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REVIEW

The State of Dispositional Mindfulness Research

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Abstract

Objectives We present a bibliometric review of research on trait mindfulness published from 2003 until 2021 to determine the current state of the field and identify research trajectories.

Methods A search conducted on Aug 25, 2021, using the search terms "trait mindfulness" OR "dispositional mindfulness" in the Web of Science Core Collection identified 1405 documents.

Results Using keyword-based network analyses, the various clusters suggested two major approaches in the field, one focusing on cognitive attentional processes, and a second approach that encompasses a wider field of well-being and clinical research topics. We also documented increasing consolidation of research fields over time, with research on wider individual differences such as personality being subsumed into clinically and well-being-oriented research topics. More recently, a distinct theme focused on the validity of measurement of mindfulness emerged. In addition to general patterns in the field, we examined the global distribution of trait mindfulness research. Research output was substantially skewed towards North American-based researchers with less international collaborations. Chinese researchers nevertheless also produced research at significant rates. Comparing the difference in research topics between China and the US-based researchers, we found substantial differences with US research emphasizing meditation and substance abuse issues, whereas researchers from China focused on methodological questions and concerns around phone addiction.

Conclusions Overall, our review indicates that research on trait mindfulness might profit from conceptual and cultural realignment, with greater focus on individual differences research as well as stronger focus on cross-cultural and comparative studies to complement the strong clinical and cognitive focus in the current literature.

Keywords Dispositional mindfulness · Trait mindfulness · Bibliometry · Review · Network analysis

Mindfulness is a concept that originally formed part of a wider philosophical and spiritual belief system associated with Buddhism. Core ideas inspired and derived from this Buddhist philosophy were imported into Western psychology and medical practice during the second half of the twentieth century (Baer et al., 2006). Mindfulness-based interventions have been widely incorporated into clinical practice (Karl et al., 2022) and have been shown to be effective in addressing a wide range of mental health issues (Fischer et al., 2020). This ease of implementation and efficacy in addressing mental health issues prominent in Western societies (especially anxiety and depression) has led to a substantial growth in the field (Creswell, 2017; Van Dam et al., 2018).

Building on this research on mindfulness interventions, a separate body of literature has emerged that focuses on stable, trait-like individual differences in mindfulness. Trait mindfulness is generally conceptualized as "the general tendency of a person to show characteristics of nonjudgmental awareness of present-moment experience in their everyday life" (Krägeloh, 2020, p. 64). This view is reflective of the whole trait theory in personality (Fleeson, 2001; Fleeson & Jayawickreme, 2015). This theory views traits as mean descriptors of underlying density distributions of related states (for example trait extraversion is viewed as the average descriptor of extraversion states). In line with this perspective, trait mindfulness not only has been shown to be influenced by consistent mindfulness practices, but is also present in non-practitioners (Baer et al., 2008). Importantly, meta-analytic evidence indicates that increased trait

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mindfulness has a host of beneficial outcomes ranging from positive work outcomes to psychological well-being (Carpenter et al., 2019; Karyadi et al., 2014; Mesmer-Magnus et al., 2017; Sala et al., 2020). This focus on individual differences created a second and rather distinct research line in addition to clinical intervention studies, focusing on trait mindfulness that aim to identify outcomes, predictors, and underlying mechanisms of such stable interindividual differences. Research on trait mindfulness opens up new avenues to understand mindfulness from neuroscientific, biological, and individual difference perspectives, as well as providing opportunities for identifying possible cultural differences.

The last decades have been marked by a diversification and broadening of this new body of inquiry beyond the original focus of clinical interventions. A number of overviews focusing on specific topics in the field of mindfulness are available already (Baer, 2006; Chiesa et al., 2011; Keng et al., 2011). Given the diversity of the theories and approaches, researchers have started to use approaches such as bibliometry (the systematic analysis of bibliographic meta-data such as keywords and authorship) to generate overviews of the field of mindfulness (Baminiwatta & Solangaarachchi, 2021; Karl et al., 2022; Kee et al., 2019; Lee et al., 2021; Ma et al., 2021), and to identify the relationships of empirical research with Buddhist theoretical foundations (Valerio, 2016). Nevertheless, currently, no such high-level overview of the field of trait mindfulness is available. The absence of authoritative overviews of research trends makes it difficult to track the development and current state of this specific subfield. This is particularly important because the study of trait mindfulness allows building new bridges to different areas of psychology and clinical practices.

In this review, we aim to provide a systematic documentation of the trait mindfulness research field using a bibliometric approach. In the current study, we aim to advance four major goals: First, we map out the research-space around trait mindfulness and take stock of current research fields and important publications and authors, identifying broad research trends. Second, what are central themes of research across the corpus and how have they evolved over time? Third, how is research on trait mindfulness distributed globally?

Methods

Data Source

We used a broad search strategy using the Web of Science (WOS) on the 25th of August, 2021. In order to identify the maximum possible records, we used the search strings: "Dispositional Mindful*" OR "Trait Mindful*". We initially started our search from 1970 to the present day, but found the first explicit mention of either search term in 2003. We therefore restricted the year range to 2003–2021. We downloaded all articles as bibtex files, including all available information such as keywords, abstracts, and authorship information. We combined all files into one master-database representing the full corpus and transformed the files into processable dataframes using the bibliometrix package (Aria & Cuccurullo, 2017) in R (R Core Team, 2021). All data and analysis code can be found on the OSF (https://osf.io/84m95/?view_only=a565011c959648a2a3cdccd5486d100d).

Data Analyses

Descriptive Analyses

We first calculated descriptive statistics based on the number of publications per year, and per publication outlet, calculated the most highly cited papers within the current corpus and the most highly cited papers within the larger literature (which includes citations by papers outside the current corpus).

Research Clusters

To provide a high-level overview over author-provided keywords, we applied multiple-correspondence analysis based on a co-occurrence matrix of stemmed author assigned keywords. Importantly, this analysis extracted clusters of keywords, representing archetypical lenses of examination of trait mindfulness; therefore, individual documents can contain keywords from multiple clusters. As this method yields exploratory results that are dependent on the included variables, we decided to implement three different cutoffs for minimal degrees of keyword associations included in the analysis. To capture the broad range of topics addressed by authors, we decided to cut at 5, 25 (shown in Fig. 2 in the supplement), and 50 minimum degrees (Fig. 1).

Thematic Evolution of Research over Time

To examine the change in the research of mindfulness, we examined the evolution of themes across the last decade of research. We split the dataset into two blocks running from 2003 to 2010 and a second block from 2011 to 2021. We extracted all publisher-provided keywords, to capture higher order themes, that occurred at least two times in the second slice of the network. Following procedures described by Callon et al. (1991) which then created thematic maps based on keyword co-occurrence matrices. After normalization, clusters within these co-word matrices are calculated using the relative strength of word co-occurrences within and across different

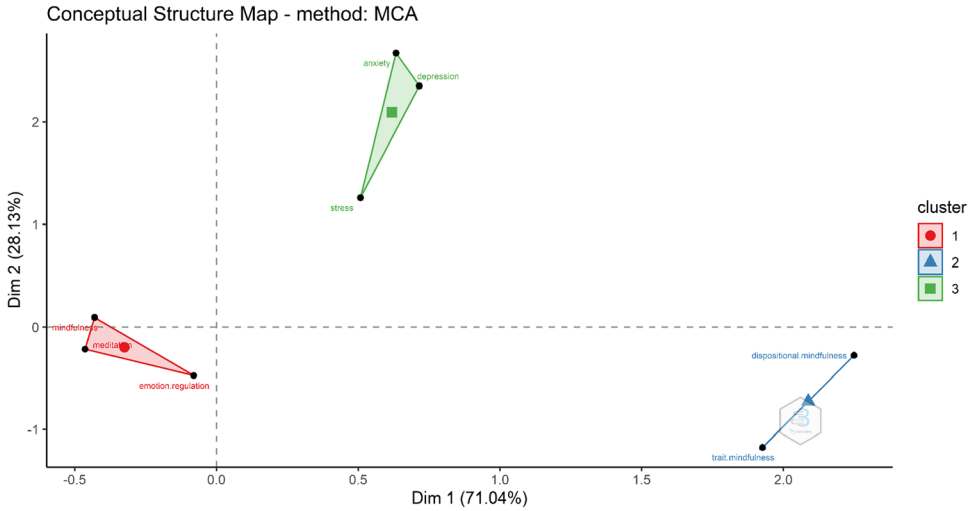

Fig. 1 MCA clustering of author keywords at 50 minimal degrees

clusters, maximizing within-cluster associations (Cobo et al., 2011). These clusters are then displayed via network centrality and network density metrics. Centrality is calculated as the sum of all frequency-normalized links between any keywords within one cluster and keywords in any of the other clusters, capturing the importance of particular theme within the larger network (representing the importance within the literature within that time period). Density is calculated as the frequency-normalized strength between any two words within a cluster divided by the number of words within the same cluster. Therefore, this captures the strength of internal ties and can be interpreted as the internal development or consistency of a theme within a literature. A thematic map displays these two statistics within a two-dimensional space, providing a visual representation of the centrality and coherence of research fields. Using this graphic representation, it is possible to classify research clusters in a rather intuitive way within a four-quadrant system of (1) Niche Themes (well-developed internal ties but unimportant external ties, implying high density but low centrality); (2) Motor Themes (well developed and important for the structuring of a research field, high centrality and density); (3) Basic Themes (important for a research field but are not developed, high centrality but low density); and (4) Emerging/Declining Themes (weakly developed and marginal, both low density and centrality).

