Worldwide, the reintegration of patients from institutionalized, sheltered care back to their communities has been a cornerstone of "best-practices" for patients with SMI. China's community mental health development has been shaped by its unique cultural, political, and socioeconomic factors. Broadly speaking, stigma against the mentally ill in China is intense, which extends to families and workers in this field as well. To date, most Chinese mental health services are still provided through hospital and outpatient clinics, therefore locked wards and long-term custodial-style care remains common. There are shortages of professional staff, inadequate and outdated training, and, overall, a low level of public awareness about mental illness. Families shoulder most of the care burden and are the de facto community service providers (*2*). Furthermore, there is a significant compartmentalization of responsibility and care between different Ministries, even those serving similar populations in the same community.

In response to these challenges, China has developed the principle of "government leadership, departmental cooperation, and social participation." The first China Mental Health Work Plan (2002–2010) was drafted in 2002, leading to the launch in 2005 of a nationwide "Severe Mental Illness Management and Treatment Project." Also known as the 686 Project, it provides people with SMI free basic psychiatric medications and quarterly follow-ups (*7*). By 2009, patients with SMI had become part of the basic public health services mandate. In 2013, China's first Mental Health Act was created, prescribing basic rights and protection for this vulnerable group. The current National Mental Health Work Plan (2015–2020) introduced a three-year demonstration pilot involving six Ministries, to improve coordination of community care for those with SMI. Most recently, in 2016, mental disability treatment and rehabilitation were included in the scope of basic medical insurance payments. Together, these policies and developments have aimed to improve the quality of care and shift care more into the community.

During this ambitious process, notable problems have surfaced:

- The gap between the demand for SMI services and the capacity to provide them is large;
- Management is still largely focused on societal safety (i.e., reducing nuisances and disturbances caused by people with SMI), which leads to strategies of containment and control—at the expense of a focus on improving social functioning and quality of life;
- There is a serious lack of empirical research and evaluation in the community mental health and rehabilitation fields; and
- There remains insufficient professional knowledge and training.

Despite gaps between aspiration and implementation, there are also opportunities for positive and enduring changes.

Person-centered community services: A conceptual shift

Beyond enhancing capacity to provide traditional medical and functional services, a change in the conceptualization of patient care is due. Treating each patient as a unique individual, understanding their subjective points of view, and meeting the needs of patients with acceptance and respect are key principles of person-centered care. At the same time, interacting in a nonjudgmental, collaborative, and empowering way that includes families and the community contributes to high-quality community care, and helps patients to be more dignified, independent, and productive members of society.

Too often, the current practices reflect a paternalistic approach that equates mental health "care" as "supervision." Much of the current community services evaluation also focuses on "rate of patient registration," "rate of SMI management/treatment," and "rate of social disturbances," among other indicators (*7*). Under the current framework, patients are mostly passive, and may be labeled and marginalized as the "other," potentially heightening shame and reinforcing society's negative views and biases against the mentally ill. At worst, this framework may unintentionally contribute to discrimination and societal stigma against them (*8*). Recent studies from Beijing, Wuhan, and Guangzhou have shown a rising sense of stigma in community patients with SMI, and a lowering of their quality of life—some even significantly lower than those of inpatients. Another follow-up study found recently discharged patients with a significant reduction in quality of life and worsening symptom severity upon returning to the community (*9*).

The "journey-of-recovery" approach: Services matching life stages and natural course of illness

SMIs are chronic illnesses with varied courses, necessitating a continuum of service modalities [e.g., inpatient hospitalization, transitional care services, residential treatment, assertive community treatment (ACT), community housing, case management, clubhouse, and community-based rehabilitation and employment services] to meet changing needs. Intensive interventions should be effective and available for the challenging acute phases of SMI; varied rehabilitative services and programs are equally important. Recent Chinese research shows roughly 20% of community SMI patients receiving "686" case management are hard to treat and do not adhere to their medications (*10*). More intensive and assertive community services are required, without resorting to hospitalization. One approach is the ACT model, a well-researched approach that has been shown internationally to help highly challenging individuals, or those with unrelenting symptoms, severe functional impairments, poor social support, high family burden, high comorbidities, and frequent rehospitalizations. The ACT model also fully embraces person-centered, rehabilitation-oriented care, which is recognized as a key ingredient of success, along with its multidisciplinary team, using an intensive community outreach approach. ACT is costly, yet cost-effective analyses show it is worthwhile for the most challenging patients. Recently, a research team conducted a pilot study of an innovative cultural adaptation of ACT in China in 2011 (*10*), and the successful results led to the first randomized controlled study to compare ACT to a "686" intensity service. The preliminary results showed that ACT intervention reduced these challenging patients' rehospitalization rate, length of stay, and psychotic symptoms, and improved employment, social, and family functioning (*12*).

