First-person experience and yoga research: studying neural correlates of an intentional practice

Elizaveta Solomonova*

Individualized Program, University of Montreal, Montreal, QC, Canada
*Correspondence: elizaveta.solomonova@umontreal.ca

INTRODUCTION
Recent years have seen a dramatic increase in the scientific study of contemplative practices. While seated meditation practices have historically been at the center of inquiry in contemplative sciences, movement-based practices, such as yoga, t’ai chi, qigong, and others, are currently coming to the forefront of this discourse. In her introduction to the present Research Topic, Schmälz et al. (2014) introduce movement-based contemplative practices (MBCP) and present their essential qualities: MBCPs are embodied and attentive to kinesthetic and proprioceptive sensations; are structured by intentional movement; and are contemplative, that is, characterized by deliberate observation and non-judgmental awareness.

In this opinion paper, I focus on the necessity of studying intentional and experiential aspects of yoga as a MBCP, and on the role of first-person experiential reports in the neurophenomenological investigation of yoga and other MBCPs. I propose that the difference between yoga as a contemplative practice and yoga as a form of physical exercise needs to be assessed through nuanced investigation of subjective experience aimed at illuminating short- and long-term intentions and goals underlying yoga practice as well as dynamic variations within the lived experience of yoga.

EMBODIMENT AND NEUROPHENOMENOLOGY
Theories of embodiment, such as enaction (Thompson, 2005, 2007; Noe, 2006; Stewart et al., 2010) stress the irreducible foundational links between the mind, the world and the body as conditions of possibility for consciousness. Rooted in the phenomenological tradition of Husserl (1982) and Merleau-Ponty many embodied mind theorists see movement not only as a pragmatic function of interacting with the world, but as a dynamic and plastic way of knowing and as a formative root of one’s selfhood and subjectivity (Morris, 2004, 2010). The concept of a “lived body,” derived from Merleau-Ponty (2012), reflects subjectivity conditioned by kinesthetic patterns and bodily habits throughout a lifetime. Yoga practice, in this view, consists of systematic change and of deconditioning of the “lived body” from its earlier habit patterns and creating new patterns and neural connections. Contemporary neurophysiological evidence lends support to the embodied mind approaches, placing sensorimotor “coupling” (Thompson and Varela, 2001) between an individual’s moving body and the world at the center of research on subjective experience.

Recent research on contemplative practices, predominantly focused on sitting meditation, has suggested a role of sustained contemplative training for processes of neuroplasticity (Manna et al., 2010), self-awareness (Vago and Silbersweig, 2012) attention modulation, (Lutz et al., 2008b; MacLean et al., 2010), and emotion regulation (Lutz et al., 2008a; Sahdra et al., 2011), among others.

Studying yoga as a MBCP would highlight specific contributions of intentional and dynamic bodily processes to embodied cognition, including processes associated with intentional movement, attention to bodily states, and brain changes linked to variations in the experiential “lived body” and in underlying nervous system due to sustained physical and mental asana practice.

Neurophenomenology (Varela, 1996; Lutz and Thompson, 2003) is the preferred method of inquiry for contemporary contemplative neurosciences and empirical studies of embodied and enactive cognition. The defining feature of neurophenomenology is the use of sophisticated objective neurophysiological measurements in conjunction with nuanced first-person methodologies. Within this framework, objective, and subjective data are seen as mutually constraining and informing, and dynamic methods of examining conscious experience are preferred. Despite a historical distrust of first-person reports by cognitive neuroscientists (Nisbett and Wilson, 1977), recent years have seen an important rise in the use of first-person methodologies both in the form of questionnaires and phenomenologically-informed practices (Chalmers, 1999). Cognitive neurosciences have gradually opened to the integration of systematic analysis of first-person reports (Overgaard et al., 2008), and a number of rigorous approaches to subjective data are now being developed. One methodology, known as “elicitation interview” (Petitmengin, 2006), has been used in a number of studies, including an investigation of epileptic aura (Petitmengin et al., 2006) and the generation of scientific insight (Petitmengin, 2007).