Mindfulness Research Across Cultures

We first examined the frequency of trait mindfulness research by country, using the first/corresponding author as a point of reference for each article. We also computed the collaboration rates between all authors by country and represented these associations within a network structure.

Research Impact and Focus Comparing US- and Chinese-Based Research

We focused on the two most active research regions in the Western and Eastern hemispheres (US and China, respectively). We calculated citation metrics and keyword frequencies separately for each nation as well as for a list of keywords that are common to both groups of researchers. To examine the correlation of the relative importance of keywords across countries, we transformed the frequencies within countries into rank-orders with ties broken at random (to increase the robustness, we bootstrapped the analysis 1000 times).

Results

Descriptive Analysis of Trait Mindfulness Research

Research on individual differences in dispositional mindfulness has shown substantial increase over the last two decades (Fig. 1 in the supplement) with an average growth rate of 31.64% per year. Overall, we found 1405 documents (1169 articles, 72, early access articles, 5 proceeding papers, 8 corrections, 5 editorials, 1 letter, 68 meeting abstracts, 9 proceeding papers, 64 reviews, 1 book chapter review, 3 early access reviews) in 495 unique sources (journals, books, etc.). Table 1 shows the 10 most common sources, which unsurprisingly were headed by the journal *Mindfulness*. Importantly, the second most important outlet for trait mindfulness research is *Personality and Individual Differences*. Most articles were authored by multiple authors with an average of 2.79 authors per document. To examine important papers cited by studies included in our corpus in the global citation network (all articles available on the WoS) and our slice of the citation network (studies within our corpus of articles),

Table 1 Top 10 research outlets

Sources	Documents
Mindfulness	247
Personality and Individual Differences	99
Frontiers in Psychology	54
Current Psychology	23
PLOS One	22
Psychosomatic Medicine	17
Annals of Behavioral Medicine	14
International Journal of Environmental Research and Public Health	13
Journal of American College Health	13
Social Cognitive and Affective Neuroscience	13

we extracted the ten most important papers based on their global and local citation scores. We found a substantial correlation of number of citations of a document within our network with its overall citations (indicating that our network captures a representative slice of the overall citation network; $r = 0.96$, $p < 0.001$). At the same time, when using rank correlations, the relative order changed which indicates differential importance of papers in our network compared to their importance in the general field ($r = 0.43$, $p < 0.001$). Focusing on specific features, the ten most important papers in the general citation network focused largely on scale development and conceptual definitions (Table 2) and were exclusively written by North American-based first authors. In contrast, papers in our local network focused largely on clinically relevant outcomes, such as well-being or psychological issues. To clarify the concepts researched jointly with dispositional mindfulness, we extracted the twenty most common keywords applied by authors to their articles in our corpus (Table 3). This revealed a similar picture to the most cited articles, with clinically relevant such as stress, anxiety, and depression being central research foci.

Identifying Research Themes and Trends

Cutting at a minimum of 5 degrees, we found a split in the keywords separating out clusters of general research on trait mindfulness, focusing on topics such as anxiety and depression and a cluster that focused on MBSR research. Cutting at 25 degrees, we found four clusters. A first cluster split from the main cluster of trait mindfulness and specifically included research on depression and stress. Two other clusters emerged: one focusing on emotion regulation, and

Table 2 Top cited documents in the global and local networks

Top documents cited by documents in the local network					
First author	Year	DOI/ISBN	Local citations	Topic	ISO3
Brown KW	2003	10.1037/0022–3514.84.4.822	889	Scale development	USA
Baer RA	2006	10.1177/1073191105283504	707	Scale development	USA
Bishop SR	2004	10.1093/CLIPSY/BPH077	461	Mindfulness measurement conceptualization	CAN
Brown KW	2007	10.1080/10478400701598298	314	Mindfulness and well-being	USA
Kabat-Zinn J	2003	10.1093/CLIPSY/BPG016	308	Mindfulness in clinical contexts	USA
Baer RA	2008	10.1177/1073191107313003	282	Scale validation	USA
Kabat-Zinn J	1990	385,298,978	282	Mindfulness theory	USA
Kabat-Zinn J	1994	9,781,400,000,000	250	Mindfulness theory	USA
Baer RA	2003	10.1093/CLIPSY/BPG015	229	Mindfulness and well-being	USA
Keng SL	2011	10.1016/J.CPR.2011.04.006	216	Mindfulness and well-being	USA
Top cited documents present in the local network					
First author	Year	DOI/ISBN	Local citations/ WOS citations	Topic	ISO3
Brown KW	2003	10.1037/0022–3514.84.4.822	889/4942	Scale development	USA
Creswell JD	2007	10.1097/PSY.0b013e3180f6171f	145/439	Affective labelling	USA
Barnes S	2007	10.1111/j.1752–0606.2007.00033.x	113/306	Relationship well-being	USA
Tomlinson ER	2018	10.1007/s12671-017–0762-6	86/119	Well-being	GBR
Shapiro SL	2011	10.1002/jclp.20761	74/189	Stress-reduction	USA
Hulsheger UR	2013	10.1037/a0031313	64/467	Well-being	NLD
Way BM	2010	10.1037/a0018312	57/105	Depression	USA
Mrazek MD	2012	10.1037/a0026678	54/261	Construct validation	USA
Murphy MJ	2012	10.1080/07448481.2011.629260	51/77	Physical health	USA
Heppner WL	2008	10.1002/ab.20258	135/45	Aggression	USA

Table 3 Top 20 author assigned keywords in the general corpus, the USA, and China

General	General frequency	USA keywords	USA frequency	China keywords	China frequency
Mindfulness	933	Mindfulness	409	Mindfulness	72
Dispositional mindfulness	118	Stress	41	Dispositional mindfulness	26
Depression	107	Depression	36	Trait mindfulness	15
Stress	97	Meditation	36	Emotion regulation	11
Anxiety	93	Anxiety	35	Adolescents	10
Emotion regulation	89	Emotion regulation	32	Anxiety	8
Meditation	80	Trait mindfulness	24	Depression	8
Trait mindfulness	63	Dispositional mindfulness	23	Mediation	8
Well-being	50	Substance use	23	Life satisfaction	7
Attention	44	Attention	19	Mental health	7
Adolescents	42	College students	18	Psychological distress	6
Rumination	40	Well-being	18	Resilience	6
Mental health	34	Coping	13	Rumination	6
Self-compassion	34	Emotion	13	Stress	6
Mediation	33	Mediation	12	Mediating effect	5
Emotion	32	Adolescence	11	Mindful parenting	5
Acceptance	27	Adolescents	11	Perceived stress	5
Substance use	27	Cortisol	11	Alexithymia	4
Resilience	26	Personality	11	Ambulatory assessment	4
Adolescence	22	Mental health	10	Oncology	4

a final cluster capturing labelling of mindfulness as either dispositional or trait. Finally, cutting at 50 degrees, three clusters were present. One clusters focused on mindfulness, mediation, and emotion regulation. The two other clusters remaining identical to the stress, anxiety, depression cluster, and the labelling of mindfulness cluster found for the 25 degree solution.

Temporal Changes in Trait Mindfulness Research

In the network structure covering 2003–2010 (we show all themes in Table 4 and in Fig. 2a, b), we found three niche themes: (1) reduction (key terms: reduction, generalized anxiety disorder; focusing on reducing general anxiety disorder); (2) personality (key terms: personality, consciousness, model, esteem; focusing on individual differences and self-esteem); and (3) the 5-factor model (key terms: 5-factor model, information, negative affect; focusing on specific avenues of information processing, this theme bordered on being a motor theme). A theme labelled "self-report" (key terms: self-report, awareness, meta-analysis, validation, amygdala, attention, dispositional mindfulness, prefrontal cortex, responses, scale; focusing on cognitive validations of self-report) bordered both motor themes and basic themes. In addition, we found three basic themes: (1) cognitive therapy (key terms: cognitive therapy, major depression, stress reduction, individual-differences; representing CBT and clinical depression or stress); (2) depression (key terms: depression, intervention, prevention, relapse, experiential avoidance, rumination, symptoms, parasuicide, therapy; focusing on wider mental-health research); and (3) meditation (key terms: meditation, inventory, anxiety, disorders, follow-up, mood, quality-of-life, stress reduction program; focusing on meditation, including well-being).

