

Social Psychological Bulletin

Psychologia Społeczna

For Body and Mind: Practicing Yoga and Emotion Regulation

Dorota Kobylińska¹, Karol Lewczuk¹, Marta Marchlewska², Aneta Pietraszek¹

¹ Faculty of Psychology, University of Warsaw, Warsaw, Poland

² Institute of Psychology, Polish Academy of Sciences, Warsaw, Poland

Corresponding author: Dorota Kobylińska (Faculty of Psychology, University of Warsaw, Poland, Stawki 5/7, 00-183 Warsaw, Poland. tel: +48225549831. E-mail: dorotak@psych.uw.edu.pl)

Handling editor: Tomasz Grzyb (SWPS University of Social Science and Humanities, Wrocław, Poland)

Received: 31 August 2017 • **Accepted:** 16 December 2017 • **Published:** 11 April 2018

Citation: Kobylińska, D., Lewczuk, K., Marchlewska, M., & Pietraszek, A. (2018). For body and mind: practicing yoga and emotion regulation. *Social Psychological Bulletin*, 13(1), Article e25502. <https://doi.org/10.5964/spb.v13i1.25502>

Abstract

The purpose of the present study was to examine if the length of yoga training may influence the use of cognitive reappraisal and expressive suppression (as emotion regulation strategies) and whether this relationship may be moderated by personality traits. Based on previous studies, we hypothesized that the link between the length of yoga practice and emotion regulation can rely most heavily on participants' conscientiousness and extraversion levels. Ninety women in two groups participated in the study: those who have been practicing yoga for over a year and those who have been practicing for a shorter period of time. An Emotion Regulation Questionnaire was applied to measure the use of the strategies of cognitive reappraisal and expressive suppression. Moreover, personality traits, based on the Big Five model were assessed. The results of the study provided support for our prediction: participants who engaged in yoga practice for a longer period of time (as compared to participants who practiced yoga for a shorter duration), reported using cognitive reappraisal more often. Furthermore, longer yoga practice was more beneficial than shorter practice especially for individuals with low levels of conscientiousness and extraversion. Thus, extraversion and conscientiousness seem to facilitate the process of drawing benefits from practicing yoga.

Keywords

yoga, emotion regulation, personality, reappraisal, suppression



Psychological Benefits of Yoga

The origins of yoga are connected to the Indian philosophical system, which promotes the unity of body and mind (Salmon, Lush, Jablonski, & Sephton, 2009). The most common kind of practice is known as Hatha and consists of two pillars – *pranayama* (breathing) and *asanas* (poses) – that are aimed at gaining control over emotions and the mind, enabling spiritual development (Eliade, 1984). It is believed that yoga, if performed correctly, can affect muscles and glands, eliciting advantageous physiological changes in the organism and promoting physical health (Ross & Thomas, 2010), which, as a consequence, brings psychological benefits (Garfinkel & Schumacher, 2000). Evidence suggests that yoga interventions appear to be equal and/or superior to exercise in most outcome measures (Govindaraj, Karmani, Varambally, & Gangadhar, 2016). Breath regulation, mindfulness during practice, and importance given to maintenance of postures are some of the elements differentiating yoga practices from physical exercise in general.

A number of studies have shown positive consequences of yoga practice for well-being and psychological health. Researchers have tested the effectiveness of yoga in relieving the symptoms of depression, anxiety, PTSD (Field, 2011; da Silva, Ravindran, & Ravindran, 2009) and neuropsychiatric disorders (Balasubramaniam, Telles, & Doraiswamy, 2013). For example, a meta-analysis conducted by Li and Goldsmith (2012) demonstrated that the deployment of techniques derived from yoga combined with pharmacotherapy reduced the symptoms of anxiety and stress. Three of the studies included in the meta-analysis showed that yoga practice contributes not only to the decrease of stress on a declarative level, but also to the reduction of cortisol level among: yoga teachers (Kamei, Toriumi, & Kimura, 2000), graduating students (West et al., 2004) and women suffering from breast cancer (Smith & Pukall, 2009; Vadiraja et al., 2009). Similarly, a number of studies related to the efficiency of yoga as an additional therapy element in mild or moderate depressive episodes, had proved that yoga had a positive influence on recovery and the reduction of symptoms (Janakiramaiah, Gangadhar, Naga Venkatesha Murthy, Subbakrishna, & Vedamurthachar, 2000; Pilkington, Kirkwood, Rampes, & Richardson, 2005). The effectiveness of yoga in the treatment of depression was also reported in a review by Uebelacker and colleagues (2010).