YOGA AS CONTEMPLATIVE PRACTICE
While the contemporary form of asana sequences of Hatha Yoga is relatively recent (Gard et al., 2014), many schools (such as Ashtanga Yoga and Iyengar Yoga) have referred to the ancient text, Patanjali’s Yoga Sutra (Miller, 1995; White, 2014), as the philosophical source text defining and...
A contemplative practice, such as yoga, has been integral to the practice of some traditions. Goals, intentions, and expectations are essential for practitioners to achieve desired outcomes. In contemplative practices, including yoga, practitioners aim to develop a state of awareness (Josipovic, 2014), where awareness focuses on present experience, maintaining attention on current activities, and engaging in self-transcendence. In yoga, this state is associated with an experience of calm/activation during practice (Weng et al., 2013). Studying neural mechanisms of yoga practice may involve an interaction between processes of intentional reward-oriented behaviors and different kinds of contemplative focus.

However, intention setting in yoga has not been widely studied, despite being an integral part of the practice of some traditions (an opening prayer in Ashtanga yoga being one such example). One phenomenological study of body-based therapeutic practices, including yoga, presented compelling evidence for the role of both long- and short-term goals and intentions in practitioners and patients, including specific goals of coping with the present situation and general motivations for exploring qualities of embodiment through practice (Mehling et al., 2011).

As a MBCP, yoga shares some of the intentional, motivational, and practical elements of meditation. As a form of exercise, it contributes to overall physical health and wellbeing. It is therefore crucial, in order to conduct neurophenomenological research on yoga and to investigate contemplative and intentional dimensions, to factor in various possible short- and long-term intentions and goals that practitioners may set for their practice.

NEUROPHENOMENOLOGY AND YOGA

Lastly, not only long and short-term intentions, motivations and expectations may have an effect on the neural correlates of yoga practice; one's subjective experience may also undergo a number of cognitive-affective changes during practice. Indeed, temporal dynamics of a meditation experience have been shown to change as a function of attentional and awareness focus in the course of short neurofeedback practices (Garrison et al., 2013a). Since real-time neurofeedback or high-resolution neuroimaging is unlikely during yoga or meditation, autonomic system measures can be employed in lieu of EEGs or brain scans. For instance, a recent study has used heart rate variability measures as a proxy for affect regulation, along with detailed first-person reports and subjective rating scales to show dynamic changes in attention, affect, and subjective experience of calm/activation during a yoga practice.
session (Mackenzie et al., 2014). Research potential for including first-person reports in yoga research is further illustrated by another recent study where women suffering from breast cancer were initiated into Iyengar yoga practice; participants underwent pre- and post-study interviews and kept a journal for the duration of the study (Thomas et al., 2014), revealing personal perspectives on qualities of embodiment, posture, and loss.

Studying the neural dynamics of embodied contemplative practices in conjunction with fluctuations in first-person experience would provide invaluable insight to outcome measures, and also to the moment-to-moment changes in practice, experience and intention, which in turn will help elucidate underlying brain mechanisms and contribute to development of interventions adapted to the needs of specific target groups (e.g., Individuals undergoing cancer treatment, depression, anxiety, chronic pain, etc...). The “lived body” is changed by MBCPs, and these changes can be qualitatively explored to investigate both effects of specific MBCPs and structure of embodied subjectivity in general. While investigating the therapeutic effect of yoga in various populations has been the approach of choice, studying healthy individuals involved in sustained contemplative yoga practice (Fiori et al., 2014) may illuminate long-term effects of the practice. This approach has been fruitful in meditation research both by selecting “expert” meditators as participants (Nicholson, 2006; Khalsa et al., 2008; Garrison et al., 2013b), and longitudinally, during a 3-month long Shamatha meditation retreat (MacLean et al., 2010; Sagar et al., 2012; Jacobs et al., 2013). Studying “expert” yoga practitioners can illuminate important aspects of the practice, for instance, some advanced yoga practices emphasize the possibility of awareness without sensory content, such as purusha in the yogic tradition (Maehle, 2007). This and other aspects of yoga need to be assessed in a phenomenological way. A neurophenomenological approach is needed in order to assess long- and short-term expectations as well as moment-to-moment fluctuations during yoga practice and their neural correlates. Lastly, employing not only expert practitioners but also practicing scientists (Desbordes and Negi, 2013) may contribute to more comprehensive and nuanced contemplative neuroscience of yoga and other MBCPs.

