea has been expressed in other words by Eysenck when discussing the biological determination of Extraversion, Neuroticism, and Psychoticism:

Clearly, genetic factors cannot act directly on behavior; there must be an intervening link between genes and chromosomes on the one hand, and social behavior on the other. This intervening link may be looked for in physiological factors, neurological structure, biochemical and hormonal determinants, or other biological features of the organism.

Arousal-oriented temperament researchers, who concentrate mostly on temperament traits in adults (in this volume Gray, Eysenck, Fahrenberg, Kohn, and Zuckerman), pay much attention to these neurological and biochemical mechanisms which regulate the energetic aspects of the emotional and behavioral components of temperament. The study conducted by Gray (Chapter 7) on the BIS, BAS, and F/FLS mechanisms underlying the emotional temperament, as well as by Zuckerman (Chapter 8) in the domain of sensation-seeking, belong to the most sophisticated research regarding the physiological and biochemical mediators of temperamental traits.

One of the crucial problems when studying biological mechanisms underlying temperament consists in the fact that the same physiological variables are often considered to be correlates of different temperamental traits. For example, the amplitude of the averaged evoked potential (AEP) is used as a physiological correlate of Augmenting/Reducing, Sensation-Seeking, Strength of the Central Nervous System (CNS), Extraversion and Impulsivity (see Strelau, 1987b). This suggests that physiological mechanisms responsible for the regulation of the level of arousal (activation) codetermine

rather the energetic (intensity) characteristics of temperament traits (common for several dimensions) but not the specificity of these traits. Netter, in her chapter on biochemical variables employed in studying temperament, offers evidence which shows that one type of behavior is mediated by a variety of transmitters and biochemical variables and the reverse. The same transmitter and biochemical variable codetermines different temperament traits. One of the recommendations emerging from this kind of data proposes that it is necessary to study configurations of different physiological and biochemical correlates in order to get a consistent picture regarding the biological mechanisms underlying a given temperament trait. This procedure is explicitly or implicitly recommended by many authors of this volume (e.g., Eysenck, Netter, Fahrenberg, and Zuckerman).

Researchers who assume that temperament has a biological background prefer causal theories of temperament. They use knowledge about the functioning of neurophysiological and biochemical mechanisms in order to explain individual differences in temperament characteristics. It has to be added, however, that theories based on a purely descriptive level are not an exception in temperament studies, especially in children (see Kohnstamm, Bates, & Rothbart, 1989). The theory of temperament developed by Thomas and Chess is a good example here. The categories of temperament they identify have some empirical foundation; however, they "do not rest on any *a priori* conceptual neurobiologic, neurochemical, or psychophysiological basis." Hofstee, in his chapter, goes further, stating that the task of personality (including temperament) researchers is first of all to describe, not to explain, personality/temperament.

The kind of strategy one prefers—explanation or description—when studying temperament or basic personality traits has different consequences for theory and practice. For biologically oriented temperament researchers it is important not to fall into reductionism (see Hofstee), which consists in reducing the psychological phenomenon of temperament to physiological reactions and/or biochemical processes. For descriptively oriented researchers it is crucial to show the predictive power of temperamental traits.

## The Diagnosis of Temperament

The number of psychometric instruments aimed at measuring temperamental traits illustrates in a given way the expansion of research on temperament observed in the last years. Slabach, Morrow, and Wachs (Chapter 13) have catalogued almost 30 different diagnostic instruments in the area of infant and child temperament. Strelau (Addendum) gives a list of 25 "paper-and-pencil" methods used for the purpose of diagnosing temperamental traits in adults.

The large number of diagnostic instruments is mainly due to the many different theories and conceptualizations regarding temperament. Sometimes even modifications within the same approach result in constructing separate inventories. For example, in three chapters of this volume (Chess & Thomas, Talwar *et al.*, and Martin & Halverson), the same stylistic definition of temperament, as proposed by Thomas and Chess (1977), has served as the starting point for developing three different structures of temperament. As a consequence it has led to the development of different temperament inventories.

Specificities exist in psychometric tests, depending on whether they are aimed at diagnosing temperament in infants and children or in adults. Two factors on which these

specificities are based are of special significance: (1) in children, permanent changes in temperament characteristics occur due to their fast development while, in adults, the temperament traits are more or less stable; and (2) because children (at least until school age) are not able to report their own behavior, ratings by others (parents, teachers) have to be used for diagnosing temperament. In adults, self-rating is the dominant psychometric method in studies on temperament.

