

Mental health, yoga, and other holistic movement practices: A relationship worth investigating

Ineke Vergeer

Stuart Biddle

University of Southern Queensland

Yoga is an ancient Indian practice that has undergone many transitions and reinterpretations over time (Goldberg, 2016) and is currently mostly practised as what is called “modern postural yoga” (De Michelis, 2004). While yoga has received extensive attention within the field of complementary and integrative medicine (Jeter, Slutsky, Singh, & Khalsa, 2015), the attitudes towards yoga within the field of physical activity appear somewhat mixed (Brinsley, Girard, Smout, & Davison, 2021). Illustrative in this is the stance of this journal, *Mental Health & Physical Activity* (MENPA), which has so far adopted a policy of not considering manuscripts on yoga and other such practices “because of the challenges of separating out the effects of physical activity” (email communication with editor Professor Adrian Taylor, 18.4.2020). In this commentary, we argue that a) yoga, and other similar practices, deserve to be considered as forms of physical activity, and in particular in relation to mental health, b) complexity is a challenge but not a reason to disregard these practices, and this challenge is not unsurmountable, and c) complexity is not absent from other physical activity contexts when it comes to mental health.

Forms of physical activity

Yoga, along with tai chi, qigong, and a range of other modern-day physical practices, is a multicomponent practice where physical activity is purposefully combined with mental and other elements, guided by a holistic philosophy of well-being. Vergeer, Johansson, and Cagas (2021) have recently proposed to treat such activities as a category of physical activity,

referred to as “holistic movement practices” (HMPs). While their multicomponent nature may be challenging for research, HMPs are nevertheless forms of movement that increasingly feature in the landscape of physical activities in modern-day society (Brinsley et al., 2021; Vergeer et al., 2017; Wang, Li, Choudhury, & Gaylord, 2019). This is evident, for example, in yoga classes often being offered in fitness clubs (Cartwright, Mason, Porter, & Pilkington, 2020), in people mentioning yoga and tai chi in response to physical activity surveillance studies (Vergeer et al., 2017), and in participants’ perceptions of yoga (Cagas, Biddle, & Vergeer, submitted). Furthermore, they fit with the traditional definition of physical activity (Brinsley et al., 2021; Caspersen, Powell, & Christensen, 1985). As physical activity constitutes an important physical and mental health behaviour, and physical activity levels are low globally, any additional forms of physical activity that widen the choice of options can only be beneficial.

Their embedding in holistic philosophies of well-being means that HMPs are explicitly designed to have effects beyond the physical to include mental, social, and/or spiritual well-being (Vergeer et al., 2021). This may involve, for example, calming the mind, developing self-compassion, training mindfulness skills, cultivating increasingly subtle body awareness and control, enhancing eudaimonic well-being, and learning to relate authentically to self, others, and the transpersonal (Larkey, Jahnke, Etnier, & Gonzalez, 2009; Schmalzl, Powers, & Blom, 2015; Sullivan, Moonaz, Weber, Taylor, & Schmalzl, 2018; Vergeer, 2018). Given both their physical nature and the purposeful attention to psychological issues, therefore, we believe that HMPs deserve attention in a journal like MENPA.

The reason for building an evidence-based body of knowledge about the relationship between physical activity and mental health is presumably to use that knowledge in designing strategies, interventions, and policies with a goal to improve and maintain good mental health

through physical activities. Establishing a body of knowledge about the role of different types or categories of physical activity, including HMPs, can only help this cause.

Complexity

How are HMPs complex?

The complexity of yoga and other HMPs is expressed in the inclusion of multiple components (Field, 2016; Park et al., 2018; Vergeer et al., 2021; Wayne & Kaptchuk, 2008a), which are not only physical but also psychological (mental, emotional, cognitive), and sometimes psycho-physiological, psycho-social and/or psycho-spiritual in nature. These components may occur in separate units (e.g., breathing or meditation exercises interspersed with physical poses) or may be rolled into one (e.g., purposeful breathing during the execution of physical poses while maintaining a mindful attitude, or visualizing energy during movement). Furthermore, the embedding in holistic philosophies may create specific attributes of psychosocial climates (e.g., emphasis on an attitude of observation and acceptance) that contributes to complexity (Vergeer et al., 2021). Because of their holistic nature, HMPs may require or invite more effortful psychological engagement than more traditional exercise (Büssing, Edelhuser, Weisskircher, Fouladbakhsh, & Heusser, 2011; Büssing et al., 2012; Vergeer, 2018; Wayne & Kaptchuk, 2008a), and it is plausible that the extent to which participants are motivated and able to put in this effort will have an effect on mental health outcomes. This is also part of the complexity of HMPs.