Going a step further, a study conducted by Vahia and colleagues (1973) showed that yoga can result in more efficient mitigation of anxiety symptoms than pharmacological treatment, such as amitriptyline and chlordiazepoxide. Similar conclusions stem from research conducted by Sahasi and colleagues (1989), which showed that a therapy including the techniques derived from yoga can have a more positive influence on the reduction of symptoms in anxiety neurosis than diazepam therapy. Finally the results of many studies on PTSD indicated yoga's potential as a form of therapy meant for people with past trauma experiences or those at risk of trauma (Dick, Niles, Street, & DiMartino, 2014; Emerson & Hopper, 2011; Emerson, Sharma, Chaudhry, & Turner, 2009).

Apart from research on the effects of yoga in the treatment of certain psychological disorders, the effects in well-being enhancement have also been demonstrated. Auty, Cope, and Liebling (2017) reported a systematic review and two meta-analyses showing that yoga and meditation programs were significantly related to increased psychological well-being and improvements in the behavioral functioning of prisoners. In a recent review (Stephens, 2017), medical yoga (including physical exercise, breathing techniques, mindfulness and meditation) was described as helping to increase mental energy and positive feelings and decrease negative feelings and aggressiveness.

Furthermore, in a study by Stueck and Gloeckner (2005), training of self-control and relaxation based on breathing exercises and techniques derived from yoga, contributed to a significant reduction of the level of helplessness and aggression. Participants displayed a tendency to make use of the newly acquired stress management techniques in situations that were different from the conditions during their training. Although Stueck and Gloeckner (2005) did not control for emotion-regulation, they claimed that exercises based on yoga taught participants how to cope with negative emotions, which in turn significantly improved their mental well-being. Similarly, in a review by Riley and Park (2015), yoga interventions were also described as effective in reducing stress.

Summing up, the psychological benefits of yoga seem well documented, however it is not clear what the exact mechanism of the influence of practicing yoga on health and well-being is.

Personality and the Effectiveness of Yoga

Personality provides an integration of diverse characteristics and experience, which mutually influence one another (Kernberg, 2016). Personality characteristics usually interact with situational influences (Cervone, 2004; Kobylińska & Marchlewska, 2016; Mischel & Shoda, 1995; Stemplewska-Żakowicz, Zalewski, Suszek, Kobylińska, & Szymczyk, 2014) affecting cognition and behavior, including the effectiveness of different processes, such as physical activity or meditation.

In general, different personality characteristics are related to engaging in physical activity as well as to outcomes of this activity. A meta-analysis of 35, independent and statistically significant research showed that physical activity was positively correlated with personality traits from the extraversion and conscientiousness domains and negatively – with traits from the domain of neuroticism (Rhodes & Smith, 2006). In another study, a high level of agreeableness and conscientiousness correlated with a tendency to adopt healthy behaviors and being ready to observe them (Smith, 2006). Although such personality traits as conscientiousness or extraversion were positively related to physical activity or adopting healthy behaviors, they were not analyzed as potential moderators of yoga effectiveness.