The excessive developmental changes in children's behavior require the construction of inventories specific for a given developmental period (e.g., infant, toddler, preschooler). Goldsmith and Rothbart show in their chapter the frame for constructing such psychometric instruments. These assessment methods take into account the quantitative and qualitative developmental specificity typical for the different age periods. At the same time they allow a comparison of temperamental traits of the same person at different ages—a requirement needed in longitudinal studies.

The many psychometric tests used in studying temperament elicit a conclusion that effort should be expended to reduce them to a small, reasonable number. Slabach *et al.* (see Chapter 13), reviewing temperament questionnaires popular in the 1980s for diagnosing temperament in children (from birth until the age of 18), present evidence showing that different questionnaires are useful for different purposes. The reliability as well as the validity measures of questionnaires compiled by the authors (see also Hubert, Wachs, Peters-Martin, & Gandour, 1982) give a good orientation regarding the usefulness of these tests.

As mentioned before, the rating by others rather than self-rating is typical for diagnosing temperament in children. One of the major problems here is the low reliability of these measures when interrater agreement is taken into account (see Slabach *et al.* in this volume). A systematic study conducted by Martin and Halverson (Chapter 14) is consistent with this conclusion.

Many temperament inventories for adults refer to arousal-oriented theories. Some of these, to which reference has been made in this volume, as, for example, the Eysenck Personality Questionnaire, Zuckerman's Sensation-Seeking Scale, or the Strelau Temperament Inventory—Revised, may be mentioned here. One of the most popular ways of examining construct validity of the arousal-oriented temperament inventories is to use psychophysiological or psychophysical measures, supposed to be indicators of arousal (activation). As shown in many studies (Fahrenberg, Chapter 18; see also Fahrenberg, 1987; Strelau, 1990), when psychophysiological/physical measures, treated as markers of a given trait, are correlated with psychometric scores of this trait, the correlations are often very low or even zero. Amelang and Ullwer (Chapter 17) demonstrate the lack of consistency between laboratory measures and psychometric scores for extraversion and neuroticism. The lack of consistency has also been observed when biological correlates were compared with psychometric measures in children (Slabach *et al.*, this volume). From the review of literature regarding cross-situational consistency in personality traits (see, e.g., Jackson & Paunonen, 1985; Olweus, 1980) it might be concluded that there is much higher consistency when psychometric measures are compared with behavioral characteristics instead of psychophysiological correlates. This finding has support in preliminary data reported by Goldsmith and Rothbart (Chapter 15). The authors show that assessment of temperament in children based on psychometric measures correlates



with temperament characteristics expressed in natural behavior measured in laboratory conditions.

It is the editors' belief that the construction of a satisfactory temperament inventory, whatever the specificity of this instrument is, has to be based on a well-grounded theory. It must also fulfill the basic methodological and psychometric requirements. Goldsmith and Rothbart's (Chapter 15) study of the construction of tests for the assessment of temperament in children exemplifies this kind of approach. Not only constructors but also users of temperament inventories, when making a decision as to which of the many temperament inventories to select and apply, should take into account the criteria mentioned above.

## Methodological Issues in Temperament Research

The aim of this section is to concentrate on selected issues concerned with the assessment of temperamental traits. If one distinguishes between the notions "temperament" and "personality," as do many authors of this volume, the question arises whether essential differences exist between temperament and personality inventories. This question was asked by Angleitner and Riemann (Chapter 12) who, referring to preliminary data, have given an affirmative answer. Whereas temperament scales are constructed by items that ask for overt and covert behavior (reactions), personality items refer mainly to attributes, wishes, interests, and biographical facts and attitudes.

One of the most essential differences between personality and temperament inventories, especially when arousal-oriented temperament questionnaires are considered, consists in the formal characteristics of items. It has recently been suggested by Angleitner (1990; see also Strelau, Addendum) that whereas personality items refer mainly to the "frequency" criterion (how often a given behavior occurs), temperament items mostly have to do with the "intensity" measure [how strong (intense) a given reaction (behavior) is expressed].

For the assessment of temperament as well as personality by means of inventories the psychometric principles to be followed when generating items and scales are very important. A kind of guideline for constructing temperament scales is presented by Angleitner and Riemann in this volume. In this respect the rules are similar to those drawn for constructing personality inventories (see Angleitner, John, & Loehr, 1986).

As mentioned earlier, self-rating is the source of information to which temperament inventories for adults refer. The question arises whether self-rating is the best way in which temperamental characteristics can be assessed. According to Hofstee (Chapter 11), "personality and temperament are best viewed as judgmental variables." He suggests that the best strategy to assess temperament is to use methods that refer to judges (observers), i.e., peer-rating instead of self-rating (the actor's point of view).