Examining the thematic networks during the period of 2011–2021, we found a slightly higher number of clusters compared to the previous timeframe. This was due to previous fields maturing into basic themes (indicating a growth of these research topics into larger connected areas that are internally less coherent). This was reflected in the clear presence of six basic themes: (1) validation (validation, questionnaire, self-report, psychometric properties, scale, personality, validity, inventory, college-students; focusing on questionnaire validation); (2) depression (depression, anxiety, intervention, cognitive therapy, symptoms, therapy, acceptance, facets, rumination, quality-of-life; focusing on clinical approaches to anxiety and depression); (3) mindfulness (key terms: mindfulness, individual-differences, dispositional, depressive symptoms, prevention; focusing on mindfulness and depression); (4) intervention (key terms: interventions, behavior, meta-analysis; focusing on synthesis of the intervention literature); (5) dispositional mindfulness

Table 4 Themes extracted from the dispositional mindfulness literature 2005–2010|2011–2021

2005–2010	
Label	Terms
5-Factor model	5-factor model, information, negative affect
Cognitive therapy	cognitive therapy, major depression, stress reduction, individual-differences
Depression	depression, intervention, prevention, relapse, experiential avoidance, rumination, symptoms, parasuicide, therapy
Meditation	meditation, inventory, anxiety, disorders, follow-up, mood, quality-of-life, stress reduction program
Personality	personality, consciousness, model, esteem
Reduction	reduction, generalized anxiety disorder
Self-report	self-report, awareness, metaanalysis, validation, amygdala, attention, dispositional mindfulness, prefrontal cortex, responses, scale
2011–2021	
Adverse childhood experiences	adverse childhood experiences, hippocampal
Depression	depression, anxiety, intervention, cognitive therapy, symptoms, therapy, acceptance, facets, rumination, quality-of-life, children, association, randomized controlled-trial, impact, adolescents, prevalence, associations, distress, commitment therapy, adults, disorders, mood, women, risk, resilience, chronic pain, posttraumatic-stress-disorder, psychological distress, predictors, psychopathology, sample, stress reduction mbsr, outcomes, students, people, population, ptsd, consequences, fear, individuals, management, weight-loss, adjustment, risk-factors, abuse, families, fit indexes, obesity, men, mothers, psychological, sleep, style, survivors, trauma, weight, comorbidity, cortisol, dialectical behavior-therapy, hospital anxiety, major depression, ptsd symptoms, smoking-cessation, stress reduction intervention, trial, anxiety sensitivity, blood-pressure, breast-cancer, child, consumption, disease, fatigue, follow-up, impulsivity, mediator, stress reduction program, youth, adherence, behaviors, flexibility, pregnancy, reduction mbsr, stress-reduction, version, veterans, young-children, achievement, cancer, depression scale, diagnosis, dysfunction, eating behavior, exercise, family, food, impairment, intensity, intimate partner violence, outpatients, postpartum, school, thoughts, vulnerability, wenchuan earthquake, anxiety disorders, awareness scale maas, behavior problems, cardiovascular-disease, cognitive emotion regulation, cognitive reactivity, common, decreases aggression, depressive relapse, desire, disturbance, duration, features, fit, functional dimensional approach, glycemic control, growth, hospital, implicit association test, index, marital conflict, mediators, mental-disorders, parents, pathology, positive psychology, postnatal, postnatal depression, psychological inflexibility, quarantine, state, trait-mindfulness, victimization, afghanistan, agreement, alternative medicine, appraisals, arousal, autism, bullying victimization, cancer recurrence, child-behavior, chinese, cognitive distraction, complementary, criteria, critical, deployment, dietary restraint, disaster, dsm-5, early maladaptive schemas, ecological momentary assessment, emotional distress, exposed adults, family caregivers, fear-avoidance, food-intake, hassles, help-seeking, hypersexual disorder, intellectual disability, inventory-ii, iraq, life-style, lung-cancer, marital-status, mediating, medication, mellitus, mental-health problems, national-guard, obese, participants, phq-9, physical-activity questionnaire, pilot, problems, psychological impact, randomized, reinforcement sensitivity theory, rheumatoid-arthritis, risk-factor, role, salivary, self-management, state worry questionnaire, stress-disorder, suicidal ideation, university-students
Dispositional mindfulness	dispositional mindfulness, emotion regulation, stress, health, benefits, model, reduction, mental-health, trait mindfulness, self-compassion, responses, life, negative affect, satisfaction, work, attachment, mediating role, burnout, perceived stress, foundations, self-esteem, self-regulation, aggression, care, well, happiness, reactivity, conflict, experiences, life satisfaction, job-satisfaction, self-determination theory, insomnia, decision-making, job-performance, perceptions, young-adults, emotional intelligence, mechanical turk, positive affect, workplace, emotional exhaustion, engagement, events, self-control, work engagement, communication, connectedness, determinants, discrimination, models, moderating role, optimism, resources, antecedents, commitment, intelligence, perceived, posttraumatic growth, psychological resilience, recovery, self-care, support, african-american, big 5, defining mindfulness, function, high-reliability, implicit, information, inhibition, internet, internet addiction, intrinsic motivation, job demands, maltreatment, of-life, panas, personality-traits, self-determination, transition, use, abusive supervision, adult, climate-change, close relationships, cognitive therapy mbct, coping strategies, depressive, employee, experiences questionnaire, hong-kong, job, latent profile analysis, marriage, mbsr, multitasking, neurovisceral integration, nonattachment, nurses, physical health, pro-environmental behavior, pursuit, salivary alpha-amylase, search, social anxiety disorder, subjective vitality, trait resilience, transactional leadership, transformational leadership, university, adversity, autonomy, body awareness, broaden, challenges, child-development, chinese young-adults, compassion fatigue, components, comprehensive inventory, connor-davidson resilience, conservation, determination, disclosure, executive, facebook, functional assessment, generalized anxiety, green, hatha yoga, health-care professionals, health behaviors, healthy, heart-rate, high-school, immune, injustice, instruments, intention, intrinsic, judgments, justice, labor, leisure-time, literacy, long-term survivors, machiavellianism, measurement invariance, mental stress, method variance, mindfulness-based therapy, missing data, motor, need satisfaction, needs, negative emotions, organizational stressors, precision, problem behavior, problematic smartphone use, psychological detachment, regulatory focus, rhythm, romantic partners, scores, self-concordance, session presence, state mindfulness, stressors, supervision, task-performance, test–retest reliability, theory perspective, therapist mindfulness, therapists, time-course, ventromedial prefrontal cortex, workers
Emotion	emotion, avoidance, regulation, physical-activity, experiential, shame, alexithymia, promotion, reflection, breast-cancer survivors, conditional process model, decision, feelings, incremental validity, perfectionism, posttraumatic-stress, psychology interventions, success
Interventions	interventions, behavior, metaanalysis, program, quality, motivation, gender, psychological stress, cortisol responses, psychosocial stress, controlled-trial, interoceptive awareness, values, skills, teachers, body-image, sex-differences, anorexia-nervosa, eating, ego depletion, media, overweight, relaxation, classroom, compassion meditation, goals, high-risk, home-practice, interference, knowledge, objectification, participation, self-focus, transcendental-meditation

Table 4 (continued)

2005–2010	
Meditation	meditation, stress reduction, attention, mechanisms, performance, awareness, brain, experience, self, mind, psychology, working-memory capacity, positive emotions, task, heart-rate-variability, compassion, memory, prefrontal cortex, reappraisal, working-memory, older-adults, neural responses, pain, attentional control, attitudes, cognition, cognitive, functional connectivity, anterior cingulate, executive control, perception, sustained attention, cognitive control, education, neuroscience, thought, age, default mode network, efficiency, flow, fmri, neural, time, age-differences, amygdala, bias, cortex, default-mode network, enhancement, erp components, executive-control, response-inhibition, resting-state, science, top-down, activation, connectivity, dynamics, elementary-school students, emotion-regulation, mindfulness meditation, modulation, network, pictures, sport, stimuli, trait anxiety, white-matter changes, anterior cingulate cortex, attenuation, brain mechanisms, brain potentials, capacity, cerebral-blood-flow, control, cortical thickness, default, default network, erp, event-related potentials, executive functions, failures, focused attention, functional-significance, increases, long-term meditation, meditation practitioners, negativity, neural mechanisms, neural system, p300, persistence, perspective-taking, potentials, practitioners, reduction intervention, reveals, safety, systems, variability, wandering mind, ability, adolescents taica, aerobic exercise, anterior insula, attention-deficit/hyperactivity disorder, attention awareness, barratt impulsiveness scale, brain activity, brain changes, brain networks, categorization, cingulate, cingulate cortex, cocaine, cognitive failures, coherence, competence, constructs, contingent negative-variation, default-mode, default mode, defining, depressive symptomatology, electrocortical response, extroversion, faces, habit, health-care, immune function, inhibitory control, insular cortex, lapses, lead, leader-member exchange, medial prefrontal cortex, meditation experience, mirror neurons, mode, mode network activity, moods lead, need, networks, organizations, oscillations, physiological condition, precuneus, publication bias, relationship, reward, robust, semantic coherence, sense, short-term meditation, social drinkers, social exclusion, state functional connectivity, strategy, stress-management, system, therapist, visual-cortex, young
Mindfulness	mindfulness, individual-differences, dispositional, depressive symptoms, prevention, relapse prevention, relapse, gender-differences, social support, substance use, efficacy, perspective, relationship satisfaction, trait, use disorders, neuroticism, alcohol, experiential avoidance, substance use disorders, united-states, addiction, adult attachment, alcohol-use, neuroendocrine, drinking, security, thought suppression, attentional bias, childhood, distress tolerance, drug-use, mediation, randomized-trial, borderline personality-disorder, couples, loving-kindness meditation, marital satisfaction, relationship quality, adolescence, affect, dependence, dsm-iv, exposure, mortality, oriented recovery enhancement, smoking, alcohol-consumption, alcohol dependence, facet mindfulness questionnaire, intimate-relationships, item response theory, motives, psychiatric-disorders, socioeconomic-status, cancer-patients, college, eating-disorders, negative, nicotine dependence, post-traumatic stress symptoms, relapse/recurrence, replication, smartphone addiction, social foundations, substance, abusers, affective instability, alcohol-use disorders, alliance, ambulatory blood-pressure, behavior-therapy, cessation, cue-reactivity, drinking motives, emotional reactivity, health survey, heavy drinking, maternal depression, mood disorders, occupational stress, partner, peer victimization, personality-disorders, regulation strategies, relationships, short-term, styles, toronto-alexithymia-scale, withdrawal, abstinence, action questionnaire-ii, addiction treatment, aggressive-behavior, antidepressant medication, audit-c, behavioral dysregulation, bipolar disorder, body-mass index, cancer-risk factors, child-behavior problems, childhood maltreatment, clinical-sample, cognitive-behavior therapy, cognitive reappraisal, community sample, concept differentiation, concordance, cues, daily-life stress, disorder symptoms, drug-addiction, early, expectancies, fagerstrom test, forgiveness, frontal systems, future-research, guidelines, health disparities, hedonic dysregulation, hypothesis, implicit theories, impulsiveness, innovation, interpersonal mindfulness, involuntary, lapse, latent class, life stress, marijuana use, measure camm, mediate, multiple imputation, national epidemiologic survey, negative mood regulation, nicotine, perceived discrimination, peritraumatic dissociation, protective role, psychological adjustment, psychological mindedness, quit smoking, recurrent depression, salivary cortisol, screen, sensation seeking, sexual, social connection, substance-abuse, suicide, survival, symptomatology, tendency, timeline followback, turnover intention, withdrawal dynamics, working
Orientation	orientation, gay men, reduce
Psychotherapy	psychotherapy, maintenance, romantic relationship satisfaction, relationship education, affect dysregulation, antidepressants, hexaco, initiation, integrity, regression, sexual-abuse
Validation	validation, questionnaire, self-report, psychometric properties, scale, personality, validity, inventory, college-students, attention awareness scale, disorder, construct-validity, psychological health, dysregulation, social anxiety, context, empathy, generalized anxiety disorder, initial validation, difficulties, self-efficacy, strategies, sensitivity, reliability, suppression, dimensions, psychometric, 5 facet mindfulness, 5 facets, construct, short-form, cognitive-behavioral therapy, german version, kentucky inventory, properties, traits, distraction, emotions, expression, esteem, facet, image, moderator, stability, states, anxiety stress scales, dissatisfaction, psychological symptoms, questionnaire ffmq, romantic relationships, severity, social, uncertainty, academic-performance, accuracy, adolescents rumination, appraisal, cognitive vulnerability, consciousness, indexes, low-back-pain, marital quality, meditators, normative data, of-fit indexes, positive, predictor, problematic internet use, recognition, scales, spanish version, threat, worry, 5-factor model, anger, authenticity, beliefs, effortful control, goodness-of-fit, identity, intolerance, mobile phone, personality-disorder, phobia, psychological flexibility, sample-size, schizophrenia, sleep quality, smokers, subjective happiness, translation, adaptation, adhd, alcohol cue-reactivity, american, antecedent, applied relaxation, catastrophizing scale, clinical-trial, cognitions, cognitive-behavioral analysis, confidence-intervals, confirmatory factor-analysis, covariance structure-analysis, culture, daily stressors, delay, dietary patterns, emerging adulthood, emotional, expressions, ffmq, football, harm, identification, impulse control, initial, intentions, invariance, japanese version, job burnout, kentucky, life events, maas, major, metacognition, mindfulness-based interventions, negative mood, number, obsessive–compulsive disorder, ocd, online, origins, package, perseverative cognition, police, preliminary validation, private self-consciousness, process model, prosocial behavior, psychoeducational intervention, recommendations, reducing, romantic relationship, self-disclosure, self-focused attention, self-objectification, self-perceptions, self-presentation, short version, social cognition, spirituality, substance-use disorders, tolerance, traumatic stress, urgency