In the current era of growth and transition, China has an urgent need for effective, evidence-based community mental health services to serve the highly vulnerable SMI population. There are notable gains in this worthwhile field, such as the "686" program and positive research on ACT. Goals to improve China's mental health system by emphasizing the patient as an individual, and shifting from an emphasis on supervision to one based on recovery, are the leading challenges in this field.

References

1. L. Guan *et al., PLOS ONE* **10**, e0121425 (2015), doi: https://doi.org/10.1371/journal.pone.0121425.
2. M. R. Phillips *et al., The Lancet* **373**, 2041–2053 (2009).
3. World Health Organization, "A Call for Action by World Health Ministers" (Geneva, WHO, 2001), p. 6; available at http://www.who.int/mental_health/advocacy/en/Call_for_Action_MoH_Intro.pdf.
4. J. Xu *et al., BMC Psychiatry* **16**, 137 (2016), doi: https://doi.org/10.1186/s12888-016-0839-0.
5. Y. T. Xiang *et al., The Lancet* **380**, 1715–1716 (2012).
6. W. Xiong *et al., British J. Psychiatry*, **165**, 239–247 (1994).
7. B. J. Good *et al., Shanghai Arch. Psychiatry* **24**, 175–177 (2012).
8. D. F. K. Wong *et al., Psychiatry Res.* **256**, 258–266 (2017).
9. X. Q. Wang *et al., Arch. Psychiatr. Nurs.* **30**, 41–46 (2016)
10. X. Wang *et al., Psychiatr. Serv.* **67**, 431–437 (2016).
11. W. Zhao *et al., Psychiatr. Serv.* **66**, 438–441 (2015).
12. W. Xiang *et al., The 2016 Westlake Youth Forum*, June 20–24, Chengdu, China (2016).

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Mindfulness training and multimodal neuroimaging for mental health

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The World Health Organization estimates that 10–15% of the Chinese population suffers from some form of mental illness, such as anxiety, depression, schizophrenia, bipolar disorder, attention deficit hyperactivity disorder (ADHD), autism, and posttraumatic stress disorder (PTSD) (*1*). One promising research direction shows that mental-training approaches can be useful to prevent and treat several mental illnesses. Mindfulness-based approaches are a particular methodology of mental training that can be effective for at least some of these conditions. They have gained increasing popularity, both worldwide and in Chinese society, as a strategy for self-care. Given the beneficial effects of these meditation practices that have been recently discovered by scientific research, this novel societal interest could be an opportunity to generally improve mental health. More specifically, on a neurological level, many studies support the idea that mental training programs such as mindfulness meditation can deeply impact neuroplasticity and induce changes in brain networks that are associated with attentional control, emotion regulation, and self-awareness, and therefore with mental well-being in general (*2, 3*). The detailed biological mechanisms behind mindfulness meditation remain unknown. However, advances in multimodal neuroimaging techniques, including magnetic resonance spectroscopy (MRS), functional magnetic resonance imaging (fMRI), and diffusion tensor imaging (DTI), (Figure 1, on the next page), do provide state-of-the art scientific tools to explore the neural mechanisms of mindfulness meditation and how these can impact general mental health.

Types of mindfulness meditation

Mindfulness meditation is not one single practice, but a collection of different methodologies. We divide the various mindfulness meditations into essentially three types: (1) attention regulation, (2) emotion regulation, and (3) self-regulation. In all these cases, mindfulness practices are related to the cognitive capabilities of control, coordination, inhibition, and integration—typical of executive functions. Regarding attention regulation, there are many practices that underline the importance of exercising attention before embarking on any developmental path; the ability to regulate one's attention is a prerequisite for exercising other, more sophisticated forms of control related to well-being (e.g., sustained focus, avoidance of distractions, and self-control). With

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FIGURE 1. Multimodal neuroimaging framework for mindfulness training.

the term "emotion regulation," we refer to the act of regulating emotions in each of its different components (beginning, duration, intensity, and so on) through voluntary and involuntary strategies. The last group of mindfulness practices, self-regulation, acts not at the level of individual constructs, such as attention or emotions, but on the self of the practitioner; with these practices, the main activity is to introspectively explore the nature of conscious experience and mental processes related to the self.