A study by Shapiro and Cline (2004) demonstrated that other traits, such as depression or anxiety, can differentiate people in regard to emotional benefits resulting from yoga practice. First of all, participants' levels of stress, frustration and fatigue were much

lower after the yoga training (9 meetings, 90 min per meeting, 2 meetings per week) than before. What is more, a significant increase was noticed in the level of relaxation, happiness, satisfaction and optimistic attitude. Additionally, respective traits moderated the relation between yoga practice and mood change. Depressiveness as a trait was related to the level of frustration and irritation: the more depressive the participants were, the bigger the decrease in frustration and irritation levels after the training. Similar positive relations were noticed between trait anxiety as a trait and levels of frustration, irritation and pessimistic attitude. The results of this study clearly demonstrate the moderating role of traits in achieving benefits from yoga practice.

In another study, researchers examined how Zen meditation influences psychophysiological factors and whether personality moderates this influence (Takahashi et al., 2005). The study showed that novelty seeking was positively correlated with alpha EEG power (specific to the state of relaxation) during the meditation. Novelty seeking is understood as a reaction to a new type of external stimulation in a manner characteristic for reward seeking and punishment avoidance. Yet, it turns out that people who meditate initially direct their attention towards the outside, but with practice gradually direct their attention to the inside, which fosters positive effects of meditation, including calming down and relaxation. The results may constitute a valuable implication for studies on susceptibility to calming down and relaxation during yoga practice, in relation to particular personality traits, due to the fact that focus on breathing in order to direct attention to the inside is the key element in yoga.

Summing up, the described studies show that: 1) personality can be related to outcomes of physical activity in general and yoga in particular, 2) personality traits can moderate the influence of yoga on psychological health and well-being. Among traits that may be strongly related with positive outcomes of physical exercise and behavioral change, conscientiousness (O'Connor, Conner, Jones, McMillan, & Ferguson, 2009) and extraversion (Rhodes, Courneya, & Jones, 2002) seem to have a special role. Conscientiousness, defined as dutifulness, self-discipline and deliberation was shown to moderate the intention – behavior link in predicting exercise behavior (Bogg, 2008; Conner, Rodgers, & Murray, 2007), while other Big Five traits did not have such an effect. Moreover, extraversion and conscientiousness were positively correlated with exercise behavior (Courneya & Hellsten, 1998) as well as self-determination of exercise behavior (Ingledeu, Markland, & Sheppard, 2004). Relating these findings to self-determination theory (Ryan & Deci, 2000), Ingledeu and colleagues (2004) hypothesized that “extraverted individuals are able to feel self-determined because exercise can satisfy the need for relatedness, conscientious individuals because exercise can satisfy the need for competence” (p. 1921). In another study, extraversion was found to predict yoga class attendance and home practice during Mindfulness Based Cancer Recovery Program (Tamagawa et al., 2015).

Emotion Regulation

Despite the fact that emotions have an important adaptive function in humans' life, serving as important information about oneself or the external world (Ekman & Davidson, 1994), certain characteristics of emotions (e.g., frequency of occurrence, intensity and duration) may be non-adaptive (Frijda, 1994). Frijda (2008) suggests that one of the reasons for dysfunctionality of certain emotional manifestations might be a change of the environment in which modern-day humans live (in comparison to the environment of his evolution) and the quick intellectual and cultural development that overtook evolution. Emotional regulation, therefore, gains greater and greater importance.

In line with Gross' theory (Gross, 2008, 2014, 2015a, 2015b), emotional regulation is defined as a process through which emotions are modified: how and when they are experienced and expressed on behavioral, experiential and psychophysiological levels. Emotion regulation might be aimed at reducing, reinforcing or maintaining both negative and positive emotions – depending on the current goals of a person. In his process model of emotion regulation, Gross (2015b) describes five levels, related to the dynamics of emotional process, on which regulation may occur: situation selection, situation modification, attention deployment, cognitive change and response modulation.

