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Theses of the Doctoral Dissertation

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**Physical, psychological, and spiritual benefits of hatha yoga
practice**

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Introduction

Yoga in the last two-three decades has spread almost all over the world (Michelis, 2005; Singleton & Byrne, 2008), and gained high popularity in scientific research, mainly due to its promising health benefits (Field, 2016; Patwardhan, 2017). Research on yoga incorporates a wide variety of physical and mental health-related topics among both healthy and diseased populations (Büssing, Michalsen, et al., 2012; Domingues, 2018; Dwivedi & Tyagi, 2016; Field, 2016; Govindaraj et al., 2016; Hendriks et al., 2017; Ross & Thomas, 2010).

Yoga is a philosophical framework and a set of different methods which has evolved over thousands of years in ancient India (Baktay, 1992; Iyengar, 1991). It consists of various physical, mental, moral, and spiritual practices aimed at improving holistic health, self-awareness, and self-realization (Impett et al., 2006; Iyengar, 1991; Kaczvinszky, 1995; Ross & Thomas, 2010). However, in Western society, it is often interpreted purely as a form of physical fitness (MacDonald, 2013; Sarbacker, 2014). Indeed, one of the most common yoga practices in the West is hatha yoga which emphasizes physical postures (asana), breathing exercises (pranayama), relaxation, and also includes meditation techniques (Devereux, 1994).

In scientific research, yoga is mostly interpreted and investigated as a form of mind-body exercise (Mehling et al., 2011; Park et al., 2018), or as an Eastern movement forms (Boros et al., 2019; D. H. K. Brown, 2013; Lu et al., 2009). Based on these categorizations, it can be surmised that modern yoga practice (namely hatha yoga) differs from other forms of physical activity in several ways, which are the followings: (1) its specific body postures including relaxation poses, (2) breath regulation, (3) longer/sustained maintenance of the postures and (4) the requirement of constant non-judgmental attention during practice (Govindaraj et al., 2016; Impett et al., 2006; Veda Bharati, 1985; Yesudian & Haich, 1992). Beyond these elements, classes are very diverse concerning exact physical exercises and potential inclusion of yogic teachings, such as ethical principles or philosophical views (Cramer et al., 2014; Field, 2016; Park et al., 2018).

Existing scientific literature suggest that regular yoga practice has beneficial effects on various aspects of mental and physical health (Büssing, Michalsen, et al., 2012; Dwivedi & Tyagi, 2016; Govindaraj et al., 2016; Hendriks et al., 2017; Ross & Thomas, 2010). Concerning physical fitness and cardiovascular characteristics, review studies report mainly beneficial results with respect to flexibility, balance, strength, weight loss, blood pressure, respiration, heart rate, and overall cardiovascular endurance (Büssing, Michalsen, et al., 2012; S. Dwivedi & Tyagi, 2016; Raub, 2002; Roland et al., 2011; Ross & Thomas, 2010). However, majority of

single studies investigate these potential effects of yoga with very diverse interventions among various populations, thus generalization and standardization of the findings is challenging (Park et al., 2018; Patwardhan, 2017). To reveal exact effectiveness of yoga practice, studies with precise research questions and detailed description of components of interventions are needed (Büssing, Michalsen, et al., 2012; Elwy et al., 2014; Park et al., 2018; Patwardhan, 2017).

Similar to physical benefits of yoga practice, positive effects on various indicators of mental health are suggested by large number of studies and reviews (Büssing, Michalsen, et al., 2012; Domingues, 2018; Dwivedi & Tyagi, 2016; Field, 2016; Govindaraj et al., 2016; Hendriks et al., 2017; Ross & Thomas, 2010). Positive outcomes were reported concerning mindfulness (Brisbon & Lowery, 2011; Curtis et al., 2011), body awareness (Daubenmier, 2005; Delaney & Anthis, 2010), affect (Meissner et al., 2016; Vadiraja et al., 2009), and spirituality (Büssing, Hedtstück, et al., 2012). However, for more evidences further investigations are proposed (Domingues, 2018; Hendriks et al., 2017). Especially, spirituality is an understudied area within the field of yoga research (Büssing, Hedtstück, et al., 2012; MacDonald, 2013).

Concluding, in yoga research there is a proposal for further investigation of various physical and psychological measures (Field, 2016; Hendriks et al., 2017), especially there is a call for the inclusion of spirituality (Büssing, Hedtstück, et al., 2012; Groessl et al., 2015; MacDonald, 2013). Effects of specific components and aspects of yoga practice are needed to be more precisely explored (Büssing, Michalsen, et al., 2012; Field, 2016; Park et al., 2014; Patwardhan, 2017).

Physical effects of hatha yoga – Longitudinal study Part 1

Aims

The longitudinal study - on the one hand - aimed to investigate the effects of a 10-session long one time/week beginner level traditional hatha yoga training on different indicators of physical fitness and heart rate measures among healthy female adults. The first goal was to examine whether a weekly frequency of yoga course with an emphasis on asana practice (body postures) consisting of 10 sessions is sufficient to result in significant positive changes in body mass index (BMI), body fat percentage, balance, flexibility, core muscle strength, resting heart rate and heart rate variability. Additionally, we intended to explore the training effect characteristics (HR and used calories during practice) of an average beginner level hatha yoga class.

A further specific aim was to investigate the potential effects of verbal instructions during yoga practice on the above-mentioned physical and physiological variables. It was examined whether differences in verbal cuing, namely whether it emphasizes mainly physical aspects of practice or also includes philosophical and spiritual contents, would lead to different outcomes in the measured variables.

Methods

Participants

The final sample included 82 female students (mean age: 22.0 ± 3.83 years) with no previous experience in yoga. The yoga group consisted of 49 participants (mean age: 21.49 ± 2.3 years), the control group encompassed 33 individuals (mean age: 22.75 ± 5.32 years). Average age, degree level, average physical activity level in the previous 3 months of the two groups were statistically comparable. The yoga group divided into two yoga groups, such as Sport (N=27) and Spiritual (N=22) were also statistically comparable concerning demographic data.