Physical activity is not an isolated endeavour

Complexity is not absent from other forms of physical activity, however, particularly not when it comes to mental health. No form of physical activity takes place in a psychosocial vacuum. As Teychenne et al. (2020) have recently argued, the relationship between any type of physical activity and mental health is likely to be influenced not only by physiological but also by psychosocial and contextual factors. As a case in point, in a recent

umbrella review, Pesce et al. (2021) showed the role of contextual factors as well as the importance of cognitive engagement on the effects of chronic physical activity on cognition. With HMPs, the main difference is that psychological elements are purposely included in the philosophy behind the practice and are therefore more explicit and directive.

The call for more attention to contextual factors is also echoed in Piggini's (2020) recent proposal to start using a definition of physical activity that encompasses more than a focus on muscles moving and energy expenditure (Caspersen et al., 1985). Taking a more agentic (i.e., focusing on the *person* as mover) and socio-cultural contextual perspective, Piggini's definition emphasizes that physical activity involves people moving within culturally specific spaces and contexts, underscoring the importance of the wider context for understanding the role, impact, and intervention potential of physical activity.

A possible taxonomy

Beyond what participants bring to the physical activity context (e.g., motivational status, personality, interests and values, mental and physical health status), there are a myriad of factors in this context itself that are likely to shape participants' experiences, and that may thus affect psychological and mental health outcomes. To illustrate this multiplicity we provide a tentative taxonomy of such factors with respect to HMPs in Figure 1.

While this taxonomy focuses on HMPs, it is easy to see that issues such as the physical nature of the activity, mental demands or possibilities, psychosocial context, physical/environmental context, and pedagogical context, also play a role in any other type of physical activity. Acknowledging the potential complexity of factors affecting people's psychological experiences (and subsequent mental health outcomes) in *any* physical activity context, should pave the way for including HMPs in the context of MENPA publications. Furthermore, the deliberate inclusion of psychological, psycho-physiological, psycho-social and/or psycho-spiritual elements should make HMPs of particular interest to mental health

researchers. Excluding HMPs from consideration because of measurement challenges would seem like wielding the proverbial hammer and treating everything as a nail.

Building a relevant body of knowledge

Our argument is that HMPs constitute forms of physical activity and, therefore, deserve attention in the field of physical activity and mental health. The question is how best to build a credible body of knowledge that serves policy makers and practitioners. This question, and its associated challenges, has already been pondered in the field of complementary medicine (Field, 2016; Larkey et al., 2009; Park et al., 2014; Wayne & Kaptchuk, 2008a, 2008b). The literature has approached this problem by a) pointing out strategies to maximise the effectiveness of experimental designs, and b) making the case for multi-method approaches, where triangulation of results is possible and the unique contributions of different methods are valued. RCTs are considered the “gold standard” when it comes to evidence in health. However, RCTs have drawbacks. RCTs require strict control, and this inevitably means limiting the complexity of a practice, which may not do justice to the intricacies of an HMP. On the other hand, the complex and multicomponent nature of HMPs poses challenges to RCTs. Perhaps the question is: How can we make the most of the “gold standard” approach AND how can we make the most of additional methodologies to create a body of knowledge that is trustworthy as well as practically informative and useful?