In their research, Gross and colleagues focused on two strategies: cognitive reappraisal (an antecedent focused strategy) and expressive suppression (a response-focused strategy). As reappraisal occurs early in the emotion-generative process (an antecedent-focused strategy; Gross, 2008; Ochsner & Gross, 2008), it may modify the whole emotional process and response. It is a form of cognitive change that involves changing the way of thinking about a situation by altering its emotional meaning and impact. Suppression is a form of response modulation (a response-focused strategy) that involves inhibiting ongoing emotion-expressive behavior (Gross, 1998). It comes later in the emotion-generative process and does not influence the emotion itself, affecting only the behavioral aspects of emotion response tendencies. Individuals differ in their use of these two emotion regulation strategies, and such individual differences have implications for their affect, well-being, and social relationships (Gross, 2008; Gross & John, 2003).

Studies have shown that using reappraisal correlates positively with well-being and negatively with symptoms of psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010), while using expressive suppression is positively correlated to psychopathology symptoms and negatively to satisfaction with interpersonal relations (Gross & Levenson, 1993; Srivastava, Tamir, McGonigal, John, Gross, 2009). Moreover, people who use reappraisal experience and express more positive and less negative emotions, while people who use mainly suppression experience and express less positive and more negative emotions (John & Gross, 2004). Consequences of the two contrasted strategies activated in experimental research also suggested that reappraisal is more adaptive and effective than suppression on an affective, cognitive and social level (Dan-Glauser & Gross, 2015; John & Gross, 2004; Mauss & Gross, 2004). One of the reasons is that suppression requires active effort

to manage the emotion. However, as Troy and colleagues (2013) put it, multiple theoretical accounts suggest that this conclusion is incomplete, because no psychological process is inherently and always adaptive (Grant & Schwartz, 2011; Lazarus, 1993). Several recent studies have demonstrated that the effectiveness of reappraisal and suppression depends on the situational context in which they are applied as well as goals that an individual is pursuing (e.g., McRae, Jacobs, Ray, John, & Gross, 2012; Sheppes et al., 2014; Troy, Shallcross, & Mauss, 2013).

Yoga and Emotion Regulation

The findings presented above indicate that exercises derived from yoga can be helpful in the mitigation of depression, stress and anxiety symptoms. Focus on the present moment and pursuit of mindfulness might be useful in the process of learning to notice how emotions manifest themselves through the body, which in turn should facilitate self-regulation, including emotional regulation (Gard, Noggle, Park, Vago, & Wilson, 2014). On the other hand, more and more studies show the importance of effective emotion regulation in psychological health and recovering from psychological disorders or emotional problems (Aldao, 2013; Aldao et al., 2010; Aldao, Jazaieri, Goldin, & Gross, 2014; DeSteno, Goss, & Kubzansky, 2013; Gross, 2015a). Thus, emotion regulation enhancement can be a hypothetical mechanism through which yoga and mindfulness influence psychological health and well-being. That is why in our study we were specifically interested in the relation of yoga and emotion regulation and the moderating role of personality traits. We based our reasoning on some existing data regarding general emotion regulation and yoga.

First of all, dispositional mindfulness (which is a part of yoga practice: Auty, Cope, & Liebling, 2017; Salmon, Lush, Jablonski, & Sephton, 2009) is related to emotion regulation and that emotion regulation is enhanced with Mindfulness Based Stress Reduction training (Goldin & Gross, 2010). Moreover, mindfulness meditation was found to be more effective than aerobic exercise in decreasing negative emotions and social anxiety symptom severity in patients with social anxiety disorder (Goldin, Ziv, Jazaieri, Hahn, & Gross, 2013; Goldin et al., 2016), depression (Ramel, Goldin, Carmona, & McQuaid, 2004) and in increasing well-being (Brown & Ryan, 2003; Carmody & Baer, 2008; Grossman, Niemann, Schmidt, & Walach, 2004; Krygier et al., 2013). More direct evidence for the yoga – emotion regulation link is presented in a review by Menezes and colleagues (Menezes et al., 2015). The results they present suggest that “yoga produces improvements in emotional functioning in healthy subjects and people who suffer from some physical illnesses, particularly in psychological self-reported variables” (p. 82). As for length of yoga practice, they reported results for practice ranging from one single session to 6 months. In two of the studies, frequency of yoga practice was associated with lower mood disturbances (Khalsa, Hickey-Schultz, Cohen, Steiner, & Cope, 2012) and reduced LPP in response to negative images suggesting enhanced cognitive emotion regulation (Gootjes, Franken, & Van Strien, 2011). In another study, yoga turned out to decrease expressive suppression and increase psycho-

logical flexibility (Dick, Niles, Street, & DiMartino, 2014). However, evidence regarding behavioral and neuropsychological correlates of yoga practice is less well-established.