Metabolic mechanisms of mindfulness training

To gain a full understanding of these mental practices and their effects on mental health, they must pass the scrutiny of a neuroscientific understanding of the brain and the metabolic processes involved (*4–6*). Several multimodal neuroimaging studies show that the iteration of mental practices changes the brain's metabolism, structure, and function. A detailed investigation of the effects of mindfulness meditation training using MRS would be an important tool to shed light on the metabolic mechanisms involved in specific brain networks, such as the default mode network (DMN) or the salience network, and how these are influenced and modulated by mental training.

Brain network mechanisms in mindfulness training

The brain is a complex biological system in which dynamic adjustments to network organization over multiple time scales are crucial for mediating cognition, emotion, and behavior (*7, 9*). DTI and fMRI provide useful tools for characterizing the large-scale brain network reorganization thought to be important for gaining a better understanding of brain states (*8, 10*). Previous studies have indicated that mindfulness training induces functional and structural connectivity changes in brain networks. The DMN is known to play a key role in mind-wandering or rumination. In addition, studies on mindfulness training are showing that the central executive network is enhanced during this activity. Furthermore, the salience network plays a significant role in monitoring our body state, and therefore in mental training it is generally involved in perceiving sensations inside the body, or interoception (*10*). During mindfulness meditation, the brain is continuously communicating with the body (the heart, other internal organs, and the immune system). The communication between brain and body provides the brain with a body mapping of how and what the practitioner feels. Recently, some researchers have begun to investigate the relationship between interoception and mindfulness training.

Mindfulness training is believed to impact large-scale brain networks (whole networks or subnetworks) that have been associated with different brain functions and behaviors of fundamental importance for mental health. There is a growing interest in the application of mindfulness to the clinical field. Since most psychological disorders are associated with poor regulation of emotions and/or dysfunctional strategies to manage emotions, many researchers believe that psychotherapeutic interventions should be focused on these types of techniques. Determining the properties of large-scale, brain-network topology is an important step toward understanding the underling neural mechanisms of mindfulness training and its impact on the clinical population. A key research direction appears to be how to integrate the mental and physical effects of mindfulness meditation with the information coming from neuroimaging and physiology research, in order to better understand the relationship between the brain and the body. The combination of a real-time neurofeedback technique, such as electroencephalography-correlated functional magnetic resonance imaging (EEG-fMRI), statistical learning (Bayesian and machine learning), interoception, and behavior studies can be useful tools for decoding the dynamics of mental states throughout such intervention. The outcomes of such large-scale research could be a significant foundation for improving mental health worldwide.

References

1. Y. T. Xiang *et al.*, *Lancet* **380**, 1715–1716 (2012).
2. M. B. Ospina *et al.*, *Evid. Rep. Technol. Assess.* **155**, 1–263 (2007); available at https://www.researchgate.net/profile/lisa_tjosvold/publication/6076604_meditation_practices_for_health_state_of_the_research/links/54f882280cf28d6deca2adc7.pdf.
3. A. Grecucci *et al.*, *PLOS ONE* **10**, e0116541 (2015), doi: https://doi.org/10.1371/journal.pone.0116541.
4. S. Chun *et al.*, *Neuroimage Clin.***9**, 348–354 (2015).
5. C. Yuksel *et al.*, *Mol. Psychiatry* **20**, 1079–1084 (2015).
6. P. Lin *et al.*, *Cereb. Cortex* **21**, 821–830 (2011).
7. N. De Pisapia *et al.*, *Cereb. Cortex* **22**, 639–649 (2012).
8. P. Lin *et al.*, *Sci. Rep.* **7** (2017), doi: 10.1038/srep46088.
9. Y. Y. Tang, B. K. Hölzel, M. I. Posner, *Nat. Rev. Neurosci.* **16**, 213–225 (2015).
10. L. Q. Uddin, *Nat. Rev. Neurosci.* **16**, 55–61 (2015).

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