ACKNOWLEDGMENTS

Thanks are due to Patrick Winogrod, Elena Frantova, Philippe Stenstrom and Michelle Carr for their involvement in the development of ideas presented this paper and for editorial assistance.

REFERENCES

Carter, E. J., Hodgins, J. K., and Rakison, D. H. (2011). Exploring the neural correlates of goal-directed action and intention understanding. Neuroimage 54, 1634–1642. doi: 10.1016/j.neuroimage.2010.08.077 Chalmers, D. J. (1999). “How can we construct a science of consciousness,” in The Cognitive Neurosciences III, ed M. S. Gazzaniga (Cambridge, MA: The MIT Press), 1111–1119. D’Ardenne, K., McClure, S. M., Nystrom, L. E., and Cohen, J. D. (2008). BOLD responses reflecting dopaminergic signals in the human ventral tegmental area. Science 319, 1264–1267. doi: 10.1126/science.1150605 Desbordes, G., and Negi, L. T. (2013). A new era for mind studies: training investigators in both scientific and contemplative methods of inquiry. Front. Hum. Neurosci. 7:741. doi: 10.3389/fnhum.2013.00741 Dickenson, J., Berkman, E. T., Arch, J., and Lieberman, M. D. (2013). Neural correlates of focused attention during a brief mindfulness induction. Soc. Cogn. Affect. Neurosci. 8, 40–47. doi: 10.1093/scan/nss030 Fiori, F., David, N., and Aglioti, S. M. (2014). Processing of proprioceptive and vestibular body signals and self-transcendence in Ashtanga yoga practitioners. Front. Hum. Neurosci. 8:734. doi: 10.3389/fnhum.2014.00734 Fliesbach, K., Weber, B., Trautner, P., Dohmen, T., Sunde, U., Elger, C. E., et al. (2007). Social comparison affects reward-related brain activity in the human ventral striatum. Science 318, 1305–1308. doi: 10.1126/science.1145876 Gard, T., Noggle, J. J., Park, C. L., Vago, D. R., and Wilson, A. (2014). Potential self-regulatory mechanisms of yoga for psychological health. Front. Hum. Neurosci. 8:770. doi: 10.3389/fnhum.2014.00770 Garrison, K. A., Santoyo, J. E., Davis, J. H., Thornhill, T. A. IV, Kerr, C. E., and Brewer, J. A. (2013a). Effortless awareness: using real time neurofeedback to investigate correlates of posterior cingulate cortex activity in meditators’ self-report. Front. Hum. Neurosci. 7:440. doi: 10.3389/fnhum.2013.00440 Garrison, K. A., Scheinost, D., Worhunsky, P. D., Elwafi, H. M., Thornhill, T. A. IV, Thompson, E., et al. (2013b). Real-time fMRI links subjective experience with brain activity during focused attention. Neuroimage 81, 110–118. doi: 10.1016/j.neuroimage.2013.05.030 Haruno, M., and Kawato, M. (2006). Different neural correlates of reward expectation and reward expectation error in the putamen and caudate nucleus during stimulus-action-reward association learning. J. Neurophysiol. 95, 948–959. doi: 10.1152/jn.00382.2005 Heuer, E. G. (1982). Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy, Vol. I. Hague: Kluwer Publishers. Jacobs, T. L., Shaver, P. R., Eppel, E. S., Zanesco, A. P., Aichele, S. R., Bridwell, D. A., et al. (2013). Self-reported mindfulness and cortisol during a Shamatha meditation retreat. Health Psychol. 32, 1104–1109. doi: 10.1037/a0031362 Jois, S. K. P. (2010). Yoga Mula: The Seminar Treatise and Guide from the Living Master of Ashtanga Yoga. New York, NY: North Point Press.