Overview of the Study

The aim of the present study was to test whether people who had been practicing yoga for a long time (more than 1 year) would regulate their emotions more effectively in comparison to those who had been practicing yoga for shorter duration (less than 1 year). The study was meant to test in particular whether long-term yoga practice (in comparison to the beginnings of practice) is related to a greater tendency to use the cognitive reappraisal strategy and a lower tendency to use expressive suppression. We also aimed to determine if the relations were moderated by personality traits (as defined in the Big Five model). Furthermore, we intended to check the pattern of correlations between the use of mentioned emotion regulation strategies and personality traits.

We hypothesized that people who have been practicing yoga for longer than a year, in comparison to those who have been practicing for a period of time shorter than a year, regulate their emotions more effectively as they use more cognitive reappraisal and less expressive suppression. We also tested whether personality traits would moderate the effects of the length of yoga training on the use of: cognitive reappraisal and expressive suppression strategies. Specifically, we expected the positive effect of longer (versus shorter) yoga training on cognitive reappraisal and negative effect of longer (versus shorter) yoga training on expressive suppression among those individuals who are generally less prone to adopt healthy behaviors, thus those low in extraversion and low in conscientiousness.

Methods

We applied a questionnaire to measure the use the strategies of cognitive reappraisal and expressive suppression in two groups: those who have been practicing yoga for over a year and those who have been practicing for a shorter period of time. Moreover, personality traits, based on the Big Five model (Costa & McCrae, 1992), were measured.

Participants and Procedure

Ninety women, aged 17-55 ($M = 27.12$, $SD = 6.92$) took part in the study. The participants attended yoga classes in one of the yoga schools in Warsaw.

At the beginning of the study participants were informed that the subject of the study was the relation between yoga practice and everyday functioning and they were asked to indicate the duration of their yoga practice (more or less than a year). One year was considered a milestone, due to the fact that, after this period of time yoga practitioners usually know the elementary positions well enough to start their own practice in *mysore* style (Smith, 2007). This means that during the classes they attend, the role of a yoga teacher is merely to correct and improve students' practice but not to guide the practice. The begin-

ning of *mysore* is deemed a shift to a more engaging and self-conscious form of practice. Thus, the results of those who trained for less than a year ($n = 45$) were compared with the results of those who trained for a year or longer ($n = 45$). Women in both groups attended yoga classes twice or three times a week, each lasting for 1-1.5 h.

Next, we measured emotion regulation strategies (i.e., reappraisal and suppression) and personality traits. The answers to all the participants' questions were provided after the questionnaires were completed. The study was fully anonymous with no compensation offered to participants.

Measures

Personality Traits

Personality traits were measured with the Polish adaptation (Zawadzki, Strelau, Szczepaniak, & Śliwińska, 1998) of NEO-Five Factor Inventory (Costa & McCrae, 1992). NEO-Five Factor Inventory comprises 60 items; 12 items per each of the five domains: conscientiousness ($M = 30.39$, $SD = 7.95$), extraversion ($M = 28.26$, $SD = 7.20$), neuroticism ($M = 22.40$, $SD = 9.36$), openness to experience ($M = 33.78$, $SD = 6.05$), and agreeableness ($M = 30.58$, $SD = 5.84$). Conscientiousness is a dimension related to diligence, endurance in a pursuit of a goal, strength of will, being dutiful and prone to keeping order (sample item: *I keep my belongings clean and neat*). Extraversion is a dimension related to sociability, openness, optimism and stimulation seeking (sample item: *I like to have a lot of people around me*). Neuroticism is a trait related to a tendency to experience negative emotions and higher sensitivity towards stress or low capacity to control drives (sample item: *I often feel inferior to others*). Openness to experience is related to seeking new experiences, world curiosity and tolerance for novelty or changes (sample item: *I am intrigued by the patterns I find in art and nature*). Agreeableness is described as a trait related to sensitivity to the experiences of others, being prone to trust and cooperate (sample item: *I try to be courteous to everyone I meet*). Participants responded on a scale from 1 = *strongly disagree* to 5 = *strongly agree*. Previous studies have shown that the reliability of the Polish adaptation of NEO-Five Factor Inventory is satisfactory and very close to the reliability of the original version – between .68 and .82 (Cronbach's alpha) for five questionnaire scales (Zawadzki et al., 1998).