Procedure

The yoga course consisted of 10 weekly sessions, 1.5 hours each. Control students took part solely in the baseline and post-intervention measurements, they did not receive any training or alternative intervention. Physical components of the classes (i.e., exact movements, order of postures) were completely identical for the two yoga groups and the amount of verbal information provided during the sessions was equivalent. There were identical contents in the scripts for the two groups concerning the correct body posture, alignment of the asanas, however, there were also substantial differences in the instructions provided during sessions. Whereas the so-called Sport group received instructions emphasizing the physical aspects of yoga practice (e.g., correct alignment of the body, which muscle is strengthened or stretched in the particular asana), the so-called Spiritual group was provided with more holistic, i.e., philosophical and spiritual descriptions and explanations (e.g., what is the energetic body, which chakra is activated by a specific posture and its corresponding mental, emotional characteristics, what is the final aim of yoga practice, “om” mantra chanting at the end of the class).

Measurements took place one week before and one week after the yoga training with the exception of plank test which was assessed at the beginning of the first and last yoga class (thus control data are not available).

Measures

The following measures were assessed:

- BMI
- body fat percentage (measured with OMRON BF-511 body composition scale)
- balance (static balance) was assessed by the one-leg-stand (stork) test (Suni et al., 2009) and Functional reach test (FRT) (Duncan et al., 1990)
- flexibility was measured with the side bend test (Suni et al., 1998) and the modified sit and reach test (Hoeger & Hopkins, 1992)
- core muscle strength was measured by plank test (Strand et al., 2014)
- Resting heart rate (rHR) and heart rate variability (RMSSD (ms)) data were collected with Firstbeat Teambelt system from FirstBeat SPORTS Team Pack (Firstbeat Technologies Ltd., Jyväskylä, Finland) (Parak & Korhonen, 2013).

Statistics were conducted by both frequentist and Bayesian analyses.

Results

No significant differences between the two yoga groups emerged in any of the measured physical and physiological variables. Comparing the yoga and control group, significant improvements in the yoga group compared to the control group were shown in balance (measured by the one leg stand with open eyes) and flexibility (measured by the side bend test and the modified sit and reach test). Furthermore, the yoga group showed an improvement in core muscle strength. No significant results in BMI, body fat percentage, resting heart rate, and heart rate variability were found.

Average HR and energy consumption during a 90-minute-long beginner level hatha yoga class were: $AvgHR = 93.39 \pm 9.78$ bpm; $kcal = 195.83 \pm 61.72$.

Discussion and conclusions

The study indicates that weekly setting of 10 beginner level traditional hatha yoga classes (1.5 hours each) can result in improvements in balance, flexibility, and core muscle strength. However, it does not impact BMI, body fat percentage, resting heart rate and heart rate variability. Verbal instructions provided during practice do not impact these physical and physiological outcomes.

It can be stated that beginner level hatha yoga classes show medium intensity among yoga classes, and might be an appropriate form of physical activity to achieve some public

health guidelines (Sherman et al., 2017). We can conclude that a yoga intervention with a weekly frequency of one session is adequate for positive changes in certain aspects of physical fitness, however, for betterment in physiological, especially cardiovascular markers longer time of training and/or a higher weekly frequency, and/or more intense yoga practice is needed. The relevance of these findings accords with the conclusions of Tolnai and colleagues (2016), that weekly training is beneficial for those who cannot afford more leisure time than this for physical activity. However, engagement in regular physical activity might increase over time as beneficial outcomes occur, and the process might be able to end in a virtuous circle.

Psychological effects of hatha yoga – Longitudinal study Part 2

Aims

The previously presented longitudinal study had another main goal, namely, to investigate the significance of verbal instructions during yoga practice on different measures of mental health, which are correlates of Eastern movement forms and mind-body exercises, such as body awareness, mindfulness, spirituality, and affect among healthy female adults. It was expected that a 10-session weekly hatha yoga training leads to favorable changes in the aforementioned constructs; moreover, participants receiving more holistic or spiritual verbal cuing would show greater improvements than those receiving instructions focused primarily on the physical aspects of the yoga practice. Additionally, long term effectiveness of yoga practice was investigated on variables which were affected by the training. A further explorative aim of the study was to explore the potential intercorrelations among the changes in outcome variables.

Methods

Participants

The final sample included 84 female university students (mean age: 22.0 ± 3.80 years) divided into three groups. There were two yoga groups, namely the Sport group ($N=27$; mean age: 21.48 ± 2.08 years) and the Spiritual group ($N=23$; mean age: 21.43 ± 2.56 years), and a no intervention control group ($N=34$; mean age: 22.79 ± 5.24 years).

Procedure

See Procedure of Longitudinal study Part 1. As mentioned before, verbal instructions of the two yoga groups were partly different. Questionnaires were completed online one week before and after the intervention, and also 6 weeks after the training (follow-up).

Measures

The following measures were assessed:

- *Body Awareness Questionnaire* (BAQ) (Shields et al., 1989), (Emanuelson et al., 2015; Köteles, 2014)
- *Mindful Attention and Awareness Scale* (MAAS) (Brown & Ryan, 2003), (Simor et al., 2013)
- *Positive and Negative Affect Schedule* (PANAS) (Watson et al., 1988), (Gyollai et al., 2011)
- Short version of the *Spiritual Connection Questionnaire* (SCQ-14) (Wheeler & Hyland, 2008), (Csala & Köteles, 2021)

Statistics were conducted by both frequentist and Bayesian analyses.

Results

There were no significant differences between the three groups at baseline for any variables. No significant interactions emerged (analyzed by 2 x 3 mixed (times x intervention) ANOVAs) in any of the measured variables. However, when the two yoga groups were merged and compared to control group (analyzed by 2 x 2 mixed ANOVAs), a significant interaction effect was found for negative affect and spirituality. Level of negative affect decreased in the yoga group while it remained basically the same in the control group at the end of the intervention. Level of spiritual connection increased in the merged yoga group and decreased in the control group after the intervention. Follow up analyses result in only partially positive outcomes in negative affect. Furthermore, a weak to moderate negative correlation between the changes in mindfulness and negative affect, and a weak to moderate positive association between the changes in body awareness and spirituality were found.