RCTs and related experimental designs

Objectives

Objectives of experimental studies vary (Kinser & Robins, 2013), and useful distinctions can be made between research questions that address efficacy (effects under ideal circumstances), effectiveness (effects in real world settings), dose (duration, frequency, intensity), and underlying mechanisms of action (Gartlehner et al., 2006; Kinser & Robins, 2013). Establishing efficacy and effectiveness is associated with early stages of knowledge,

with the interest generally focusing on the effect of the overall “package” compared to no practice or usual care. Here, HMPs are not much different from other forms of physical activity, and such knowledge is useful in the field, if only to position an HMP alongside other forms of physical activity. When considering possible mechanisms, studies will need to dismantle, as far as possible, the complexity of HMPs. This requires identification of potential active ingredients and generation of hypotheses about their effects on (mental) health outcomes. This is easier with separate components that are not movement-based (e.g., separate breathing exercises, educational components), and may be more challenging with integrated components.

Components

The subcomponents of yoga and tai chi have been addressed extensively by several authors (Park et al., 2018; Schmalzl et al., 2015; Wayne & Kaptchuk, 2008a). For example, Schmalzl et al. (2015), differentiated yoga’s ingredients into movement-related (e.g., coordinated movement of moderate intensity; expansion of range of motion; tracking of bodily sensations; intent of obtaining a state of ‘eutony’ – ‘well-balanced tension’), and attention-related (e.g., focused attention vs open monitoring; meta-cognitive awareness; and using gaze as a tool for training attention focus) components. Various theoretical perspectives have also been put forward regarding underlying psychophysiological, neurocognitive, and psychological mechanisms of yoga (Gard, Noggle, Park, Vago, & Wilson, 2014; Schmalzl et al., 2015; Sullivan et al., 2018). Park, Finkelstein-Fox, Sacco, Braun, and Lazar (2021), for instance, stipulated mindfulness, interoceptive awareness, spiritual well-being, self-compassion, and self-control as possible mechanisms mediating the relationship between yoga and stress reduction.

Clearly, as argued by Larkey et al. (2009), it is important to establish the physiological, exercise-related contribution of HMPs (aerobic fitness, flexibility, strength,

level of exertion, etc.), so that these practices can be more precisely compared to other forms of physical activity. Such knowledge would also better enable disentangling physical from more holistic components of HMPs. Two reviews have considered studies that compared yoga interventions to physical activity interventions, finding generally equal or positive effects in favour of yoga (Ross & Thomas, 2010; Sivaramakrishnan et al., 2019). These are early indications that yoga may be equal to other forms of physical activity for some mental health outcomes, while offering something beyond these for others. In terms of dismantling the effects of physical exercise and other components of yoga, however, the comparisons are crude, as the forms of physical activity used in the included studies vary widely and are physically quite different from yoga (e.g., walking, jogging, cycling, dance, tai chi). When looking for the active ingredients in HMPs, systematic variation of the holistic elements is necessary. An example of a study controlling for holistic elements of yoga (in this case, spiritual cueing) can be seen in Csala, Ferentzi, Tihanyi, Drew, and Köteles (2020), where the physical components were kept constant while the instructions were varied between the intervention conditions.

Control

The choice of control group or condition is important in order to distinguish different types of study objectives (Kinser & Robins, 2013). According to Park et al. (2014), however, the rationale for the choice of comparison group is rarely explicated in yoga research despite regular use of such groups. Reviewing 128 RCTs on yoga, they found that 63 (49.2%) employed at least one active comparison group. Of these, 43% comprised forms of physical exercise, while others involved relaxation/meditation (20%), educational (16%), psychotherapy/counselling (11%), or (western or complementary) medical (10%) interventions. Only exercise and relaxation/meditation comparisons may tap into mechanisms

of action, whereas psychotherapy/counselling and medical interventions probably represent ‘usual care’ and thus constitute efficacy/effectiveness designs.

Measurements

Apart from isolating and manipulating holistic components, measurement of these components is important. This would aid, among other things, statistically accounting for their presence when manipulation is not possible (Cerin, 2010). An example of such measurement is the Essential Properties of Yoga Questionnaire (Groessl et al., 2015; Park et al., 2018), designed to assess the ingredients of yoga interventions and completable by both observers and yoga participants or teachers.