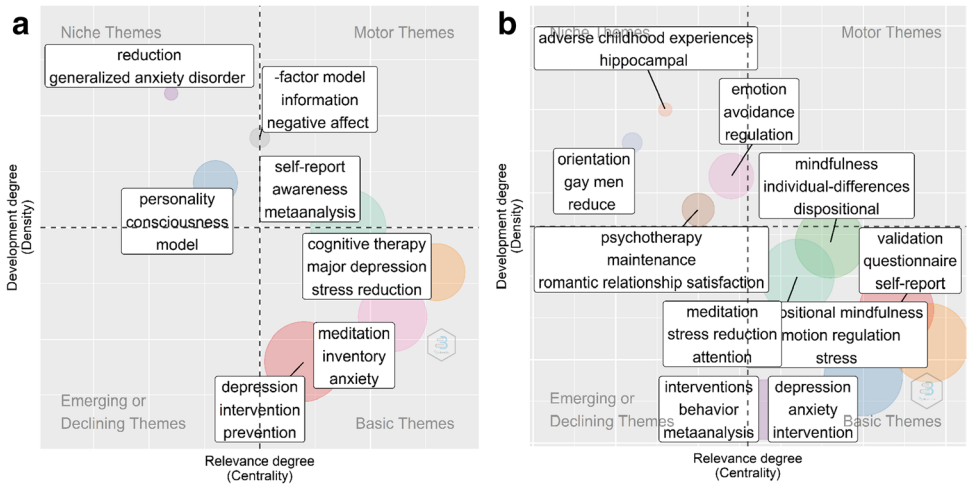

Fig. 2 Thematic maps from 2003 to 2010 (**a**) and from 2011 to 2021 (**b**)

(key terms: dispositional mindfulness, emotion regulation, stress, health, benefits, model, reduction, mental-health, trait mindfulness, self-compassion; focusing on mindfulness an general well-being); and (6) meditation (key terms: meditation, stress reduction, attention, mechanisms, performance, awareness; focusing on mindful meditation, stress reduction, and attentional processes). On the other hand, we found the emergence of four new niche themes: (1) orientation (key terms: orientation, gay men, reduce; focusing on LGBTQIA + topics); (2) adverse childhood experiences (key terms: adverse childhood experiences, hippocampal, focusing as mindfulness as protective factor); (3) psychotherapy (key terms psychotherapy, maintenance, romantic relationship satisfaction; focusing on the role of mindfulness in relationships); and (4) emotion (key terms: emotion, avoidance, regulation; focusing on the role of mindfulness in relation to avoidant emotion regulation strategies). We show the change of terms between categories together with the overlap of categories in Table 5 (visualized in Fig. 3).

Global Distribution of Trait Mindfulness Research

Looking at the geographic distribution of first authors' institutions, we found that the publications on dispositional

Table 5 Keywords changing cluster between time blocks

Themes 2003–2010	Themes 2011–2021	Words	Inclusion Index
5-Factor model—2003–2010	Dispositional mindfulness—2011–2021	Information; negative affect	.33
5-Factor model—2003–2010	Validation—2011–2021	5-Factor model	.33
Cognitive therapy—2003–2010	Depression—2011–2021	Cognitive therapy; major depression	.25
Cognitive therapy—2003–2010	Meditation—2011–2021	Stress reduction	.25
Cognitive therapy—2003–2010	Mindfulness—2011–2021	Individual-differences	.25
Depression—2003–2010	Depression—2011–2021	Depression; intervention; rumination; symptoms; therapy	.11
Depression—2003–2010	Mindfulness—2011–2021	Prevention; relapse; experiential avoidance	.11
Meditation—2003–2010	Depression—2011–2021	Anxiety; disorders; follow-up; mood; quality-of-life; stress reduction program	.13
Meditation—2003–2010	Meditation—2011–2021	Meditation	.13
Meditation—2003–2010	Validation—2011–2021	Inventory	.13
Personality—2003–2010	Dispositional mindfulness—2011–2021	Model	.25
Personality—2003–2010	Validation—2011–2021	Personality; consciousness; esteem	.25
Reduction—2003–2010	Dispositional mindfulness—2011–2021	Reduction	.50
Reduction—2003–2010	Validation—2011–2021	Generalized anxiety disorder	.50
Self-report—2003–2010	Dispositional mindfulness—2011–2021	Dispositional mindfulness; responses	.10
Self-report—2003–2010	Interventions—2011–2021	Metaanalysis	.10
Self-report—2003–2010	Meditation—2011–2021	Awareness; amygdala; attention; prefrontal cortex	.10
Self-report—2003–2010	Validation—2011–2021	Self-report; validation; scale	.10

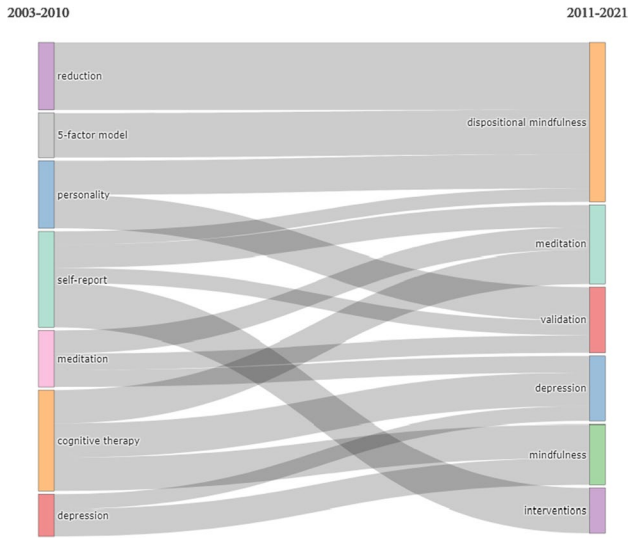

Fig. 3 Cluster change between thematic maps

mindfulness were substantially biased towards Europe, Australia, and North America (Fig. 4). The USA was the most productive country, accounting for 41.34% of all published documents, followed by China (10.17%), Canada (7.81%), Australia (6.26%), and the UK (5.31%). Importantly, the USA also had the lowest rate of multi-country studies (9.27%), indicating that the majority of scientific output on mindfulness focuses on USA-specific samples and issues. Interestingly, China not only had the second highest output of published documents on this topic of trait mindfulness (10.17%), but also showed a relatively high percentage (33.33%) of multi-country collaborations. To clarify the relationship between countries, we examined the collaboration network between countries based on co-authorships (Fig. 5). Overall, we found that the nodes with the highest strength were the USA (186), the UK (87), China (80), Netherland (52), and Australia (44), indicating that most cross-country collaborations included authors from these countries.