Discussion and conclusions

The present findings indicate that different types of verbal instructions during physically identical beginner level hatha yoga sessions do not result in different outcomes with respect to spirituality, body awareness, mindfulness, and affect among healthy female university participants. However, when data were merged across intervention groups, yoga participants showed a significant increase in spirituality and decrease in negative affect when compared to

the no treatment control group at the end of the 10-session long weekly yoga training. No effects for mindfulness, body awareness, and positive affect was found.

In contrast to our hypotheses, yoga practice led to the same outcomes regardless of verbal instructions. It can be explained various ways. On the one hand, yoga practice has special physical and mental characteristics; it integrates sustained muscular activity with inward focus, breath-awareness, and synchronization of breath and movement (Govindaraj et al., 2016; Impett et al., 2006; Mehling et al., 2011). These components are expected to result in a mental stillness, self-contemplative state, and reduction of stress and anxiety (Collins, 1998; Iyengar, 1991; Rama et al., 1976; Sengupta, 2012), hence they could beneficially impact negative affect. Additionally, awareness of breath can facilitate deeper levels of self-awareness (Rama et al., 1976), thus providing a potential explanation for the improvement in spirituality that both of the intervention groups experienced.

A further explanation for our findings may be that yoga can impact psychological functioning “through the body”, regardless of verbal cuing. It has been proposed that postural yoga differs from other purely physical activities because it possesses a distinct contemplative or spiritual dimension (Sarbacker, 2014). Yogis developed and utilized physical practices like asana, pranayama, or other techniques to embody psychological and spiritual elements through exercise. In yoga, training and transformation of the body is aligned with psychological and spiritual features or changes (Jois, 2002; Sarbacker, 2014); specific poses might provoke particular feelings and mental content (Rama et al., 1976).

Another alternative explanation is the attitude of the yoga teacher towards the students. Similarly to psychotherapy (Client-centered therapy), the authentic, empathetic, and unconditional positive attitude of the instructor offers emotional support and models how to accept and understand oneself and feel connected to others (Rogers, 1951). These ‘therapeutic’ qualities in yoga instructors can be strengthened through the moral principles of yoga (e.g. nonviolence, truthfulness, patience, compassion, sincerity) (Deborah, 2009; Iyengar, 1991).

The lack of beneficial changes in mindfulness, body awareness, and positive affect can be explained that the weekly setting or the length of the yoga intervention were not sufficient to evoke such changes. However, for proper understanding, further studies with various settings of interventions are needed.

Follow up outcomes indicate, that for concrete maintenance of the beneficial outcomes or further improvements, probably continued and regular practice is required.

Concerning association between the changes in the measured variables (namely a moderate negative correlation between mindfulness and negative affect, and a moderate

positive correlation between body awareness and spirituality), no proper conclusion on causality can be drawn. Thus, further exploration of the associations among these constructs is suggested. This could result in more appropriate design for mental health interventions (Büssing, Michalsen, et al., 2012, 2012; Hendriks et al., 2017; Mehling et al., 2011).

Concluding, more holistic and spiritual verbal instructions during the physically identical yoga sessions did not result in different outcomes with respect to spirituality, body awareness, mindfulness, and affect. Regardless of verbal cues, however, even a brief beginner level traditional hatha yoga intervention led to a significant increase in spirituality and decrease in negative affect. Practicing yoga might influence psychological functioning through its physical components, at least among novice practitioners. It seems to have beneficial effects even when only the physical elements of yoga practice are emphasized in class.

Psychological effects of hatha yoga – Cross-sectional study

Aims

Aim of this cross-sectional study was to investigate the correlations between two aspects of yoga practice (more precisely, regularity and yoga experience) and the previously examined psychological variables, namely mindfulness, body awareness, spirituality, and affect, among regular hatha yoga practitioners. We aimed to explore whether these associations – if they are manifest – are stronger with current regularity of yoga practice (weekly hours) or with yoga experience (the number of years practicing yoga). A further goal was to examine the potential mediating effects between yoga practice and these mental health variables.

Methods

Participants

The sample consisted of 85 adult yoga practitioners (13 males, 15.3 % and 72 females, 84.7 %) with a mean age of 43.85 years ($SD = 10.77$). Participants have practiced yoga in average for 7.70 years ($SD = 8.37$), 13 of them were yoga teachers (15.3 %). Average weekly yoga practice in the previous four weeks of the attendants was 4.92 hours/week ($SD = 5.21$; min-max: 0-30 hours/week).

Procedure

Participants were recruited through the e-mail address list of the Hungarian Yoga Association (Magyar J6ga T6rsas6g). Questionnaires were completed anonymously online in Hungarian.

Measures

The same questionnaires were applied as in the Longitudinal study Part 2. Concerning *Positive and Negative Affect Schedule* (PANAS) (Watson et al., 1988), its short form was used. Statistics were similarly conducted by both frequentist and Bayesian analyses.

Results

Weekly hours of yoga practice showed a weak to moderate positive correlation with mindfulness, body awareness, spirituality, and positive affect, and a weak to medium negative correlation with negative affect. Yoga experience showed a weak to medium positive correlation with mindfulness and a weak positive association with positive affect. However, no correlation between yoga experiences and body awareness, spirituality, and negative affect were found. Partial correlations between current regularity of yoga practice and the measured variables stayed significant after controlling for age, gender, education, and yoga experience.

Mediation analyses revealed the mediating effect of mindfulness between weekly hours of yoga practice and negative affect, furthermore, the mediating effect of body awareness between weekly hours of yoga practice and spirituality, and between weekly hours of yoga practice and positive affect.

Discussion and conclusions

Present results indicate that current regularity of yoga practice (hours/week) shows a favorable significant correlation with mindfulness, body awareness, spirituality, and positive and negative affect even after controlling for age, gender, education, and yoga experience (number of years practicing yoga). In contrast, yoga experience correlated only with mindfulness and positive affect. The measured psychological variables showed remarkable intercorrelations. Mediation analyses revealed that mindfulness mediates the correlation between weekly hours of yoga practice on negative affect, and body awareness revealed to be a significant mediator between both current regularity of yoga practice and spirituality, and current regularity of yoga practice and positive affect. These indicate the important role of intentional attention during practice.