The psychological engagement encouraged in HMPs (Büssing et al., 2012; Vergeer et al., 2021; Wayne & Kaptchuk, 2008a) may be an important factor in their effectiveness but such engagement is difficult to control and challenging to measure. Nevertheless, early measures of involvement have been developed in yoga research (Gaiswinkler & Unterrainer, 2016). Furthermore, the challenge of assessing thought content during physical activity is not a new one for the field of sport and exercise psychology (Brick, MacIntyre, & Campbell, 2014; Masters & Ogles, 1998), with new technologies (e.g. portable EEGs) that facilitate concurrent assessment offering promising measurement options when combined with stimulated recall (Brick et al., 2014). As seen in Csala et al. (2020)’s study, an alternative approach could be to measure and/or control teachers’ instructions.

Simplification

Another approach to manage the challenge of complexity in HMPs is simplification. Several authors have proposed standardization and/or simplification of trial protocols in order to facilitate better control and repeatability (Ward, 2013; Wayne & Kaptchuk, 2008b). Such protocols would be easier to teach and learn within a short period of time, while the rationale for each element could be clearly articulated and instructor manuals created. Even smaller

units of study were proposed by Smith, Lyons, and Esat (2019), who coined the term “yoga kernels” to describe specific poses or practices that can be used for specific conditions, for example, managing acute stress. Discrete, evidence-based, and teachable in a straightforward manner, such kernels would be amenable to both systematic study and dissemination as public health interventions. By reducing the complexity of HMPs, some things will be missed while others will be gained. Nonetheless, these approaches have their place in the generation of a useful body of knowledge on HMPs, in particular in RCT designs.

Specialists and detailed reporting

Two further issues regarding intervention studies concern the involvement of HMP specialists in study design and detailed reporting of intervention ingredients. Thorough knowledge of the HMP under investigation is essential, and this is best achieved through involving HMP specialists directly, and/or making use of focus groups, Delphi procedures (e.g., de Manincor, Bensoussan, Smith, Fahey, & Bouchier, 2015), or co-creation methods (Leask et al., 2019). See Sherman (2012) for some useful guidelines regarding yoga-specific considerations in developing yoga trials.

Insufficient reporting of intervention details is a common complaint about intervention studies (e.g., Pesce et al., 2021), and the HMP field is no exception (Larkey et al., 2009; Park et al., 2018; Schmalzl et al., 2015; Wayne & Kaptchuk, 2008a, 2008b). Detailed reporting is particularly vital for identification of active ingredients and potential mechanisms. For HMPs, as well as other forms of physical activity, this includes not only the physical ingredients of the sessions (e.g., yoga poses) but also any other ingredients (e.g., separate or simultaneous breathing exercises), details about philosophy and style, and other aspects outlined in Figure 1. Creativity, insight and inside knowledge of an HMP will be needed when designing studies that isolate and control for HMPs non-physical components, and during- and post-intervention process evaluation will play an important role.

Other approaches

To complement the limitations of RCTs, other research designs or methods have been put forward to help construct an evidence-based body of knowledge that can accommodate the complexities of HMPs and inform (mental health) interventions, strategies, and policies. Wayne and Kaptchuk (2008b), for example, proposed the use of a whole systems ecological framework for the study of tai chi. They also advocated the use of pluralistic methodologies (e.g., non-experimental pre-post designs, observational cohort, case-control, and cross-sectional studies), citing advantages such as lower costs, enhanced ecological validity, motivated participants, and ability to assess long-term changes. In addition, they suggested the use of more complex statistical analysis tools such as path analyses, structural equation modelling, and confirmatory factor analysis. This is in line with Cerin's (2010) recommendations on the use of statistical mediation procedures in investigating possible active ingredients in the relationship between physical activity and mental health.

Several authors have also proposed the use of qualitative and mixed methods to generate knowledge and augment understanding about HMPs (Kinser & Robins, 2013; Vergeer et al., 2021; Wayne & Kaptchuk, 2008b). This could involve qualitative data collection within experimental designs (e.g., about participant experiences through process evaluation, Moore et al., 2015) to enhance insights gained from quantitative data, as well as a range of purely qualitative designs that are particularly suited to capturing the complexity of HMPs. Triangulation of data can also enhance confidence in establishing conclusions regarding causality (Munafò & Davey Smith, 2018).