Cross-cultural Comparison of the Most Active Countries per Region: USA vs China

As China was the only non-American/non-European country among the top 10 countries, we compared the keywords applied by authors in China to keywords applied by US authors. Overall, we found 144 overlapping keywords, representing 9.375% of total words in the combined country set ($N = 1536$). Using only keywords that were present in both samples, we found a high correlation in usage frequency: $r(144) = 0.93$, $p < 0.001$. In contrast, we found a lower correlation between ranks for terms with a usage greater than 1 across countries: $r(40) = 0.505[0.501, 0.509]$, $p < 0.003[0.002, 0.003]$. This indicates there are several terms that are shared across countries, while each country also use unique terms.

Comparing the most frequently used keywords in the USA and China (see Table 3), we find similar patterns with sample descriptors and specific indicators of ill-being such as Anxiety and Depression, and Substance Abuse taking a higher place in the USA. The potentially most striking difference is (1) the absence of *Meditation* in the Chinese sub-network, which ranks relatively highly in the USA network and (2) the strong presence of statistical features such as *Mediation* in Chinese articles. We examined the country differences further by examining the twenty most cited

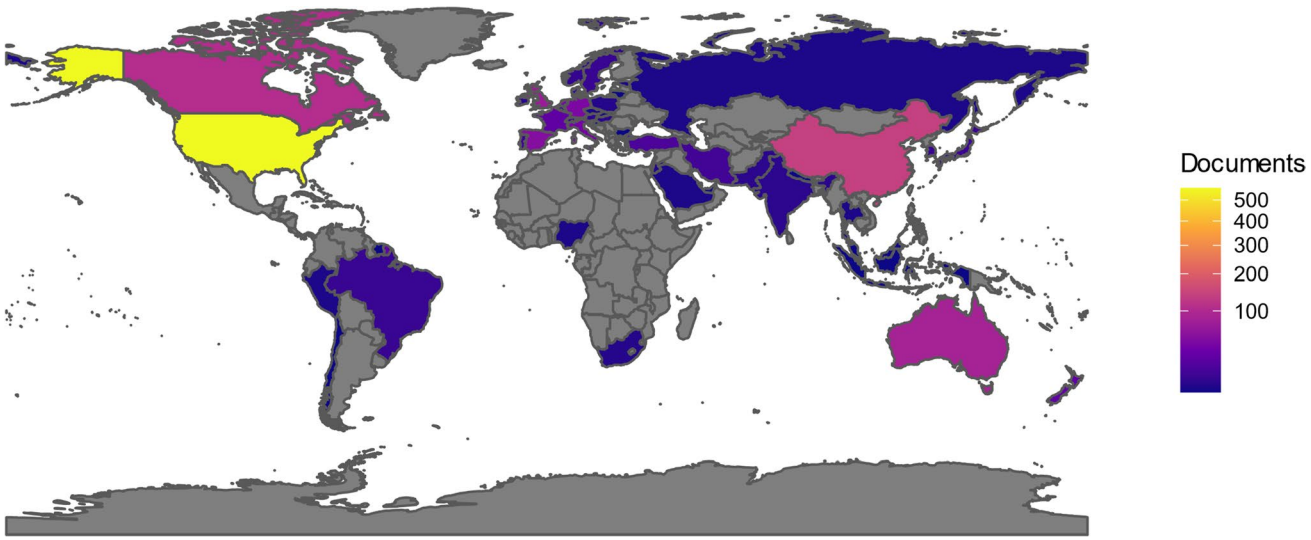

Fig. 4 Map of documents by country

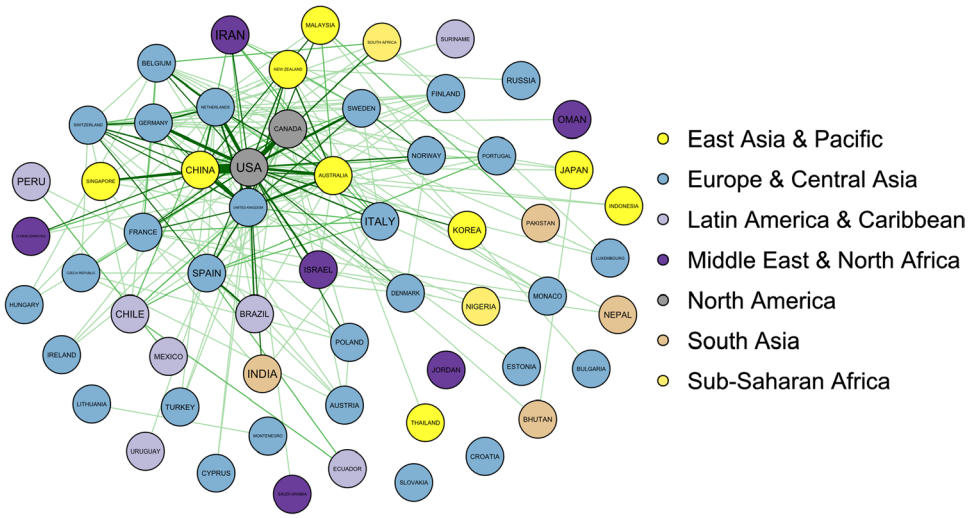

Fig. 5 Collaboration graph

papers in the reference section in each country's corpus. This helps us understand whether USA- and Chinese-based first authors rely on different sources for developing their research. We show the results in Table 6 (we also list the top cited papers in the Chinese corpus in Table 7, indicating which papers by China-based first authors had the largest impact on the field). Overall, we found an overlap of 60% in the top cited documents, suggesting that research in both countries draws on somewhat similar sources. Documents which appeared among the most cited papers in China but

Table 6 Local citations in US and Chinese corpora

US				China			
Author	Year	DOI	Freq	Author	Year	DOI	Freq
BROWN KW	2003	10.1037/0022–3514.84.4.822	359	BROWN KW	2003	10.1037/0022–3514.84.4.822	103
BAER RA	2006	10.1177/1073191105283504	309	BAER RA	2006	10.1177/1073191105283504	46
BISHOP SR	2004	10.1093/CLIPSY/BPH077	191	BISHOP SR	2004	10.1093/CLIPSY/BPH077	45
KABAT-ZINN	1990		135	KABAT-ZINN J	2003	10.1093/CLIPSY/BPG016	43
BROWN KW	2007	10.1080/10478400701598298	124	**DENG YQ**	2012	10.1007/S12671-011–0074-1	38
BAER RA	2008	10.1177/1073191107313003	109	BROWN KW	2007	10.1080/10478400701598298	35
KABAT-ZINN J	2003	10.1093/CLIPSY/BPG016	106	SHAPIRO SL	2006	10.1002/JCLP.20237	32
KABAT-ZINN J	1994		103	**PODSAKOFF PM**	2003	10.1037/0021–9010.88.5.879	30
BAER RA	2003	10.1093/CLIPSY/BPG015	91	KABAT-ZINN J	1994		23
BAER RA	2004	10.1177/1073191104268029	89	HOFMANN SG	2010	10.1037/A0018555	22
KENG SL	2011	10.1016/J.CPR.2011.04.006	83	KENG SL	2011	10.1016/J.CPR.2011.04.006	22
HOFMANN SG	2010	10.1037/A0018555	76	**HU LT**	1999	10.1080/10705519909540118	20
HOLZEL BK	2011	10.1177/1745691611419671	70	BAER RA	2008	10.1177/1073191107313003	19
CRESWELL JD	2007	10.1097/PSY.0B013E3180F6171F	67	**DENG Y.-Q**	2011	10.1007/S12671-011–0050-9	18
SHAPIRO SL	2006	10.1002/JCLP.20237	65	**HAYES AF**	2013		18
BARNES S	2007	10.1111/J.1752–0606.2007.00033.X	62	**GARLAND EL**	2015	10.1080/1047840X.2015.1092493	17
GROSSMAN P	2004	10.1016/S0022-3999(03)00,573–7	61	**WEINSTEIN N**	2009	10.1016/J.JRP.2008.12.008	17
CARMODY J	2008	10.1007/S10865-007–9130-7	58	BAER RA	2003	10.1093/CLIPSY/BPG015	16
BROWN KW	2012	10.1016/J.PSYNEUEN.2012.04.003	56	**GOLDIN PR**	2010	10.1037/A0018441	15
COHEN S	1983	10.2307/2136404	52	CARMODY J	2008	10.1007/S10865-007–9130-7	13
FELDMAN G	2007	10.1007/S10862-006–9035-8	52	**COFFEY KA**	2008	10.1177/1533210108316307	13
KABAT-ZINN J	1982	10.1016/0163–8343(82)90,026–3	52	KABAT-ZINN	1990		13
				THOMPSON RW	2011	10.1177/1524838011416375	13

Documents are bolded if they do not appear in the top-20 cited documents of the other country. In case of citation number ties, all documents are retained