Our results strengthen the evidence of the associations between yoga practice and positive mental health and suggest the importance of the current regularity of practice.

Spiritual effects of yoga practice – Systematic review

Aims

Aim of the systematic review was to assess the available empirical research on the relationship between yoga and spirituality in order to provide an overview of existing findings and highlight future directions for investigating this topic. Of particular interest was whether empirical findings indicate a positive association between yoga practice and spirituality, and to explore which aspects of spirituality are associated with yoga practice (besides the one that was investigated in the previous two studies).

Methods

The PRISMA guideline (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) was followed (Liberati et al., 2009). The protocol was registered in the PROSPERO international prospective registry of systematic reviews (registration number: CRD42020155043, date of registration: November 1, 2019). Literature search was conducted in Google Scholar, PsycINFO, and Science Direct (incl. PsycARTICLES) with the terms of “yoga, spirituality”, “yoga, spiritual”, or “yoga, spirit” in the title or abstract. Additional records were included, too. Empirical studies (cross-sectional and longitudinal/intervention studies) with sound methodology published in peer-reviewed scientific journals in either English, German, or Hungarian language were included. According to the final screening, 30 articles met the inclusion criteria of the review. There was a later analysis of 6 recent studies between 2020-2021.

Results

Out of the 30 included studies, 25 applied quantitative methods and seven qualitative ones (that is, two studies applied both). 15 studies had a cross-sectional and 15 a longitudinal design encompassing a yoga intervention. All studies involved adults, however, none of the samples were representative. The majority of them investigated participants without a common reported health problem, whereas seven studies focused on diseased populations.

Most of the studies, more precisely 25 out of 30, investigated a form of hatha yoga. This indicates that in empirical research, yoga is mainly studied as a form of mind-body exercise

(Mehling et al., 2011; Park et al., 2018). Regarding origin of the studies, 22 were conducted in Western countries (Europe or USA), six in India, and two remaining studies were conducted in Iran and Japan. According to in-depth, semi-structured interviews with yoga instructors, westernized yoga lacks spirituality, that is, most classes are devoid of spiritual teachings (Ness & Briles, 2016).

Even so, yoga practice without explicit spiritual teachings can affect spirituality (Gaiswinkler & Unterrainer, 2016; Ness & Briles, 2016). The vast majority of the reviewed studies reported positive results concerning the connection between yoga and spirituality. Various aspects of spirituality were affected: spiritual well-being, spiritual intelligence, spiritual aspirations, existential thinking, sense of meaning and peace, the feeling of faith, hope, and compassion (Büssing, Hedtstück, et al., 2012; Pandya, 2017, 2018, 2019; Safara & Ghasemi, 2017; Seena et al., 2017).

Results indicated the relevance of regularity of practice (Csala et al., 2017; Gaiswinkler & Unterrainer, 2016; Moliver et al., 2013). Furthermore, initial physical intentions over spiritual motivations were revealed. However, spiritual motivations were shown to increase over time and be associated with greater levels of spiritual and psychological well-being (Ivtzan & Jegatheeswaran, 2015; Park et al., 2016; Quilty et al., 2013).

For yoga practitioners, spirituality provides a meaning and framework of life and is a way of gaining more self-awareness and improving oneself. Incorporation of yoga philosophy, meditation, consecration, and prayer may foster experiences of inner peace, freedom, and connectedness (Griera, 2017; Hasselle-Newcombe, 2005; Wahlström et al., 2018).

The results of the six recent articles are in general in accordance with the outcomes of this review and support its findings. In addition, they provided further insights into the relationship between yoga and spirituality. For this, the warmth and friendliness of the yoga teacher (Park et al., 2020) or perceiving yoga as a spiritual path (Büssing et al., 2021) is relevant.

Discussion and conclusions

So far, only a few studies have investigated the relationship between yoga and spirituality, with holistic yoga practices being a particularly poorly studied area. Nevertheless, according to the quantitative and qualitative findings yoga practice seems to be positively associated with spirituality. This association is most likely dependent on the exact nature of the practice and the practitioner's background, intention and preexisting relationship with spirituality. Yoga interventions appear to have the potential to enhance different aspects of spirituality, such as spiritual aspirations, search for insight/wisdom, existential thinking, sense

of meaning and peace, as well as the feeling of faith, hope, and compassion. It can be a method that facilitates spiritual well-being and health, spiritual growth and the development of an integrative worldview.

To achieve these benefits, regular yoga practice is essential. Consequently, the practice itself is a key component for spiritual growth. Concerning the intention to practice, physical and appearance motivations seem to be more prevalent than spiritual ones which holds for both beginner and advanced Western practitioners.

Concluding, yoga practice seems to be positively associated with various aspects of spirituality and may be a valid method to evoke spiritual interest and foster spiritual well-being and health. For most benefits, regular yoga practice is essential. Even though physical fitness appears to be the most important aspect of yoga practice in Western society, spiritual benefits are still manifest. For more evidence and a deeper exploration of the specific effects of yoga on spirituality, future research is encouraged.

General discussion and final conclusions

The present doctoral dissertation investigated some specific aspects of yoga practice concerning physical, psychological, and spiritual associations and effects in order to bring more evidences in the vast but very heterogeneous scientific literature on yoga.

The current results revealed that weekly frequency of yoga practice (1.5 hours) is sufficient to evoke beneficial physical and psychological changes (including spirituality) after 10 sessions among healthy young women. More precisely, beginner level hatha yoga practice with the above-mentioned setting resulted in an improvement of balance, flexibility, core muscle strength, in addition, an increased level of spirituality and a decreased level of negative affect. However, it did not lead to changes in BMI, body fat percentage, HR and HRV, in addition, in mindfulness, body awareness and positive affect. Concerning BMI and body fat percentage, this type of yoga practice might not lead to changes among healthy adults, but it can be assumed that for changes in these measures more intense and longer period of practice is needed. Regarding changes in HR, HRV, mindfulness, body awareness and positive affect, presumably more frequent or longer period of practice is required.