Conclusion

In this commentary, we have argued that HMPs deserve attention as forms of physical activity, that the complexity of HMPs can pose research challenges but these are not insurmountable, and that complexity is also a major feature of any other type of physical

activity. To truly understand the role and effects of HMPs it is imperative to take into account the underlying philosophy with its indications of what is ultimately possible by engaging fully and committedly in the practice over an extended period of time, and what is important in the practice to obtain holistic well-being. Furthermore, it is important to consider what people bring to the practice, including motives, interest, desires, attitudes, personality, trauma history, and cultural beliefs, and how people engage with the practice (e.g., do they engage with all its holistic aspects or do they treat it as a physical practice only?).

Teychenne et al. (2020) made the point that “it is now well-established that physical activity plays a role in both the promotion of mental well-being and the prevention of mental ill-being, including and beyond that of diagnosed disorders such as depression, anxiety, substance use disorders, PTSD, and schizophrenia” (p.3-4). Perhaps it is time for the next question: to what extent and in what way do different forms and contexts of physical activity contribute to mental well-being, for different conditions or populations?

References

- Brick, N., MacIntyre, T., & Campbell, M. (2014). Attentional focus in endurance activity: new paradigms and future directions. *International Review of Sport and Exercise Psychology*, 7(1), 106-134. doi:10.1080/1750984X.2014.885554
- Brinsley, J., Girard, D., Smout, M., & Davison, K. (2021). Is yoga considered exercise within systematic reviews of exercise interventions? A scoping review. *Complementary Therapies in Medicine*, 56, 102618. doi:<https://doi.org/10.1016/j.ctim.2020.102618>
- Büssing, A., Edelhuser, F., Weisskircher, A., Fouladbakhsh, J. M., & Heusser, P. (2011). Inner correspondence and peacefulness with practices among participants in eurythmy therapy and yoga: A validation study. *Evidence-based Complementary and Alternative Medicine*, 2011. doi:10.1155/2011/329023
- Büssing, A., Hedtstück, A., Sauer, S., Michalsen, A., Ostermann, T., & Heusser, P. (2012). Associations between mindfulness, lightheartedness, and inner correspondence in yoga practitioners. *Mindfulness*, 3(3), 227-234. doi:10.1007/s12671-012-0098-1
- Cagas, J. Y., Biddle, S. J. H., & Vergeer, I. (submitted). Why do people do yoga? Examining motives across different types of yoga participants. .
- Cartwright, T., Mason, H., Porter, A., & Pilkington, K. (2020). Yoga practice in the UK: A cross-sectional survey of motivation, health benefits and behaviours. *BMJ Open*, 10(e031848). doi:10.1136/bmjopen-2019-031848
- Caspersen, C. J., Powell, K. E., & Christensen, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health*