Josipovic, Z. (2010). Duality and nonduality in meditation research. Conscious. Cogn. 19, 1119–1121; discussion 1122–1113. doi: 10.1016/j.concog.2010.03.016 Josipovic, Z. (2014). Neural correlates of nondual awareness in meditation. Ann. N.Y. Acad. Sci. 1307, 9–18. doi: 10.1111/nyasa.12261 Khalsa, S. S., Rudrauf, D., Damasio, A. R., Davidson, R. J., Lutz, A., and Tranel, D. (2008). Interoceptive awareness in experienced meditators. Psychophysiology 45, 671–677. doi: 10.1111/j.1469-8986.2008.00666.x Lutz, A., Brefczynski-Lewis, J., Johnstone, T., and Davidson, R. J. (2008a). Regulation of the neural circuitry of emotion by compassion meditation: effects of meditative expertise. PLoS ONE 3:e1897. doi: 10.1371/journal.pone.0001897 Lutz, A., Slagter, H. A., Dunne, J. D., and Davidson, R. J. (2008b). Attention regulation and monitoring in meditation. Trends. Cogn. Sci. 12, 163–169. doi: 10.1016/j.tics.2008.01.005 Lutz, A., and Thompson, E. (2003). Neurophenomenology integrating subjective experience and brain dynamics in the neuro-sciences of consciousness. J. Conscious. Stud. 10, 9–10.

Mackenzie, M. J., Carlson, L. E., Paskevich, D. M., Ekkekakis, P., Wurz, A. J., Wytsma, K., et al. (2014). Associations between attention, affect and cardiac activity in a single yoga session for female cancer survivors: an enactive neurophenomenology-based approach. Conscious. Cogn. 27C, 129–146. doi: 10.1016/j.concog.2014.04.005 MacLean, K. A., Ferrer, E., Aichele, S. R., Bridwell, D. A., Zanesco, A. P., Jacobs, T. L., et al. (2010). Intensive meditation training improves perceptual discrimination and sustained attention. Psychol. Sci. 21, 829–839. doi: 10.1177/0956797610371339 Maehle, G. (2007). Ashtanga Yoga: Practice and Philosophy. Novato, CA: New World Library. Manna, A., Raffone, A., Perrucci, M. G., Nardo, D., Ferretti, A., Tartaro, A., et al. (2010). Neural correlates of focused attention and cognitive monitoring in meditation. Brain Res. Bull. 82, 46–56. doi: 10.1016/j.brainresbull.2010.03.001 Mehling, W. E., Wrubel, J., Daubenmier, J. J., Price, C. J., Kerr, C. E., Silow, T., et al. (2011). Body awareness: a phenomenological inquiry into the common ground of body-mind therapies. Philos. Ethics Hum. Sci. 6, 1–12. doi: 10.1186/1747-5341-6-6 Merleau-Ponty, M. (2012). Phenomenology of Perception. Transl. by D. Landes. New York, NY: Routledge.
Overgaard, M., Gallagher, S., and Ramsøy, T. Z. (2010). “Empirical and phenomenological studies of embodied cognition,” in Handbook of Phenomenology and Cognitive Science, eds S. Gallagher and D. Schmicking (Dordrecht; New York; Heidelberg; London: Springer), 235–252.

Nicholson, P. (2006). Does meditation predispose to inducing simple partial seizures? EEG studies of expert meditators self-reporting simple partial seizures. Med. Hypotheses 66, 674–676. doi: 10.1016/j.mehy.2005.09.023

Rahman, M. A., Baulac, M., and Navarro, V. (2007). Towards the source of intentionality, representation and symbol, “in The Yoga Sutra of Patanjali: A Translation of the Text, with Commentary, Introduction, and Glossary of Keywords. Los Angeles, CA: University of California Press.

Morris, D. (2010). “Maladaptive and phenomenological responses to suffering. Compassion training alters altruism and neural responses to suffering. Psychol. Sci. 24, 1171–1180. doi: 10.1177/0956797612469537

White, D. G. (2014). The ‘Yoga Sutra of Patanjali’: A Biography. Princeton, NJ: Princeton University Press.

Conflict of Interest Statement: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 21 December 2014; accepted: 02 February 2015; published online: 25 February 2015.

Citation: Solomonova E (2015) First-person experience and yoga research: studying neural correlates of an intentional practice. Front. Hum. Neurosci. 9:85. doi: 10.3389/fnhum.2015.00085

This article was submitted to the journal Frontiers in Human Neuroscience.

Copyright © 2015 Solomonova. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.