Among the many temperament traits there exist some the diagnosis of which is based mainly on psychophysiological or/and psychophysical measures. The reducing/augmenting dimension as proposed by Petrie (1967) and Buchsbaum (Buchsbaum & Silverman, 1968), as well as the Pavlovian properties of the CNS (Nebylitsyn, 1972; Strelau, 1983) exemplify this statement. The many studies reported in the literature

(e.g., Fahrenberg, 1987; Strelau, 1983, 1990) show that psychophysiological and psychophysical measures lack generalizability. They are highly modality-specific and differ in response patterns. This means, among other things, that the application of single psychophysiological or biochemical measures for diagnosing temperament traits is obsolete. This also holds true when psychophysiological scores are used as markers of psychometrically measured traits (Fahrenberg, this volume). An essential step in the assessment of temperament based on psychophysiological measures "would be to acknowledge advances in differential psychophysiology concerning, for example, the multivariate approach, differentiation of response patterns, and multimodal assessment strategies." It is rather obvious that this very essential methodological requirement can be fulfilled only in best psychophysiological laboratories and can hardly be adapted for practical purposes.

## Importance of Temperament for Practical Application

Concentration on the role temperament plays in everyday life is not the main purpose of the book. There are, however, some theoretical problems presented in this volume which are of special importance for application in practice. The concept of "goodness of fit," as discussed by Chess and Thomas and by Talwar *et al.* is probably the best example of this kind of issue.

Goodness of fit, as understood by Chess and Thomas implies an adequate interaction between the individual's temperament traits as well as other personality characteristics (including competencies) and the environment (demands, expectations, opportunities). If the individual with given temperamental traits (the core of our interest) is not able to cope with the environmental demands, then poorness of fit occurs. Chess and Thomas's concepts of goodness and poorness of fit have much in common with the concept of stress. This is especially evident when stress is understood as a state caused by the imbalance between the environmental demands and the individual's capacity/capability (codetermined by, among other factors, temperamental traits) to cope with these demands (Strelau, 1988). The role of temperament in human behavior is especially evident in extreme situations (Nebylitsyn, 1972; Strelau, 1983), it means when the individual is confronted with high discrepancy between the environmental demands and his/her capability of coping with them. Kohn's study (Chapter 16) is largely devoted to the relationship between temperamental traits and sensitivity as well as tolerance to pain, is an example of studying the relationship between stress and temperament in a laboratory situation. Chess and Thomas, in their chapter, make us aware of the usefulness of the concept of goodness of fit in everyday practice (educational problems, psychological health, etc.).

Taking as a starting point the assumption that temperament is significant for adaptive functioning through its links with the social context, Talwar *et al.* have developed a concept of goodness of fit which "emphasizes the need to consider both the characteristics of individuality of the person and the demands of the social environment, as indexed, for instance, by expectations or attitudes of key significant others with whom the person interacts." A match (fit) between the individual's temperament traits and the

demands of the social context assures positive interaction, whereas a poor fit between individual temperament and a particular social context leads to negative adjustment.

Another way of looking at the importance of temperament in real life has been proposed by Buss (see Chapter 3). The author underlines the role of temperamental traits themselves rather than the kind of demand-capacity interaction in choosing given environments (e.g., city living vs countryside) and/or activities (e.g., job in television news vs job as an accountant) in order to maintain positive adjustment. Also, problem behaviors, such as shyness or hyperactivity, are explained by Buss not by means of individual-environment interaction but by referring to extreme positions on given temperament traits or by a combination of traits.

Many studies are reported in the literature (see Carey & McDevitt, 1989; Chess & Thomas, 1986; Kohnstamm *et al.* 1989; Strelau, 1983) supporting the idea expressed in several chapters of this book (Buss, Chess & Thomas, Kohn, Talwar *et al.*), that temperament contributes essentially to the efficiency and adequacy of human behavior in everyday life, especially when confronted with extreme situations.

Many other issues, questions, and remarks may arise after getting acquainted with this volume. As mentioned earlier, it has been our intention to center on these which seem to be most characteristic of the current state of research on temperament. On the basis of the 19 chapters, written by experts in temperament, some recommendations may be suggested for further studies in this area. We postulate, among other premises, more systematic concentration on a cross-cultural approach, where much attention is paid to the universality of the structure of temperament, to the determinants of temperamental traits from a developmental perspective, and to behavior treated as the basic source of information regarding the individual's temperament and its significance in real life.

