CHAPTER 4

Traits and States in Mindfulness Meditation

Abstract Personality is the collection of characteristic thoughts, attitudes, feelings, and behaviors that impact how we view ourselves and what we believe about others and the world around us. In general, personality traits are relatively stable characteristics, but states are transient. Research has shown that our beliefs and attitudes are learned and shaped by our own experience and expectation, and that these are not fixed and can be changed. Studies have shown that mindfulness induces state changes that influence cognition, feelings, and corresponding brain activity and connectivity after short-term training, and traits changes are also found following long-term practice. This chapter explores how traits and states contribute to mindfulness practice, and explain how this knowledge could improve our practice efficiency.

Keywords Personality · Temperament · Trait · State

Individual Differences

It is known that people differ in their attitude towards the practice of mindfulness meditation, and that not everyone shows the same level of change after mindfulness training. However, we know little about how training might differ among individuals. For example, studies show that mindfulness meditation changes brain structure in the ACC and insula associated with self-control and awareness. If some people are born with a greater ACC or insula than average, might these people be naturally more able to focus

Y.-Y. Tang, *The Neuroscience of Mindfulness Meditation*,
DOI 10.1007/978-3-319-46322-3_4

attention or more inclined to meditation? It is likely that such differences will make it impossible to determine which method would be most efficient for each individual. In our review article *The neuroscience of mindfulness meditation*, we focused on the neural mechanisms and consequences of mindfulness meditation. However, it is also important to differentiate between dispositional mindfulness (also known as trait mindfulness) and deliberate (intentional) mindfulness. Both may reflect the possible individual differences in mindfulness practice. Although our review mainly investigated mindfulness as an intentional practice, pre-existing differences in trait mindfulness could have affected the findings described (Tang et al. 2016a, b).

So far, relatively little is known about how differences in dispositional mindfulness might influence brain processing and the effective practice of mindfulness. However, a number of studies have investigated the neural correlates of dispositional mindfulness and have identified some functional and structural brain areas that are involved. Unfortunately, these reports are not consistent. Several factors could contribute to this inconsistency, but one of the reasons may be related to the assessment methods of trait mindfulness.

Measuring Trait or Dispositional Mindfulness

Trait mindfulness is usually assessed through self-report questionnaires, such as the Mindful Attention Awareness Scale, the Kentucky Inventory of Mindfulness Skills, and the Five Facet Mindfulness Questionnaire. However, the use of these questionnaires comes with specific challenges and limitations, which have been extensively discussed by others. For instance, a recent review concluded that the evidence to support the validity of these questionnaires is lacking (Park et al. 2013; Grossman 2011). It is therefore important to remember that what is being interpreted as "dispositional or trait mindfulness" is actually what these questionnaires assess. All of these challenges call for a more objective measurement of trait mindfulness; for instance, physiological or/and brain biomarkers (Tang et al. 2015).

State and Trait Changes Following Mindfulness

Growing evidence has indicated that mindfulness practice induces both state and trait changes. For example, mindfulness meditation can not only temporarily change the condition of brain and its corresponding pattern of activity or connectivity (state change), but also alter personality traits following a longer period of practice. Researchers had traditionally assumed

that personality traits are relatively stable entities, but more recent research demonstrates that personality, including disposition towards mindfulness, can change over time as a result of life experiences or through mindfulness practice (Crescentini and Capurso 2015), suggesting that personality itself is flexible. Although this demonstrates that individuals can change the way they feel, believe, and act, the finding also complicates the systematic investigation of the construct of 'trait mindfulness'. Nevertheless, recent evidence suggests that it is important to assess trait mindfulness at different points during studies that aim to investigate and distinguish the effects of mindfulness meditation from intentional mindfulness. Individual differences in personality are likely to contribute to how people respond to and benefit from mindfulness practice, in the same way that differences in brain function and structure, genetic predisposition, life experiences, and environmental factors do (see Fig. 4.1). However, little is known about what temperamental, personality, or genetic differences contribute to these differential training effects (Tang et al. 2015, 2016a).

As in other fields, it may be that the study of temperament and personality differences by questionnaires serves as an important level of analysis to predict success in mindfulness training. Using the control condition as baseline, one study showed that in Zen meditators, the percent change in slow alpha EEG power in the frontal area, reflecting enhanced internalized attention, was negatively correlated with low-frequency HRV (as sympathetic indices) and was positively correlated with the novelty seeking score

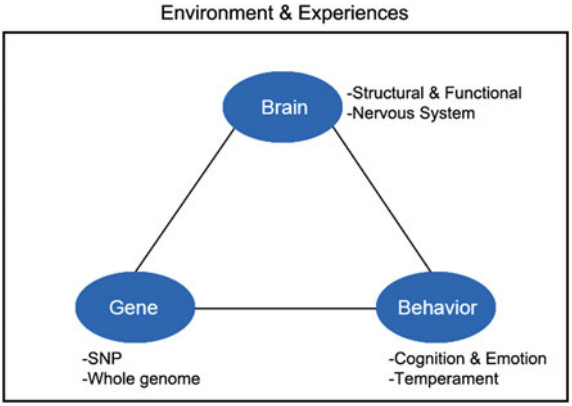

Fig. 4.1 Gene-brain-behavior-environment interaction in mindfulness meditation

in Cloninger's Temperament and Character Inventory (TCI); whereas the percent change in fast theta power in the frontal area, reflecting enhanced mindfulness, was positively correlated with high-frequency HRV (as a parasympathetic index) and also with the harm avoidance score in TCI. These results suggest that internalized attention and mindfulness (two major core factors of behaviors of mind during meditation) are characterized by different combinations of EEG patterns and HRV and personality traits (Takahashi et al. 2005).