Emotion Regulation Strategies

Emotion regulation strategies (reappraisal and expressive suppression) were measured with the Polish version (Śmieja, Mrozowicz, & Kobylińska, 2011) of Emotion Regulation Questionnaire (ERQ, Gross & John, 2003). The questionnaire consists of 10 questions referring to the way the person regulates emotions in everyday life. Four questions assess using the strategy of expressive suppression of emotions ($M = 3.35$, $SD = 1.23$), for example: “*I control my emotions by not expressing them*”, whereas six others relate to using the reappraisal strategy ($M = 4.91$, $SD = 1.25$), for example: “*When I want to feel less negative emotions (such as sadness or anger), I change what I'm thinking about*”. Participants responded on a

scale from 1 = *totally disagree* to 7 = *totally agree*. Previous studies have proven that the Polish version of ERQ had high reliability (as ranging from .75 to .85 for reappraisal subscale and from .74 to .85 for suppression subscale; Śmieja, Mrozowicz, & Kobylińska, 2011).

Results

First we compared short (< 1 year) and long (> 1 year) yoga practice groups in terms of emotion regulation skills. The independent *t*-test revealed that participants in the long training group showed higher levels of using reappraisal ($M = 5.23$, $SD = 1.06$) than participants in the short training group ($M = 4.60$, $SD = 1.37$), $t(88) = 2.43$, $p = .02$. We did not find significant differences between long ($M = 3.17$, $SD = 1.19$) and short ($M = 3.53$, $SD = 1.26$) training groups in using suppression of emotions, $t(88) = -1.42$, $p = .16$.

Secondly, we conducted zero order correlations between using reappraisal, using suppression and Big Five personality traits across conditions (see Table 1).

Table 1
Correlations Between All Continuous Variables Included in the Model

Variable	1	2	3	4	5	6
1. Neuroticism	-					
2. Extraversion	-.47***	-				
3. Openness	.07	.18 [†]	-			
4. Agreeableness	-.34**	.13	.21*	-		
5. Conscientiousness	-.58***	.24*	-.04	.44***	-	
6. Reappraisal	-.52***	.48***	.22*	.19 [†]	.31**	-
7. Suppression	.53***	-.48***	-.02	-.27*	-.12	-.38***

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Using reappraisal was significantly positively related to: extraversion, conscientiousness and openness to experience and significantly negatively related to: neuroticism and using suppression. We also found a marginally significant positive relationship between using reappraisal and agreeableness. Using suppression was significantly positively related to neuroticism and significantly negatively related to extraversion and agreeableness. We found no significant relationships between suppression and: openness to experience or conscientiousness.

Next, we performed a hierarchical multiple regression analysis to investigate the effect of the length of yoga training on using reappraisal in interaction with personality traits. Variables coding personality traits were mean-centered prior to the analyses. The length of yoga training was coded as 0 = short and 1 = long (Table 2).

In the first step we introduced the length of yoga training and found its positive significant effect on using reappraisal, indicating that participants were more likely to use a cognitive reappraisal strategy after long (vs. short) yoga training.