Table 7 Most cited documents from China

First author	Year	DOI	WOS citations	Topic
Liu QQ	2017	10.1016/j.chb.2017.02.042	92	Sleep quality
Kong F	2014	10.1016/j.paid.2013.09.002	72	Life satisfaction
Bao X	2015	10.1016/j.paid.2015.01.007	62	Stress
Zhang J	2013	10.1016/j.paid.2013.04.004	39	Safety performance
Zhang J	2014	10.1016/j.aap.2014.03.006	38	Safety behavior
Wang X	2014	10.1016/j.neuroscience.2014.08.006	35	Default mode network
Yang X	2019	10.1007/s10826-018–01,323-2	33	Anxiety and depression
Lu H	2014	10.1016/j.neuroscience.2014.04.051	28	Brain structure
Kong F	2016	10.1080/17470919.2015.1092469	26	Well-being
Chan KKS	2017	10.1007/s12671-016–0675-9	25	Stigma

not the US focused around adaptation of scales (Deng et al., 2012), methodological and statistical questions (A. F. Hayes, 2013; Hu & Bentler, 1999; Podsakoff et al., 2003), well-being (Coffey & Hartman, 2008; Weinstein et al., 2009), resilience to trauma (Thompson et al., 2011), social anxiety (Goldin & Gross, 2010), and mindfulness theory (Garland et al., 2015). Documents which appeared among the most cited papers in the USA but not China were focused on mindfulness scale development (Baer et al., 2004), cognitive neuroscience (Brown et al., 2012; Creswell et al., 2007), mechanisms of meditation (Hölzel et al., 2011), romantic relationships (Barnes et al., 2007), well-being (Grossman et al., 2004; Kabat-Zinn, 1982), measurement of stress (Cohen et al., 1983), and emotion regulation (Feldman et al., 2007). Furthermore, we examined the top five cited articles that were not shared between the countries for each country. In the USA, these focused on substance abuse (Bowen et al., 2009; Chiesa & Serretti, 2014), mindfulness measurement (Grossman, 2008), the relationship between mindfulness, anxiety and depression (Desrosiers et al., 2013), intimate relationships (Wachs & Cordova, 2007), and experiential avoidance (S. C. Hayes et al., 1996). In China, the articles were focused on phone addiction (Jun, 2016; Leung, 2008; Liu et al., 2017; Seo et al., 2016), resilience to the psychological effects of natural disasters (Hagen et al., 2016; Lyu et al., 2017; Xiao et al., 2014; Xu et al., 2018; Ying et al., 2013), biological underpinnings of mindfulness (Creswell, 2015), mental health (Yang et al., 2003), emotional intelligence (Kong & Zhao, 2013), cultural adaptations of scales (Chen et al., 2012; Gong et al., 2010), and PTSD (Foa et al., 2001; Hagen et al., 2016).

Discussion

Our current study aimed to provide a mapping of the research spaces investigating trait mindfulness. A few findings stand out, leading to two important considerations about the current research on trait mindfulness: one being the unequal distribution of mindfulness research globally and possible implications for our understanding of trait mindfulness, the other is the focus on clinical and health outcomes.

Global Distribution of Mindfulness Research

First, resembling psychology as a wider field (Henrich, 2020), we found a dominance of US and European researchers in the field of mindfulness. Especially US-based first authors showed a low likelihood to collaborate with other colleagues internationally. If they did, they enjoyed a high centrality in the collaborators network, indicating that a substantial body of work on mindfulness is exclusively focused on US samples. The high collaboration statistics also suggest that research on trait mindfulness in other countries often included US perspectives. Given the historical origin of mindfulness as a Buddhist philosophical construct, this finding of Western researchers and perspectives raises questions and possible challenges about the current conceptualization and authenticity, from a Buddhist perspective, of the construct of mindfulness, which already has received some discussion (Grossman & Dam, 2011). An encouraging trend is that this is being recognized as seen by the central position of this paper in studies being published by US-based authors. Furthermore, there is increasing awareness that individual difference measures aimed at capturing trait mindfulness such as the FFMQ may perform sub-optimally in non-WEIRD (Western, educated, industrialized, rich, and democratic) populations (Christopher et al., 2009; Karl et al., 2020), which in turn has led to the development of alternative and more culturally aligned measures by researchers (Ng & Wang, 2021). If research on trait mindfulness fails to incorporate more diverse non-WEIRD perspectives, this might not only result in operational definitions of trait mindfulness that are not universally accessible, but also may fail to meet the different needs of populations around the globe. This becomes apparent looking at the different use of keywords in the two biggest producers of research, one based

in the Global West (USA) and the other based in the Global East (China).

In both countries, researchers focused on well-being outcomes, yet the relative priority was markedly different. Whereas in the USA substance abuse was a major target of research (potentially as a reaction to the ongoing Opioid epidemic in the United States; Manchikanti et al., 2012), this was absent in China when examining the major research trends as indicated by keywords. Interestingly, a range of papers that were highly cited in China compared to the US focused on phone addiction, which has been a substantial topic of both societal concern and research in the Chinese context (Li & Lin, 2019; Ni et al., 2009). Taken together, this showcases how trait mindfulness is shaped by the needs of individual cultures and highlights the need to carefully consider the research context of current trait mindfulness studies.

Furthermore, while the keyword "meditation" was a central research topic connected to trait mindfulness in the USA, it was again absent in China. It might be that the term "meditation" has different, possibly more spiritual or religious connotations and therefore it is not used by authors within Chinese research institutes (for a special issue on cultural conceptualizations of mindfulness see; Kirmayer, 2015). Interestingly, a common term in both countries was *Mediation*, indicating that a substantial portion of research on trait mindfulness does not research direct relationships, but rather tests more complex path models (for the most highly cited examples in the current set see: Demarzo et al., 2014; Iani et al., 2017; Nitzan-Assayag et al., 2015). When examining the unique high impact citations driving research in China and the USA, we found a reflection of this pattern with a substantial number of references in the USA focusing on meditation or mindfulness practice (Carmody & Baer, 2008; Grossman et al., 2004; Hölzel et al., 2011), whereas uniquely important references in China focused on methodological concerns (Deng et al., 2012; A. F. Hayes, 2013; Hu & Bentler, 1999; Podsakoff et al., 2003). Interestingly, we also found that the top three key terms in China were labels of mindfulness (mindfulness, trait mindfulness, dispositional mindfulness), whereas in the USA authors seem to elaborate less on the label mindfulness and specific terms (trait or dispositional mindfulness) are of lower importance compared to outcome-focused keywords.

Second, while examining key terms and their development, we found an increasing consolidation of trait mindfulness research into distinct clusters and a strong focus on outcomes compared to predictors. Examining the thematic maps of overall keywords related to trait mindfulness, we found that a major split in the research field exists between research focusing on MBSRs and basic cognitive processes, and a more diverse field containing personality and positive psychology. Narrowing down further this central cluster separated into three clusters, the emergent clusters captured different clinical approaches centred around adolescents, general research on emotion regulation, and a cluster specifically focused on anxiety, stress, and depression. Overall, breaking apart the keywords used in conjunction with trait mindfulness reveals that the field is mostly split into cognitive research and outcome-focused clinical research.

Zooming out to the broader trends in the literature, the result of the keyword analysis is mirrored in the development of the themes overall across the time period. Overall, research on mindfulness has consolidated into distinct subfields over the last two decades. Research topics such as personality and individual differences, over time, became less of a separate focus and merged with the wider literature on stress reduction. This might represent an increasing focus of research on clinically relevant outcomes with mechanism and individual differences subsumed under these topics. Interestingly, a distinct subfield has emerged that focused on psychometric approaches to mindfulness, indicating the increasing emphasis in the field to consolidate and validate measurements of mindfulness (Andrei et al., 2016; Karl & Fischer, 2020; Karl et al., 2020; Siegling & Petrides, 2014, 2016). In contrast, the thematic maps show an emergence of new clusters that focus on specific subtopics such as LGBTQIA + related topics and topics surrounding romantic relationships. Overall, research on trait mindfulness has consolidated around psychometric issues and outcome-focused topics such as stress, well-being, and clinical interventions. This reveals a potential imbalance within the field, with increasing focus on outcomes, while less research is conducted on potential predictors of mindfulness. To achieve a fuller understanding of dispositional mindfulness, it is essential to address potential predictors given the complex causal interplay between mindfulness and established individual differences such as personality (Karl et al., 2021) and situational variables such as affect (Karl & Fischer, 2021; Mahlo & Windsor, 2021).

Limitations and Future Research

One major limitation of our current work lies in the database (Web of Science) used. Our current source might miss papers that are not indicated in the WoS or not formally published (so-called grey literature). Our search also relied on author (or publisher) assigned key terms to identify articles of interest. Furthermore, while the bibliometric approach we utilised allows us to describe the relationship between keywords that are present in the corpus, it cannot provide information about keywords that are not present and can also not provide information on which keywords from the nomological network are absent. Additionally, our use of English language search terms leave open the question how terms used in other languages map onto our selected key terms.

Last, given the substantial body of literature resulting from our search, we focus on broad trends that do not allow for a narrative review or the identification of more qualitative and nuanced trends of the research field. We provide our full database on the Open Science Framework to allow interested researchers to explore more narrow sub-topics.

Utilizing a bibliometric approach to provide a high-level perspective, our research indicates that the field of trait mindfulness is maturing and quite distinct areas focusing on cognitive attentional processes and clinical interventions have emerged, with a strong focus of the field on outcomes of mindfulness, including both applied and in basic attentional processes. In contrast, potential predictors of trait mindfulness, such as cultural and individual differences, are less developed in recent thematic networks. The increasing interest in measurement and validity of current mindfulness constructs (manifested in the emergent themes around scale validity) might present an opportunity to more closely examine the nomological network of mindfulness and individual differences, as well as cultural differences in mindfulness.