Could we predict performance or behavior following mindfulness? Our studies have shown a mean improvement in creative performance following IBMT; however, differences among individuals have been neglected. We thus examine whether short-term IBMT can improve creative performance and seek to determine which type of people are most likely to benefit. In a randomized study using short-term IBMT and the same amount of relaxation training (30 min/session/day for a week), mood (Profile of Mood States), personality (Eysenck Personality Questionnaire), and creative performances (Torrance Test of Creative Thinking) were assessed before and after training. Results indicated that the IBMT group had significantly greater creative performance than the relaxation group, consistent with previous results. A linear regression showed that five predictors in pre-tests including depression, anger, fatigue, introversion × vigor, and emotional stability × vigor accounted for 57% of the variance in the change in creativity before versus after IBMT. In this way, we demonstrated substantial differences among individuals whose training effects were correlated with aspects of their mood and personality. Our results also suggest that mood and personality could be useful tools to predict individual variation in the improvement of creative performance following mindfulness training (Ding et al. 2014a, b).

Do genes and environment (or experience) interact to influence the success of mindfulness training? Studies of training effects in other domains have suggested that a number of genetic polymorphisms may interact with experience to influence the success of training. For example, DRD4 gene (one of dopamine receptor genes) is involved in executive attention and self-control. The 7-repeat allele of the DRD4 gene has been associated with attention-deficit/hyperactivity disorder (ADHD) and the temperamental quality of sensation seeking. Evidence that environment and/or experience can have a stronger influence in individuals with the 7-repeat allele has been reported. Moreover, in a randomized study, an intervention that increases parents' use of positive discipline reduced externalizing

behavior in toddlers with the 7-repeat allele of the DRD4 gene, significantly more so than those without this allele.

How do these differences arise? On one hand, they are due to genetic variations. On the other hand, environmental influences and learning can also lead to differences. Therefore, experience and genetics are not separate influences but they frequently interact. Gene expression, for example, can be altered by the environment in which the genes operate. Genetic differences can also influence the degree to which specific experience is effective in leading to learning. Our genes thus influence the degree to which our behavior is altered by experience. These results illustrate the complex interaction between genetic variation and environmental influence such as experience (Belsky et al. 2009; van Ijzendoorn et al. 2011).

Given that there is evidence of mindfulness meditation influencing behavior and activation and connectivity of the ACC, PFC, striatum, and other brain regions, it may be useful for future research to examine polymorphisms in dopamine genes and their likely influence on the success of meditation practice. In addition, individual differences in personality and lifestyle, and trainers and group dynamics during training, are likely to have significant influence on training effects, but this influence is poorly understood. However, more empirical studies are needed to establish a definitive effect of these factors on mindfulness. We believe that more longitudinal, randomized, and actively controlled studies with larger sample sizes could deepen our understanding of how we could help people with different personality traits practice effectively (Tang et al. 2015, 2016a).

References

Belsky, J., Jonassaint, C., Pluess, M., Stanton, M., Brummett, B., & Williams, R. (2009). Vulnerability genes or plasticity genes? *Mol Psychiatry, 14*, 746–754.

Crescentini, C., & Capurso, V. (2015). Mindfulness meditation and explicit and implicit indicators of personality and self-concept changes. *Frontiers in Psychology, 6*, 44.

Ding, X., Tang, Y. Y., Tang, R., & Posner, M. I. (2014a). Improving creativity performance by short-term meditation. *Behavioral and Brain Functions, 10*, 9.

Ding, X., Tang, Y. Y., Deng, Y., Tang, R., & Posner, M. I. (2014b). Mood and personality predict improvement in creativity due to meditation training. *Learning and Individual Differences, 37*, 217–221.

Grossman, P. (2011). Defining mindfulness by how poorly I think I pay attention during everyday awareness and other intractable problems for psychology's (re) invention of mindfulness: comment on Brown et al. *Psychology Assessment, 23*, 1034–1040.

Park, T., Reilly-Spong, M. & Gross, C. R. (2013). Mindfulness: A systematic review of instruments to measure an emergent patient reported outcome (PRO). *Quality Life Research, 22*, 2639–2659.

Takahashi, T., Murata, T., Hamada, T., Omori, M., Kosaka, H., Kikuchi, M., et al. (2005). Changes in EEG and autonomic nervous activity during meditation and their association with personality traits. *International Journal of Psychophysiology, 55*(2), 199–207.

Tang, Y. Y., Holzel, B. K., Posner, M. I., (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience, 16*(4), 213–225.

Tang, Y. Y., Holzel, B. K., & Posner, M. I. (2016a). Traits and states in mindfulness meditation. *Nature Reviews Neuroscience, 17*(1), 59.

Tang, Y. Y., Tang, R., & Posner, M. I. (2016b). Mindfulness meditation improves emotion regulation and reduces drug abuse. *Drug and Alcohol Dependence, 163,* S13–S18.

van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Belsky, J., et al. (2011). Gene-by-environment experiments: A new approach to finding the missing heritability. *Nature Reviews Genetics, 12*, 881.