- Reports*, 100, 126-131.
- Cerin, E. (2010). Ways of unraveling how and why physical activity influences mental health through statistical mediation analyses. *Mental Health and Physical Activity*, 3(2), 51-60. doi:10.1016/j.mhpa.2010.06.002
- Csala, B., Ferentzi, E., Tihanyi, B. T., Drew, R., & Köteles, F. (2020). Verbal Cuing Is Not the Path to Enlightenment. Psychological Effects of a 10-Session Hatha Yoga Practice. *Frontiers in Psychology*, 11(1375). doi:10.3389/fpsyg.2020.01375
- de Manincor, M., Bensoussan, A., Smith, C., Fahey, P., & Bouchier, S. (2015). Establishing key components of yoga interventions for reducing depression and anxiety, and improving well-being: a Delphi method study. *BMC Complementary and Alternative Medicine*, 15(85). doi:10.1186/s12906-015-0614-7
- De Michelis, E. (2004). *A history of modern yoga: Patanjali and western esotericism*. London, UK: Bloomsbury.
- Field, T. (2016). Yoga research review. *Complementary Therapies in Clinical Practice*, 24, 145-161. doi:10.1016/j.ctcp.2016.06.005
- Gaiswinkler, L., & Unterrainer, H. F. (2016). The relationship between yoga involvement, mindfulness and psychological well-being. *Complementary Therapies in Medicine*, 26, 123-127. doi:10.1016/j.ctim.2016.03.011
- Gard, T., Noggle, J. J., Park, C. L., Vago, D. R., & Wilson, A. (2014). Potential self-regulatory mechanisms of yoga for psychological health. *Frontiers in Human Neuroscience*, 8(770). doi:10.3389/fnhum.2014.00770
- Gartlehner, G., Hansen, R. A., Nissman, D., Lohr, K. N., Carey, T. S., & (2006). *Criteria for distinguishing effectiveness from efficacy trials in systematic reviews. Technical Review 12*. (AHRQ Publication No. 06-0046.). Retrieved from Rockville, MD: <https://www.ncbi.nlm.nih.gov/books/NBK44024/>
- Goldberg, E. (2016). *The path of modern yoga: The history of an embodied spiritual practice*. Rochester, VM: Inner Traditions.
- Groessler, E. J., Maiya, M., Elwy, A. R., Riley, K. E., Sarkin, A. J., Eisen, S. V., . . . Park, C. L. (2015). The Essential Properties of Yoga Questionnaire: Development and Methods. *International Journal of Yoga Therapy*, 25, 51-59.
- Jeter, P. E., Slutsky, J., Singh, N., & Khalsa, S. B. S. (2015). Yoga as a therapeutic intervention: a bibliometric analysis of published research studies from 1967 to 2013. *The Journal of Alternative and Complementary Medicine*, 21(10), 586-592. doi:10.1089/acm.2015.0057
- Kinser, P. A., & Robins, J. L. (2013). Control Group Design: Enhancing Rigor in Research of Mind-Body Therapies for Depression. *Evidence-based Complementary and Alternative Medicine*, 2013, 140467. doi:10.1155/2013/140467
- Larkey, L., Jahnke, R., Etnier, J., & Gonzalez, J. (2009). Meditative movement as a category of exercise: Implications for research. *Journal of Physical Activity and Health*, 6(2), 230-238. doi:10.1123/jpah.6.2.230
- Leask, C. F., Sandlund, M., Skelton, D. A., Altenburg, T. M., Cardon, G., Chinapaw, M. J. M., . . . Teenage Girls on the Move Research, G. (2019). Framework, principles and recommendations for utilising participatory methodologies in the co-creation and evaluation of public health interventions. *Research Involvement and Engagement*, 5(1), 2. doi:10.1186/s40900-018-0136-9
- Masters, K. S., & Ogles, B. M. (1998). Associative and dissociative cognitive strategies in exercise and running: 20 years later, what do we know? *The Sport Psychologist*, 12(3), 253-270.
- Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., . . . Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council