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Author Contribution JAK: designed and executed the study, conducted the data analyses, and wrote the paper. RF: collaborated with the design, writing of the study, and analysis of the data.

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References

Andrei, F., Vesely, A., & Siegling, A. B. (2016). An examination of concurrent and incremental validity of four mindfulness scales. *Journal of Psychopathology and Behavioral Assessment, 38*(4), 559–571. https://doi.org/10.1007/s10862-016-9546-x

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics, 11*(4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007

Baer, R. A. (2006). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125–143. https://doi.org/10.1093/clipsy.bpg015

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report. *Assessment, 11*(3), 191–206. https://doi.org/10.1177/1073191104268029

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45. https://doi.org/10.1177/1073191105283504

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment, 15*(3), 329–342. https://doi.org/10.1177/1073191107313003

Baminiwatta, A., & Solangaarachchi, I. (2021). Trends and developments in mindfulness research over 55 years: A bibliometric analysis of publications indexed in web of science. *Mindfulness, 12*(9), 2099–2116. https://doi.org/10.1007/s12671-021-01681-x

Barnes, S., Brown, K. W., Krusemark, E., Campbell, W. K., & Rogge, R. D. (2007). The role of mindfulness in romantic relationship satisfaction and responses to relationship stress. *Journal of Marital and Family Therapy, 33*(4), 482–500. https://doi.org/10.1111/j.1752-0606.2007.00033.x

Bowen, S., Chawla, N., Collins, S. E., Witkiewitz, K., Hsu, S., Grow, J., Clifasefi, S., Garner, M., Douglass, A., Larimer, M. E., & Marlatt, A. (2009). Mindfulness-based relapse prevention for substance use disorders: A pilot efficacy trial. *Substance Abuse, 30*(4), 295–305. https://doi.org/10.1080/08897070903250084

Brown, K. W., Weinstein, N., & Creswell, J. D. (2012). Trait mindfulness modulates neuroendocrine and affective responses to social evaluative threat. *Psychoneuroendocrinology, 37*(12), 2037–2041. https://doi.org/10.1016/j.psyneuen.2012.04.003

Callon, M., Courtial, J. P., & Laville, F. (1991). Co-word analysis as a tool for describing the network of interactions between basic and technological research: The case of polymer chemsitry. *Scientometrics, 22*(1), 155–205. https://doi.org/10.1007/BF02019280

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23–33. https://doi.org/10.1007/s10865-007-9130-7

Carpenter, J. K., Conroy, K., Gomez, A. F., Curren, L. C., & Hofmann, S. G. (2019). The relationship between trait mindfulness and affective symptoms: A meta-analysis of the Five Facet Mindfulness Questionnaire (FFMQ). *Clinical Psychology Review, 74*, 101785. https://doi.org/10.1016/j.cpr.2019.101785

Chen, S., Gui, H., Zhou, R., & Jia, Y. Y. (2012). Revision of Mindful Attention Awareness Scale(MAAS). *Chinese Journal of Clinical Psychology*, *20*, 148–151. https://doi.org/10.16128/j.cnki.1005-3611.2012.02.024

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31*(3), 449–464. https://doi.org/10.1016/j.cpr.2010.11.003

Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse, 49*(5), 492–512. https://doi.org/10.3109/10826084.2013.770027

Christopher, M. S., Christopher, V., & Charoensuk, S. (2009). Assessing "Western" mindfulness among Thai Theravāda buddhist monks. *Mental Health, Religion & Culture, 12*(3), 303–314. https://doi.org/10.1080/13674670802651487

Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application

to the Fuzzy Sets Theory field. *Journal of Informetrics, 5*(1), 146–166. https://doi.org/10.1016/j.joi.2010.10.002

Coffey, K. A., & Hartman, M. (2008). Mechanisms of action in the inverse relationship between mindfulness and psychological distress. *Complementary Health Practice Review, 13*(2), 79–91. https://doi.org/10.1177/1533210108316307

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396. https://doi.org/10.2307/2136404

Creswell, J. D. (2015). Biological pathways linking mindfulness with health. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.), *Handbook of mindfulness: Theory, research, and practice* (pp. 426–440). The Guilford Press.

Creswell, J. D. (2017). Mindfulness interventions. *Annual Review of Psychology, 68*(1), 491–516. https://doi.org/10.1146/annurev-psych-042716-051139

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69*(6), 560–565. https://doi.org/10.1097/PSY.0b013e3180f6171f

MMPM Demarzo JPD Montero-Marin PKPD Stein APD Cebolla JGPD Provinciale JM García-Campayo 2014 Mindfulness may both moderate and mediate the effect of physical fitness on cardiovascular responses to stress: A speculative hypothesis Frontiers in Physiology 5 https://doi.org/10.3389/fphys.2014.00105

Deng, Y.-Q., Li, S., Tang, Y.-Y., Zhu, L.-H., Ryan, R., & Brown, K. (2012). Psychometric properties of the Chinese translation of the Mindful Attention Awareness Scale (MAAS). *Mindfulness, 3*(1), 10–14. https://doi.org/10.1007/s12671-011-0074-1

Desrosiers, A., Klemanski, D. H., & Nolen-Hoeksema, S. (2013). Mapping mindfulness facets onto dimensions of anxiety and depression. *Behavior Therapy, 44*(3), 373–384. https://doi.org/10.1016/j.beth.2013.02.001

Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J.-P. (2007). Mindfulness and emotion regulation: The development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment, 29*(3), 177–190. https://doi.org/10.1007/s10862-006-9035-8

R Fischer T Bortolini JA Karl M Zilberberg K Robinson A Rabelo L Gemal D Wegerhoff TBT Nguyễn B Irving M Chrystal P Mattos 2020 Rapid review and meta-meta-analysis of self-guided interventions to address anxiety, depression, and stress during COVID-19 social distancing Frontiers in Psychology 11 https://doi.org/10.3389/fpsyg.2020.563876

Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality and Social Psychology, 80*(6), 1011–1027. https://doi.org/10.1037/0022-3514.80.6.1011

Fleeson, W., & Jayawickreme, E. (2015). Whole trait theory. *Journal of Research in Personality, 56*, 82–92. https://doi.org/10.1016/j.jrp.2014.10.009

Foa, E. B., Johnson, K. M., Feeny, N. C., & Treadwell, K. R. (2001). The child PTSD Symptom Scale: A preliminary examination of its psychometric properties. *Journal of Clinical Child Psychology, 30*(3), 376–384. https://doi.org/10.1207/S15374424JCCP3003_9

Garland, E. L., Farb, N. A., Goldin, P. R., & Fredrickson, B. L. (2015). The mindfulness-to-meaning theory: Extensions, applications, and challenges at the attention–appraisal–emotion interface. *Psychological Inquiry, 26*(4), 377–387. https://doi.org/10.1080/1047840X.2015.1092493

Goldin, P. R., & Gross, J. J. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion, 10*(1), 83–91. https://doi.org/10.1037/a0018441

Gong, X., Xie, X., Xu, R., & Luo, Y. (2010). Psychometric properties of the chinese versions of dass-21 in chinese college students. *Chinese Journal of Clinical Psychology*, *18*(4), 443–446. https://doi.org/10.16128/j.cnki.1005-3611.2010.04.020

Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research, 64*(4), 405–408. https://doi.org/10.1016/j.jpsychores.2008.02.001

Grossman, P., & Dam, N. T. V. (2011). Mindfulness, by any other name…: Trials and tribulations of sati in Western psychology and science. *Contemporary Buddhism, 12*(1), 219–239. https://doi.org/10.1080/14639947.2011.564841

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research, 57*(1), 35–43. https://doi.org/10.1016/S0022-3999(03)00573-7

Hagen, C., Lien, L., Hauff, E., & Trond, H. (2016). Mindfulness, sustained attention and post-traumatic stress in tsunami survivors. *Psychology and Cognitive Sciences, 2*(2), 54–63.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (pp. xvii, 507). Guilford Press.

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Al, E. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152–1168. https://doi.org/10.1037//0022-006X.64.6.1152

Henrich, J. (2020). *The WEIRDest people in the world: How the West became psychologically peculiar and particularly prosperous*. Farrar.