## References

- Adcock, C. J. The differentiation of temperament from personality. *The Journal of General Psychology*, 1957, 57, 103-112.
- Allport, G. W. *Personality: A psychological interpretation*. New York: Holt, 1937.
- Angleitner, A. *Personality psychology: Trends and developments*. Presidential Address presented at the 5th European Conference of Personality Psychology, Arricia-Genzano, Italy, June 1990.
- Angleitner, A., John, O. P., & Loehr, F. J. It's what you ask and how you ask it: An itemmetric analysis of personality questionnaires. In A. Angleitner & J. S. Wiggins (Eds.), *Personality assessment via questionnaires: Current issues in theory and measurement*. Berlin: Springer, 1986.
- Buchsbaum, M. S., & Silverman, J. Stimulus intensity control and cortical evoked response. *Psychosomatic Medicine*, 1968, 30, 12-22.
- Buss, A. H., & Plomin, R. *Temperament: Early developing personality traits*. Hillsdale, NJ: Erlbaum, 1984.
- Carey, W. B., & McDevitt, S. C. (Eds.), *Clinical and educational applications of temperament research*. Amsterdam/Lisse: Swets & Zeitlinger, 1989.
- Chess, S., & Thomas, A. *Temperament in clinical practice*. New York: Guilford, 1986.
- Costa, P. T., Jr., & McCrae, R. R. *The NEO Personality Inventory*. Odessa, FL: Psychological Assessment Resources, 1985.
- Digman, J. M. Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, 1990, 41, 417-440.

- Eysenck, H. J. *The structure of human personality*. (3rd ed). London: Methuen, 1970.
- Fahrenberg, J. Concepts of activation and arousal in the theory of emotionality (neuroticism): A multivariate conceptualization. In J. Strelau & H. J. Eysenck (Eds.), *Personality dimensions and arousal*. New York: Plenum, 1987.
- Goldsmith, H. H., Buss, A. H., Plomin, R., Rothbart, M. K., Thomas, A., Chess, S., Hinde, R. A., & McCall, R. R. Roundtable: What is temperament? Four approaches. *Child Development*, 1987, 58, 505–529.
- Goldsmith, H. H., & Campos, J. J. Fundamental issues in the study of early temperament: The Denver Twin Temperament Study. In M. E. Lamb, A. L. Brown, & B. Rogoff (Eds.), *Advances in developmental psychology*. Vol. 4. Hillsdale, NJ: Erlbaum, 1986.
- Hubert, N. C., Wachs, T. D., Peters-Martin, P., & Gandour, M. J. The study of early temperament: Measurement and conceptual issues. *Child Development*, 1982, 53, 571–600.
- Jackson, D. N., & Paunonen, S. V. Construct validity and the predictability of behavior. *Journal of Personality and Social Psychology*, 1985, 49, 554–570.
- Kohnstamm, G. A., Bates, J. E., & Rothbart, M. K. (Eds.), *Temperament in childhood*. Chichester: Wiley, 1989.
- Nebylitsyn, V. D. *Fundamental properties of the human nervous system*. New York: Plenum, 1972.
- Norman, W. T. Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings. *Journal of Abnormal and Social Psychology*, 1963, 66, 574–583.
- Olweus, D. The consistency issue in personality psychology revisited—with special reference to aggression. *British Journal of Social and Clinical Psychology*, 1980, 19, 377–390.
- Petrie, A. *Individuality in pain and suffering*. Chicago: University of Chicago Press, 1967.
- Strelau, J. Temperament as an expression of energy level and temporal features of behavior. *Polish Psychological Bulletin*, 1974, 5, 119–127.
- Strelau, J. *Temperament—personality—activity*. London: Academic Press, 1983.
- Strelau, J. The concept of temperament in personality research. *European Journal of Personality*, 1987a, 1, 107–117.
- Strelau, J. Personality dimensions based on arousal theories. In J. Strelau & H. J. Eysenck (Eds.), *Personality dimensions and arousal*. New York: Plenum, 1987b.
- Strelau, J. Temperament dimensions as co-determinants of resistance to stress. In M. P. Janisse (Ed.), *Individual differences, stress, and health psychology*. New York: Springer, 1988.
- Strelau, J. *Are psychophysiological scores good candidates for diagnosing temperament/personality traits and for a demonstration of the construct validity of psychometrically measured traits?* Manuscript submitted for publication, 1990.
- Strelau, J., Angleitner, A., Bantelmann, J., & Ruch, W. The Strelau Temperament Inventory—Revised (STI-R): Theoretical considerations and scale development. *European Journal of Personality*, 1990, 4, 209–235.
- Thomas, A., & Chess, S. *Temperament and development*. New York: Brunner/Mazel, 1977.
- Windle, M., & Lerner, R. M. Reassessing the dimensions of temperamental individuality across the life-span: The Revised Dimensions of Temperament Survey (DOTS-R). *Journal of Adolescent Research*, 1986, 1, 213–230.