- guidance. *BMJ : British Medical Journal*, 350, h1258. doi:10.1136/bmj.h1258
- Munafò, M. R., & Davey Smith, G. (2018). Repeating experiments is not enough. *Nature*, 533, 399-401. doi:10.1038/d41586-018-01023-3
- Park, C. L., Elwy, A. R., Maiya, M., Sarkin, A. J., Riley, K. E., Eisen, S. V., . . . Groessl, E. J. (2018). The Essential Properties of Yoga Questionnaire (EPYQ): Psychometric properties. *International Journal of Yoga Therapy*, 28(1), 23-38. doi:10.17761/2018-00016R2
- Park, C. L., Finkelstein-Fox, L., Sacco, S. J., Braun, T. D., & Lazar, S. (2021). How does yoga reduce stress? A clinical trial testing psychological mechanisms. *Stress and Health*, 37(1), 116-126. doi:<https://doi.org/10.1002/smi.2977>
- Park, C. L., Groessl, E., Maiya, M., Sarkin, A., Eisen, S. V., Riley, K., & Elwy, A. R. (2014). Comparison groups in yoga research: A systematic review and critical evaluation of the literature. *Complementary Therapies in Medicine*, 22(5), 920-929. doi:10.1016/j.ctim.2014.08.008
- Pesce, C., Vazou, S., Benzing, V., Álvarez-Bueno, C., Anzeneder, S., Mavilidi, M. F., . . . Schmidt, M. (2021). Effects of chronic physical activity on cognition across the lifespan: a systematic meta-review of randomized controlled trials and realist synthesis of contextualized mechanisms. *International Review of Sport and Exercise Psychology*, 1-39. doi:10.1080/1750984X.2021.1929404
- Piggin, J. (2020). What is physical activity? A holistic definition for teachers, researchers and policy makers. *Frontiers in Sports and Active Living*, 2(article 72), 1-7. doi:10.3389/fspor.2020.00072
- Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine*, 16(1), 3-12. doi:10.1089/acm.2009.0044
- Schmalzl, L., Powers, C., & Blom, E. H. (2015). Neurophysiological and neurocognitive mechanisms underlying the effects of yoga-based practices: Towards a comprehensive theoretical framework. *Frontiers in Human Neuroscience*, 9(235), 1-19. doi:10.3389/fnhum.2015.00235
- Sherman, K. J. (2012). Guidelines for Developing Yoga Interventions for Randomized Trials. *Evidence-based Complementary and Alternative Medicine*, 2012, 143271. doi:10.1155/2012/143271
- Sivaramakrishnan, D., Fitzsimons, C., Kelly, P., Ludwig, K., Mutrie, N., Saunders, D. H., & Baker, G. (2019). The effects of yoga compared to active and inactive controls on physical function and health related quality of life in older adults- systematic review and meta-analysis of randomised controlled trials. *International Journal of Behavioral Nutrition and Physical Activity*, 16(33), 1-22. doi:10.1186/s12966-019-0789-2
- Smith, B. H., Lyons, M. D., & Esat, G. (2019). Yoga kernels: A public health model for developing and disseminating evidence-based yoga practices. *International Journal of Yoga Therapy*, 29. doi:10.17761/2019-00024
- Sullivan, M. B., Moonaz, S., Weber, K., Taylor, J. N., & Schmalzl, L. (2018). Toward an explanatory framework for yoga therapy informed by philosophical and ethical perspectives. *Altern. Ther. Health Med*, 24, 38-47.
- Teychenne, M., White, R. L., Richards, J., Schuch, F. B., Rosenbaum, S., & Bennie, J. A. (2020). Do we need physical activity guidelines for mental health: What does the evidence tell us? *Mental Health and Physical Activity*, 18, 100315. doi:<https://doi.org/10.1016/j.mhpa.2019.100315>
- Vergeer, I. (2018). Participation motives for a holistic dance-movement practice. *International Journal of Sport and Exercise Psychology*, 16(2), 95-111. doi:10.1080/1612197X.2016.1167759

- Vergeer, I., Bennie, J. A., Charity, M. J., Harvey, J. T., van Uffelen, J. G. Z., Biddle, S. J. H., & Eime, R. M. (2017). Participation trends in holistic movement practices: A 10-year comparison of yoga/Pilates and t'ai chi/qigong use among a national sample of 195,926 Australians. *BMC Complementary and Alternative Medicine*, *17*(1), 296. doi:10.1186/s12906-017-1800-6
- Vergeer, I., Johansson, M., & Cagas, J. Y. (2021). Holistic movement practices - An emerging category of physical activity for exercise psychology. *Psychology of Sport and Exercise*, *53*(101870). doi:10.1016/j.psychsport.2020.101870
- Wang, C., Li, K., Choudhury, A., & Gaylord, S. (2019). Trends in Yoga, Tai Chi, and Qigong use among US adults, 2002-2017. *American Journal of Public Health*, *109*(5), 755-761. doi:10.2105/AJPH.2019.304998
- Ward, L. (2013). Yoga: A useful and effective therapy for musculoskeletal disorders? *Physical Therapy Reviews*, *18*(4), 235-238. doi:10.1179/1743288X13Y.0000000093
- Wayne, P. M., & Kaptchuk, T. J. (2008a). Challenges inherent to T'ai Chi research: Part I - T'ai Chi as a complex multicomponent intervention. *Journal of Alternative and Complementary Medicine*, *14*(1), 95-102. doi:10.1089/acm.2007.7170A
- Wayne, P. M., & Kaptchuk, T. J. (2008b). Challenges inherent to T'ai Chi research: Part II - Defining the intervention and optimal study design. *Journal of Alternative and Complementary Medicine*, *14*(2), 191-197. doi:10.1089/acm.2007.7170B

(4423words)

(text 3067 words)

Figure 1

Tentative taxonomy of possible active ingredients in HMPs