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science, 6*(6), 537–559. https://doi.org/10.1177/1745691611419671

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Iani, L., Lauriola, M., Cafaro, V., & Didonna, F. (2017). Dimensions of mindfulness and their relations with psychological well-being and neuroticism. *Mindfulness, 8*(3), 664–676. https://doi.org/10.1007/s12671-016-0645-2

Jun, S. (2016). The reciprocal longitudinal relationships between mobile phone addiction and depressive symptoms among Korean adolescents. *Computers in Human Behavior, 58*, 179–186. https://doi.org/10.1016/j.chb.2015.12.061

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*(1), 33–47. https://doi.org/10.1016/0163-8343(82)90026-3

Karl, J. A., & Fischer, R. (2020). Revisiting the five-facet structure of mindfulness. *Measurement Instruments for the Social Sciences, 2*(1), 7. https://doi.org/10.1186/s42409-020-00014-3

Karl, J. A., & Fischer, R. (2021). *Affect and state mindfulness*. https://doi.org/10.31234/osf.io/jqhu7

Karl, J. A., Fischer, R., & Jose, P. E. (2021). The development of mindfulness in young adults: The relationship of personality, reinforcement sensitivity, and mindfulness. *Mindfulness, 12*, 1103–1114. https://doi.org/10.1007/s12671-020-01576-3

Karl, J. A., Johnson, F. N., Bucci, L., & Fischer, R. (2022). In search of mindfulness: A review and reconsideration of cultural dynamics from a cognitive perspective. *Journal of the Royal Society of New Zealand, 52*(2), 168–191. https://doi.org/10.1080/03036758.2021.1915804

Karl, J. A., Méndez Prado, S. M., Gračanin, A., Verhaeghen, P., Ramos, A., Mandal, S. P., Michalak, J., Zhang, C.-Q., Schmidt, C., Tran, U. S., Druica, E., Solem, S., Astani, A., Liu, X., Luciano, J. V.,

Tkalčić, M., Lilja, J. L., Dundas, I., Wong, S. Y. S. Y., & Fischer, R. (2020). The cross-cultural validity of the Five-Facet Mindfulness Questionnaire across 16 countries. *Mindfulness, 11*, 1226–1237. https://doi.org/10.1007/s12671-020-01333-6

Karyadi, K. A., VanderVeen, J. D., & Cyders, M. A. (2014). A meta-analysis of the relationship between trait mindfulness and substance use behaviors. *Drug and Alcohol Dependence, 143*, 1–10. https://doi.org/10.1016/j.drugalcdep.2014.07.014

Kee, Y. H., Li, C., Kong, L. C., Tang, C. J., & Chuang, K.-L. (2019). Scoping review of mindfulness research: A topic modelling approach. *Mindfulness, 10*(8), 1474–1488. https://doi.org/10.1007/s12671-019-01136-4

Keng, S.-L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*(6), 1041–1056. https://doi.org/10.1016/j.cpr.2011.04.006

Kirmayer, L. J. (2015). Mindfulness in cultural context. *Transcultural Psychiatry, 52*(4), 447–469. https://doi.org/10.1177/1363461515598949

Kong, F., & Zhao, J. (2013). Affective mediators of the relationship between trait emotional intelligence and life satisfaction in young adults. *Personality and Individual Differences, 54*(2), 197–201. https://doi.org/10.1016/j.paid.2012.08.028

Krägeloh, C. (2020). Mindfulness research and terminology science. 마음공부*[Mindful Practice]*, *1*(53–84).

Lee, J., Kim, K. H., Webster, C. S., & Henning, M. A. (2021). The evolution of mindfulness from 1916 to 2019. *Mindfulness, 12*(8), 1849–1859. https://doi.org/10.1007/s12671-021-01603-x

Leung, L. (2008). Linking psychological attributes to addiction and improper use of the mobile phone among adolescents in hong kong. *Journal of Children and Media, 2*(2), 93–113. https://doi.org/10.1080/17482790802078565

Li, L., & Lin, T. T. C. (2019). Over-connected? A qualitative exploration of smartphone addiction among working adults in China. *BMC Psychiatry, 19*(1), 186. https://doi.org/10.1186/s12888-019-2170-z

Liu, Q.-Q., Zhou, Z.-K., Yang, X.-J., Kong, F.-C., Niu, G.-F., & Fan, C.-Y. (2017). Mobile phone addiction and sleep quality among Chinese adolescents: A moderated mediation model. *Computers in Human Behavior, 72*, 108–114. https://doi.org/10.1016/j.chb.2017.02.042

Lyu, H.-M., Wang, G.-F., Cheng, W.-C., & Shen, S.-L. (2017). Tornado hazards on June 23 in Jiangsu Province, China: Preliminary investigation and analysis. *Natural Hazards, 85*(1), 597–604. https://doi.org/10.1007/s11069-016-2588-2

Y Ma KM Kraemer J Lyu GY Yeh 2021 Randomized controlled trials of mindfulness and acceptance-based interventions over the past two decades: A bibliometric analysis The Journal of Alternative and Complementary Medicine https://doi.org/10.1089/acm.2020.0548

L Mahlo TD Windsor 2021 State mindfulness and affective well-being in the daily lives of middle-aged and older adults Psychology and Aging, No Pagination Specified-No Pagination Specified. https://doi.org/10.1037/pag0000596

Manchikanti, L., Helm, S., Fellows, B., Janata, J. W., Pampati, V., Grider, J. S., & Boswell, M. V. (2012). Opioid epidemic in the United States. *Pain Physician*, *15*(3 Suppl), ES9–38.

Mesmer-Magnus, J., Manapragada, A., Viswesvaran, C., & Allen, J. W. (2017). Trait mindfulness at work: A meta-analysis of the personal and professional correlates of trait mindfulness. *Human Performance, 30*(2–3), 79–98. https://doi.org/10.1080/08959285.2017.1307842

Ng, S., & Wang, Q. (2021). Measuring mindfulness grounded in the original Buddha's discourses on meditation practice. In A. L. Ai, P. Wink, R. F. Paloutzian, & K. A. Harris (Eds.), *Assessing spirituality in a diverse world* (pp. 355–381). Springer International Publishing. https://doi.org/10.1007/978-3-030-52140-0_15

Ni, X., Yan, H., Chen, S., & Liu, Z. (2009). Factors influencing internet addiction in a sample of freshmen university students in china. *CyberPsychology & Behavior, 12*(3), 327–330. https://doi.org/10.1089/cpb.2008.0321

Nitzan-Assayag, Y., Aderka, I. M., & Bernstein, A. (2015). Dispositional mindfulness in trauma recovery: Prospective relations and mediating mechanisms. *Journal of Anxiety Disorders, 36*, 25–32. https://doi.org/10.1016/j.janxdis.2015.07.008

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

R Core Team. (2021). *R: The R Project for Statistical Computing*. https://www.r-project.org/

Sala, M., Rochefort, C., Lui, P. P., & Baldwin, A. S. (2020). Trait mindfulness and health behaviours: A meta-analysis. *Health Psychology Review, 14*(3), 345–393. https://doi.org/10.1080/17437199.2019.1650290

Seo, D. G., Park, Y., Kim, M. K., & Park, J. (2016). Mobile phone dependency and its impacts on adolescents' social and academic behaviors. *Computers in Human Behavior, 63*, 282–292. https://doi.org/10.1016/j.chb.2016.05.026

Siegling, A. B., & Petrides, K. V. (2014). Measures of trait mindfulness: Convergent validity, shared dimensionality, and linkages to the five-factor model. *Frontiers in Psychology, 5*, 1164. https://doi.org/10.3389/fpsyg.2014.01164

Siegling, A. B., & Petrides, K. V. (2016). Zeroing in on mindfulness facets: Similarities, validity, and dimensionality across three independent measures. *PLoS ONE, 11*(4), e0153073. https://doi.org/10.1371/journal.pone.0153073

Thompson, R. W., Arnkoff, D. B., & Glass, C. R. (2011). Conceptualizing mindfulness and acceptance as components of psychological resilience to trauma. *Trauma, Violence, & Abuse, 12*(4), 220–235. https://doi.org/10.1177/1524838011416375

Valerio, A. (2016). Owning mindfulness: A bibliometric analysis of mindfulness literature trends within and outside of Buddhist contexts. *Contemporary Buddhism, 17*(1), 157–183. https://doi.org/10.1080/14639947.2016.1162425

Van Dam, N. T., van Vugt, M. K., Vago, D. R., Schmalzl, L., Saron, C. D., Olendzki, A., Meissner, T., Lazar, S. W., Kerr, C. E., Gorchov, J., Fox, K. C. R., Field, B. A., Britton, W. B., Brefczynski-Lewis, J. A., & Meyer, D. E. (2018). Mind the hype: A critical evaluation and prescriptive agenda for research on mindfulness and meditation. *Perspectives on Psychological Science : A Journal of the Association for Psychological Science, 13*(1), 36–61. https://doi.org/10.1177/1745691617709589

Wachs, K., & Cordova, J. V. (2007). Mindful relating: Exploring mindfulness and emotion repertoires in intimate relationships. *Journal of Marital and Family Therapy, 33*(4), 464–481. https://doi.org/10.1111/j.1752-0606.2007.00032.x

Weinstein, N., Brown, K. W., & Ryan, R. M. (2009). A multi-method examination of the effects of mindfulness on stress attribution, coping, and emotional well-being. *Journal of Research in Personality, 43*(3), 374–385. https://doi.org/10.1016/j.jrp.2008.12.008

Xiao, Z., Xinchun, W. U., Yuanyuan, A. N., & Jieling, C. (2014). The roles of rumination and social support in the associations between core belief challenge and post-traumatic growth among adolescent survivors after the Wenchuan earthquake. *Acta Psychologica Sinica, 46*(10), 1509. https://doi.org/10.3724/SP.J.1041.2014.01509

Xu, W., Fu, G., An, Y., Yuan, G., Ding, X., & Zhou, Y. (2018). Mindfulness, posttraumatic stress symptoms, depression, and social functioning impairment in Chinese adolescents following a tornado: Mediation of posttraumatic cognitive change. *Psychiatry Research, 259*, 345–349. https://doi.org/10.1016/j.psychres.2017.09.088

Yang, T., Huang, L., & Wu, Z. (2003). The application of Chinese health questionnaire for mental disorder screening in community settings in mainland China. *Zhonghua Liu Xing Bing Xue Za Zhi, 24*(9), 769–773.

Ying, L., Wu, X., Lin, C., & Chen, C. (2013). Prevalence and predictors of posttraumatic stress disorder and depressive symptoms among child survivors 1 year following the Wenchuan earthquake in China. *European Child & Adolescent Psychiatry, 22*(9), 567–575. https://doi.org/10.1007/s00787-013-0400-3