Table 2
Results of a Multiple Regression Predicting Reappraisal

Step and predictor variable	B	SE	p	R ²	F	p
Step 1				.06	5.90	.02
Training (0 = short; 1= long)	0.63	0.26	.02			
Step 2				.46	5.93	< .001
Training (0 = short; 1= long)	0.18	0.22	.41			
Neuroticism	-0.03	0.02	.21			
Extraversion	0.06	0.02	.004			
Openness	0.04	0.03	.17			
Agreeableness	-0.01	0.03	.67			
Conscientiousness	0.05	0.02	.06			
Training × Neuroticism	-0.07	0.03	.04			
Training × Extraversion	-0.07	0.04	.09			
Training × Openness	0.04	0.04	.38			
Training × Agreeableness	0.00	0.04	.99			
Training × Conscientiousness	-0.09	0.04	.02			

In the second step we introduced all Big Five personality traits and their interactions with the length of yoga training. After introducing personality traits we did not find a significant effect of the length of yoga training on using reappraisal. However, we found a positive significant effect of extraversion and a marginally significant positive effect of conscientiousness. Furthermore, the two-way interaction between the length of yoga training and conscientiousness was significant. We also found marginally significant two-way interaction between the length of yoga training and extraversion. Finally, we found a significant two-way interaction between the length of yoga training and neuroticism.

Simple slopes analysis indicated that the effect of the length of yoga training on using reappraisal was positive and significant for low conscientiousness, -1 SD; $B = 0.86, SE = 0.36, p = .02$; and non-significant for high conscientiousness, +1 SD; $B = -0.49, SE = 0.35, p = .16$ (Figure 1).

Simple slopes analysis also indicated that the effect of the length of yoga training on reappraisal was positive and marginally significant for low extraversion, -1 SD; $B = 0.66, SE = 0.35, p = .07$; and non-significant for high extraversion, +1 SD; $B = -0.29, SE = 0.35, p = .41$ (Figure 2).

Finally, simple slopes analysis indicated that the effect of the length of yoga training on using reappraisal was positive and marginally significant for low neuroticism, -1 SD; $B = 0.82, SE = 0.37, p = .03$; and non-significant for high neuroticism, +1 SD; $B = -0.45, SE = 0.39, p = .25$ (Figure 3).

Finally, we performed a hierarchical multiple regression analysis to investigate the effect of the length of yoga training on using suppression in interaction with personality traits. Variables coding personality traits were mean-centered prior to the analyses. The length of yoga training was coded as 0 = short and 1 = long (Table 3).

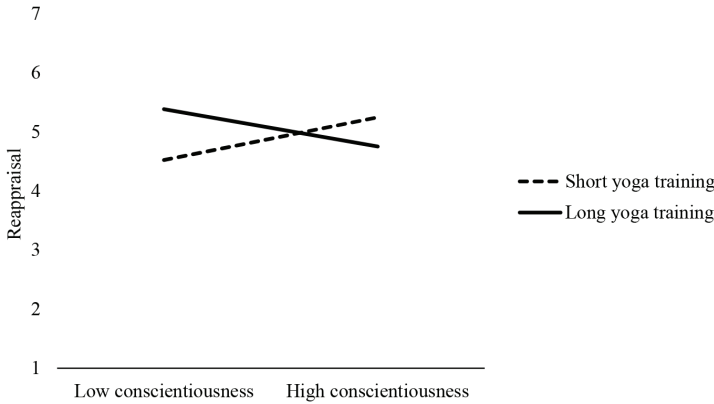


Figure 1. Interaction effect of the length of yoga training and conscientiousness on using reappraisal.