The significance of verbal instruction during practice was investigated in order to explore a potential impact of a specific component of yoga practice which has not been examined similarly so far. Physically identical yoga classes accompanied with different types of verbal cuing (in such, that one focused mainly on physical aspects of practice, while the other

also included philosophical and spiritual contents) resulted in the same outcomes concerning both physical and psychological measures. This outcome can be best explained by the characteristics of yoga practice itself, namely that hatha yoga possesses specific postures, as well as there is a sustained inner focus, mindful attention and breath regulation during practice. Social aspects of practice (such as personality of the teacher or the group setting) might have an impact, too.

To sum up, practice on weekly basis for 1.5 hours seems to be an adequate frequency and amount to lead beneficial physical, psychological changes (including spirituality), regardless of verbal instruction during practice, at least among healthy young adults. This is relevant for those who lack motivation for more practice or cannot afford more time for practice. Engaging in only one class per week, thus experiencing positive physical and mental health outcomes after a few weeks, might result in more motivation and end in greater regularity of practice, which again is associated with more benefits.

Indeed, current regularity of yoga practice was favorably associated with mindfulness, body awareness, spirituality, and positive and negative affect. In contrast, yoga expertise showed positive association only with mindfulness and positive affect. This strengthens previous outcomes which highlighted the importance of regular practice. Additionally, mindfulness was a significant mediator between yoga practice and negative affect, and body awareness was a significant mediator between yoga practice and spirituality, and also positive affect. These strengthens that mindfulness and body awareness are important factors concerning beneficial correlates of hatha yoga.

Lastly, positive associations between yoga and various aspects of spirituality seem to be evident. Physically based yoga practice can evoke beneficial spiritual effects. However, more holistic practice with the inclusion of philosophical teachings and meditation, as well as the support of community can enhance these benefits. Physical intentions (such as physical fitness and appearance) for yoga practice are higher than spiritual ones both by beginning practice and at later phases, however, spiritual intentions to practice yoga increase over time. Motivations to continue yoga involve physical, psychological, social, and spiritual factors strengthening that yoga is a tool for improving holistic, namely biopsychosocial-spiritual health.

References

- Baktay, E. (1992). *A diadalmas jóga. Rádzsa jóga; a megismerés és önuralom tana*. Szukits Könyvkiadó.
- Boros, S., Csala, B., & Szabolcs, Z. (2019). Keleti mozgásformák. In F. Köteles & E. Ferentzi (Eds.), *Tanulmányok az interocepcióról. Bárdos György professzor tiszteletére* (pp. 239–279). ELTE Eötvös Kiadó.
- Brisbon, N. M., & Lowery, G. A. (2011). Mindfulness and Levels of Stress: A Comparison of Beginner and Advanced Hatha Yoga Practitioners. *Journal of Religion and Health, 50*(4), 931–941. <https://doi.org/10.1007/s10943-009-9305-3>
- Brown, D. H. K. (2013). Seeking spirituality through physicality in schools: Learning from ‘Eastern movement forms.’ *International Journal of Children’s Spirituality, 18*(1), 30–45. <https://doi.org/10.1080/1364436X.2013.776521>
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822–848.
- Büssing, A., Bretz, S. V., & Beerenbrock, Y. (2021). Ethical Principles of Yoga Philosophy in Western Yoga Practitioners: Validation of the Yama/Niyama Questionnaire. *Complementary Medicine Research, 1*–11. <https://doi.org/10.1159/000513026>
- Büssing, A., Hedtstück, A., Khalsa, S. B., Ostermann, T., & Heusser, P. (2012). Development of Specific Aspects of Spirituality during a 6-Month Intensive Yoga Practice. *Evidence-Based Complementary and Alternative Medicine: ECAM, 2012*, 981523. <https://doi.org/10.1155/2012/981523>
- Büssing, A., Michalsen, A., Khalsa, S. B. S., Telles, S., & Sherman, K. J. (2012). Effects of yoga on mental and physical health: A short summary of reviews. *Evidence-Based Complementary and Alternative Medicine: ECAM, 2012*, 165410. <https://doi.org/10.1155/2012/165410>
- Collins, C. (1998). Yoga: Intuition Preventive Medicine Treatment. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 27*(5), 563–568. <https://doi.org/10.1111/j.1552-6909.1998.tb02623.x>
- Cramer, H., Lauche, R., Haller, H., Steckhan, N., Michalsen, A., & Dobos, G. (2014). Effects of yoga on cardiovascular disease risk factors: A systematic review and meta-analysis. *International Journal of Cardiology, 173*(2), 170–183. <https://doi.org/10.1016/j.ijcard.2014.02.017>

- Csala, B., & Köteles, F. (2021). Validation of the Hungarian version of the short form of Spiritual Connection Questionnaire (SCQ-14). *Mentálhigiéné És Pszichoszomatika*, 22(2), 207–228. <https://doi.org/10.1556/0406.22.2021.006>
- Csala, B., Tihanyi, B. T., Boros, S., Selmeczi, J. C., & Köteles, F. (2017). A jógyakorlás és az affektivitás kapcsolatának potenciális mediátorai: Tudatos jelenlét, testi válaszkészség, önegyüttérzés, spiritualitás. *Magyar Sporttudományi Szemle*, 18(71), 19–24.
- Curtis, K., Osadchuk, A., & Katz, J. (2011). An eight-week yoga intervention is associated with improvements in pain, psychological functioning and mindfulness, and changes in cortisol levels in women with fibromyalgia. *Journal of Pain Research*, 4, 189–201. <https://doi.org/10.2147/JPR.S22761>
- Daubenmier, J. J. (2005). The relationship of yoga, body awareness, and body responsiveness to self-objectification and disordered eating. *Psychology of Women Quarterly*, 29(2), 207–219. <https://doi.org/10.1111/j.1471-6402.2005.00183.x>
- Deborah, A. (2009). *The Yamas & Niyamas: Exploring Yoga's Ethical Practice*. On-Word Bound Books LLC.
- Delaney, K., & Anthis, K. (2010). Is Women's Participation in Different Types of Yoga Classes Associated with Different Levels of Body Awareness Satisfaction? *International Journal of Yoga Therapy*, 20(1), 62–71. <https://doi.org/10.17761/ijyt.20.1.t44l6656h22735g6>
- Devereux, G. (1994). *The Elements of Yoga*. Element Books Ltd.
- Domingues, R. B. (2018). Modern postural yoga as a mental health promoting tool: A systematic review. *Complementary Therapies in Clinical Practice*, 31, 248–255. <https://doi.org/10.1016/j.ctcp.2018.03.002>
- Duncan, P. W., Weiner, D. K., Chandler, J., & Studenski, S. (1990). Functional reach: A new clinical measure of balance. *Journal of Gerontology*, 45(6), M192-197. <https://doi.org/10.1093/geronj/45.6.m192>
- Dwivedi, S., & Tyagi, P. (2016). Yoga as a health promotion lifestyle tool. *Indian Journal of Medical Specialities*, 7(1), 29–34. <https://doi.org/10.1016/j.injms.2016.01.001>
- Elwy, A. R., Groessl, E. J., Eisen, S. V., Riley, K. E., Maiya, M., Lee, J. P., Sarkin, A., & Park, C. L. (2014). A systematic scoping review of yoga intervention components and study quality. *American Journal of Preventive Medicine*, 47(2), 220–232. <https://doi.org/10.1016/j.amepre.2014.03.012>
- Emanuelson, L., Drew, R., & Köteles, F. (2015). Interoceptive sensitivity, body image dissatisfaction, and body awareness in healthy individuals. *Scandinavian Journal of Psychology*, 56(2), 167–174. <https://doi.org/10.1111/sjop.12183>

- Field, T. (2016). Yoga research review. *Complementary Therapies in Clinical Practice*, 24, 145–161. <https://doi.org/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. <https://doi.org/10.1016/j.ctim.2016.03.011>
- Govindaraj, R., Karmani, S., Varambally, S., & Gangadhar, B. N. (2016). Yoga and physical exercise—A review and comparison. *International Review of Psychiatry (Abingdon, England)*, 28(3), 242–253. <https://doi.org/10.3109/09540261.2016.1160878>
- Griera, M. (2017). Yoga in Penitentiary Settings: Transcendence, Spirituality, and Self-Improvement. *Human Studies*, 40(1), 77–100. <https://doi.org/10.1007/s10746-016-9404-6>
- Groessler, E. J., Chopra, D., & Mills, P. J. (2015). An Overview of Yoga Research for Health and Well-Being. *Journal of Yoga & Physical Therapy*, 5(4), 1–4. <https://doi.org/10.4172/2157-7595.1000210>
- Gyollai, A., Simor, P., Koteles, F., & Demetrovics, Z. (2011). Psychometric properties of the Hungarian version of the original and the short form of the Positive and Negative Affect Schedule (PANAS). *Neuropsychopharmacologia Hungarica: A Magyar Pszichofarmakologiai Egyesület Lapja = Official Journal of the Hungarian Association of Psychopharmacology*, 13(2), 73–79.
- Hasselle-Newcombe, S. (2005). Spirituality and ‘Mystical Religion’ in Contemporary Society: A Case Study of British Practitioners of the Iyengar Method of Yoga. *Journal of Contemporary Religion*, 20(3), 305–322. <https://doi.org/10.1080/13537900500249806>
- Hendriks, T., de Jong, J., & Cramer, H. (2017). The Effects of Yoga on Positive Mental Health Among Healthy Adults: A Systematic Review and Meta-Analysis. *Journal of Alternative and Complementary Medicine (New York, N.Y.)*, 23(7), 505–517. <https://doi.org/10.1089/acm.2016.0334>
- Hoeger, W. W., & Hopkins, D. R. (1992). A comparison of the sit and reach and the modified sit and reach in the measurement of flexibility in women. *Research Quarterly for Exercise and Sport*, 63(2), 191–195. <https://doi.org/10.1080/02701367.1992.10607580>
- Impett, E. A., Daubenmier, J. J., & Hirschman, A. L. (2006). Minding the body: Yoga, embodiment, and well-being. *Sexuality Research & Social Policy*, 3(4), 39–48. <https://doi.org/10.1525/srsp.2006.3.4.39>
- Ivtzan, I., & Jegatheeswaran, S. (2015). The yoga boom in western society: Practitioners’ spiritual vs. physical intentions and their impact on psychological wellbeing. *J Yoga Phys Ther*, 5(3), 1–7.

- Iyengar, B. K. S. (1991). *Light on Yoga*. The Aquarian Press.
- Jois, K. P. (2002). *Yoga Mala*. North Point Press.
- Köteles, F. (2014). A Testi Tudatosság Kérdőív magyar verziójának (BAQ-H) vizsgálata jógázó és fiatal felnőtt kontroll mintán. *Mentálhigiéné És Pszichoszomatika*, 15(4), 373–391. <https://doi.org/10.1556/Mental.15.2014.4.4>
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLOS Medicine*, 6(7), e1000100. <https://doi.org/10.1371/journal.pmed.1000100>
- Lu, C., Tito, J. M., & Kentel, J. A. (2009). Eastern Movement Disciplines (EMDs) and Mindfulness: A New Path to Subjective Knowledge in Western Physical Education. *Quest*, 61(3), 353–370. <https://doi.org/10.1080/00336297.2009.10483621>
- MacDonald, D. A. (2013). A Call for the Inclusion of Spirituality in Yoga Research. *Journal of Yoga & Physical Therapy*, 03. <https://doi.org/10.4172/2157-7595.1000138>
- Mehling, W. E., Wrubel, J., Daubenmier, J. J., Price, C. J., Kerr, C. E., Silow, T., Gopisetty, V., & Stewart, A. L. (2011). Body Awareness: A phenomenological inquiry into the common ground of mind-body therapies. *Philosophy, Ethics, and Humanities in Medicine*, 6(1), 6. <https://doi.org/10.1186/1747-5341-6-6>
- Meissner, M., Cantell, M. H., Steiner, R., & Sanchez, X. (2016). *Evaluating Emotional Well-Being after a Short-Term Traditional Yoga Practice Approach in Yoga Practitioners with an Existing Western-Type Yoga Practice* [Research article]. Evidence-Based Complementary and Alternative Medicine. <https://doi.org/10.1155/2016/7216982>
- Michelis, E. D. (2005). *A History of Modern Yoga: Patanjali and Western Esotericism*. A&C Black.
- Moliver, N., Mika, E., Chartrand, M., Haussmann, R., & Khalsa, S. (2013). Yoga experience as a predictor of psychological wellness in women over 45 years. *International Journal of Yoga*, 6(1), 11–19. <https://doi.org/10.4103/0973-6131.105937>
- Ness, A., & Briles, K. (2016). *Perceptions of Yoga Spirituality in Minnesota*. 8, 51–62.
- Pandya, S. P. (2017). Millenarianism and yoga: A spiritual approach to mental health. *Journal of Spirituality in Mental Health*, 19(2), 151–168. <https://doi.org/10.1080/19349637.2016.1222601>
- Pandya, S. P. (2018). Auroville as an intentional spiritual community and the practice of Integral yoga. *Cogent Arts & Humanities*, 5(1), 1537079.

- Pandya, S. P. (2019). Facebook and Yoga: Gurus, New Age, and Spirituality through Social Media. *Journal of Religion, Media and Digital Culture*, 8(2), 246–275. <https://doi.org/10.1163/21659214-00802004>
- Parak, J., & Korhonen, I. (2013). Accuracy of Firstbeat Bodyguard2 beat-to-beat heart rate monitor. *White Paper by Firstbeat Technologies Ltd.* http://www.firstbeat.com/userData/firstbeat/tiedostolataukset/white_paper_bodyguard2_final.pdf
- Park, C. L., Elwy, A. R., Maiya, M., Sarkin, A. J., Riley, K. E., Eisen, S. V., Gutierrez, I., Finkelstein-Fox, L., Lee, S. Y., Casteel, D., Braun, T., & Groessl, E. J. (2018). The Essential Properties of Yoga Questionnaire (EPYQ): Psychometric Properties. *International Journal of Yoga Therapy*, 28(1), 23–38. <https://doi.org/10.17761/2018-00016R2>
- Park, C. L., Finkelstein-Fox, L., Groessl, E. J., Elwy, A. R., & Lee, S. Y. (2020). Exploring how different types of yoga change psychological resources and emotional well-being across a single session. *Complementary Therapies in Medicine*, 49, 102354. <https://doi.org/10.1016/j.ctim.2020.102354>
- 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. <https://doi.org/10.1016/j.ctim.2014.08.008>
- Park, C. L., Riley, K. E., Bedesin, E., & Stewart, V. M. (2016). Why practice yoga? Practitioners' motivations for adopting and maintaining yoga practice. *Journal of Health Psychology*, 21(6), 887–896. <https://doi.org/10.1177/1359105314541314>
- Patwardhan, A. R. (2017). Yoga Research and Public Health: Is Research Aligned With The Stakeholders' Needs? *Journal of Primary Care & Community Health*, 8(1), 31–36. <https://doi.org/10.1177/2150131916664682>
- Quilty, M. T., Saper, R. B., Goldstein, R., & Khalsa, S. B. S. (2013). Yoga in the Real World: Perceptions, Motivators, Barriers, and patterns of Use. *Global Advances in Health and Medicine*, 2(1), 44–49. <https://doi.org/10.7453/gahmj.2013.2.1.008>
- Rama, S., Ballentine, R., & Ajaya, S. (1976). *Yoga & Psychotherapy. The Evolution of Consciousness*. Himalayan Institute Press.
- Raub, J. A. (2002). Psychophysiologic effects of Hatha Yoga on musculoskeletal and cardiopulmonary function: A literature review. *Journal of Alternative and Complementary Medicine (New York, N.Y.)*, 8(6), 797–812. <https://doi.org/10.1089/10755530260511810>

- Rogers, C. (1951). *Client-centered therapy: Its current practice, implications and theory*. Constable.
- Roland, K. P., Jakobi, J. M., & Jones, G. R. (2011). Does yoga engender fitness in older adults? A critical review. *Journal of Aging and Physical Activity*, *19*(1), 62–79. <https://doi.org/10.1123/japa.19.1.62>
- Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine (New York, N.Y.)*, *16*(1), 3–12. <https://doi.org/10.1089/acm.2009.0044>
- Safara, M., & Ghasemi, P. (2017). The Effectiveness of Yoga on Spiritual Intelligence in Air Traffic Controllers of Tehran Flight Control Center. *Journal of Education and Learning*, *6*(4), 276–284.
- Sarbacker, S. R. (2014). Reclaiming the Spirit through the Body: The Nascent Spirituality of Modern Postural Yoga. *Entangled Religions*, *1*, 95–114. <https://doi.org/10.13154/er.v1.2014.95-114>
- Seenaa, N. S., Suresh, S., & Ravindranadan, V. (2017). Emotional intelligence, spiritual intelligence and subjective well-being of yoga practitioners. *Indian Journal of Positive Psychology*, *8*(4), 577–582.
- Sengupta, P. (2012). Health Impacts of Yoga and Pranayama: A State-of-the-Art Review. *International Journal of Preventive Medicine*, *3*(7), 444–458. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3415184/>
- Sherman, S. A., Rogers, R. J., Davis, K. K., Minster, R. L., Creasy, S. A., Mullarkey, N. C., O'Dell, M., Donahue, P., & Jakicic, J. M. (2017). Energy Expenditure in Vinyasa Yoga Versus Walking. *Journal of Physical Activity and Health*, *14*(8), 597–605. <https://doi.org/10.1123/jpah.2016-0548>
- Shields, S. A., Mallory, M. E., & Simon, A. (1989). The Body Awareness Questionnaire: Reliability and validity. *Journal of Personality Assessment*, *53*(4), 802. https://doi.org/10.1207/s15327752jpa5304_16
- Simor, P., Petke, Z., & Köteles, F. (2013). Measuring pre-reflexive consciousness: The Hungarian validation of the Mindful Attention Awareness Scale (MAAS). *Learning & Perception*, *5*(s2), 17–29. <https://doi.org/10.1556/LP.5.2013.Suppl2.2>
- Singleton, M., & Byrne, J. (Eds.). (2008). *Yoga In the Modern World: Contemporary Perspectives*. Routledge.

- Strand, S. L., Hjelm, J., Shoepe, T. C., & Fajardo, M. A. (2014). Norms for an isometric muscle endurance test. *Journal of Human Kinetics, 40*, 93–102. <https://doi.org/10.2478/hukin-2014-0011>
- Suni, J. H., Husu, P., & Rinne, M. (2009). *Fitness for Health: The ALPHA-FIT Test Battery for Adults Aged 18-69. Tester's Manual. European Union, DG Sanco*. UKK Institute for Health Promotion Research.
- Suni, J. H., Oja, P., Miilunpalo, S. I., Pasanen, M. E., Vuori, I. M., & Bös, K. (1998). Health-related fitness test battery for adults: Associations with perceived health, mobility, and back function and symptoms. *Archives of Physical Medicine and Rehabilitation, 79*(5), 559–569. [https://doi.org/10.1016/S0003-9993\(98\)90073-9](https://doi.org/10.1016/S0003-9993(98)90073-9)
- Tolnai, N., Szabó, Z., Köteles, F., & Szabo, A. (2016). Physical and psychological benefits of once-a-week Pilates exercises in young sedentary women: A 10-week longitudinal study. *Physiology & Behavior, 163*, 211–218. <https://doi.org/10.1016/j.physbeh.2016.05.025>
- Vadiraja, H. S., Rao, R., Nagarathna, R., Nagendra, H., Rekha, M., Vanitha, N., Kodaganur, G., Srinath, B. S., Vishweshwara, M. S., Madhavi, Y. S., Ajaikumar, B. S., Bilimagga, R., & Rao, N. (2009). Effects of yoga program on quality of life and affect in early breast cancer patients undergoing adjuvant radiotherapy: A randomized controlled trial. *Complementary Therapies in Medicine, 17*, 274–280. <https://doi.org/10.1016/j.ctim.2009.06.004>
- Veda Bharati, S. (1985). *Philosophy of Hatha Yoga*. Himalayan Institute India.
- Wahlström, M., Rydell Karlsson, M., & Medin, J. (2018). Perceptions and experiences of MediYoga among patients with paroxysmal atrial fibrillation—An interview study. *Complementary Therapies in Medicine, 41*, 29–34. <https://doi.org/10.1016/j.ctim.2018.09.002>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. <https://doi.org/10.1037/0022-3514.54.6.1063>
- Wheeler, P., & Hyland, M. E. (2008). The development of a scale to measure the experience of spiritual connection and the correlation between this experience and values. *Spirituality and Health International, 9*(4), 193–217. <https://doi.org/10.1002/shi.348>
- Yesudian, S., & Haich, E. (1992). *Sport és jóga*. Magyar Világ Kiadó.

Publications on the subject of the doctoral thesis

- Boros, S., **Csala, B.**, & Szabolcs, Z. (2019). Keleti mozgásformák. In F. Köteles & E. Ferentzi (Eds.), *Tanulmányok az interocepcióról. Bárdos György professzor tiszteletére* (pp. 239–279). ELTE Eötvös Kiadó.
- Boros, S., **Csala, B.**, & Szilágyi, E. (2018). Yoga Practice for The Elderly: Good Choice to Avoid Falls. *Journal of Exercise, Sports & Orthopedics*, 5(1), 1–4. <https://doi.org/10.15226/2374-6904/5/1/00166>
- 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. <https://doi.org/10.3389/fpsyg.2020.01375>
- Csala, B.**, & Köteles, F. (2021). Validation of the Hungarian version of the short form of Spiritual Connection Questionnaire (SCQ-14). *Mentálhigiéné És Pszichoszomatika*, 22(2), 207–228. <https://doi.org/10.1556/0406.22.2021.006>
- Csala, B.**, Köteles, F., & Boros, S. (2018). Effect of 10-week long hatha yoga practice on BMI, balance, flexibility and core strength among female university participants. *Magyar Sporttudományi Szemle*, 19(76), 12–18.
- Csala, B.**, Springinsfeld, C. M., & Köteles, F. (2021). The Relationship Between Yoga and Spirituality: A Systematic Review of Empirical Research. *Frontiers in Psychology*, 12, 3052. <https://doi.org/10.3389/fpsyg.2021.695939>
- Csala, B.**, Szemerszky, R., Körmendi, J., Köteles, F., & Boros, S. (submitted for publication). *Is weekly frequency of yoga practice sufficient? Physiological effects of hatha yoga among healthy novice women.*
- Csala, B.**, Tihanyi, B. T., Boros, S., Selmeczi, J. C., & Köteles, F. (2017). A jógyagyakorlás és az affektivitás kapcsolatának potenciális mediátorai: Tudatos jelenlét, testi válaszkészség, önegyüttértés, spiritualitás. *Magyar Sporttudományi Szemle*, 18(71), 19–24.
- Szabolcs, Z., **Csala, B.**, Szabo, A., & Köteles, F. (2021). Psychological aspects of three movement forms of Eastern origin: A comparative study of aikido, judo and yoga. *Annals of Leisure Research*, 0(0), 1–21. <https://doi.org/10.1080/11745398.2020.1843507>
- Tihanyi, B. T., Sági, A., **Csala, B.**, Tolnai, N., & Köteles, F. (2016). Body awareness, mindfulness and affect: Does the kind of physical activity make a difference? *European Journal of Mental Health*, 11(01–02), 97–111. <https://doi.org/10.5708/EJMH.11.2016.1-2.6>

Publications outside the scope of the doctoral thesis

- Ferentzi, E., Bogdány, T., Szabolcs, Z., **Csala, B.**, Horváth, Á., & Köteles, F. (2018). Multichannel investigation of interoception: Sensitivity is not a generalizable feature. *Frontiers in Human Neuroscience, 12*, 223. <https://doi.org/10.3389/fnhum.2018.00223>
- Ferentzi, E., Köteles, F., **Csala, B.**, Drew, R., Tihanyi, B. T., Pulay-Kottlár, G., & Doering, B. K. (2017). What makes sense in our body? Personality and sensory correlates of body awareness and somatosensory amplification. *Personality and Individual Differences, 104*, 75–81. <https://doi.org/10.1016/j.paid.2016.07.034>