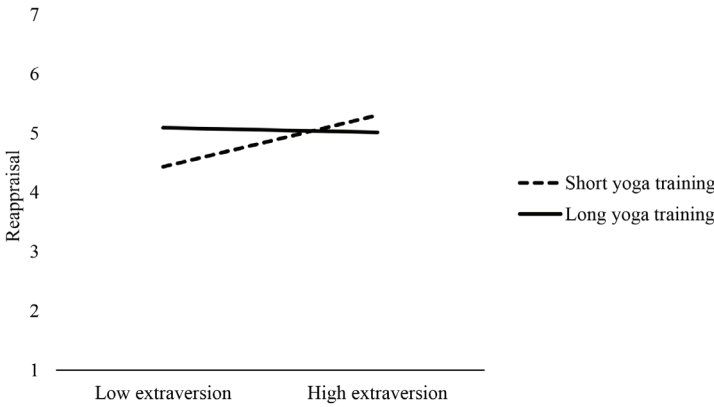


Figure 2. Interaction effect of the length of yoga training and extraversion on using reappraisal.

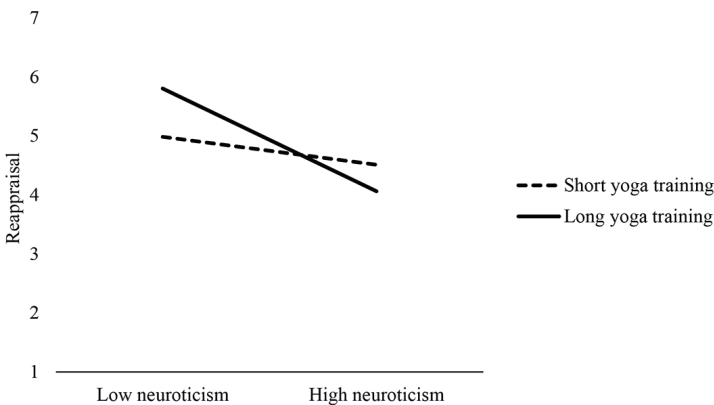


Figure 3. Interaction effect of the length of yoga training and neuroticism on reappraisal.

Table 3
Results of a Multiple Regression Predicting Suppression

Step and predictor variable	<i>B</i>	<i>SE</i>	<i>p</i>	<i>R</i> ²	<i>F</i>	<i>p</i>
Step 1				.02	2.03	.16
Training (0 = short; 1 = long)	-0.37	0.26	.16			
Step 2				.48	6.43	<.001
Training (0 = short; 1 = long)	-0.05	0.21	.82			
Neuroticism	0.06	0.02	.01			
Extraversion	-0.06	0.02	.01			
Openness	-0.01	0.02	.56			
Agreeableness	-0.02	0.03	.50			
Conscientiousness	0.04	0.02	.09			
Training × Neuroticism	0.03	0.03	.36			
Training × Extraversion	0.002	0.04	.96			
Training × Openness	0.06	0.04	.10			
Training × Agreeableness	-0.06	0.04	.17			
Training × Conscientiousness	0.02	0.03	.54			

In the first step we introduced the length of yoga training and found its negative albeit non-significant effect on using suppression.

In the second step we introduced all five personality traits and their interactions with the length of yoga training. After introducing personality traits we still did not find a significant effect of the length of yoga training on using suppression. However, we found a positive significant effect of neuroticism, significant negative effect of extraversion and positive although only marginally significant effect of conscientiousness. Finally, all two-way interactions between the length of yoga training and personality traits were non-significant.

Discussion

The purpose of the present study was to examine the relationships between the length of yoga training and the use of cognitive reappraisal and expressive suppression and whether these relationships may be moderated by personality traits. Based on previous studies, we hypothesized that the link between the length of yoga practice and emotion regulation can rely most heavily on participants' conscientiousness and extraversion levels. However, to obtain a more complete picture of relationships between the mentioned constructs, we extended our model by also including other Big Five personality traits (Costa & McCrae, 1992).

The results of the study provided support for our prediction that participants who engaged in yoga practice for a longer period of time (over 1 year; as compared to participants who practiced yoga for a period shorter than 1 year), reported using the cognitive reappraisal strategy more often in their daily life. These results are in line with previous studies showing the benefits of engagement in yoga practice for self-regulation abilities (Gard,

Noggle, Park, Vago, & Wilson, 2014), as reappraisal was shown to be an effective and adaptive strategy of emotion regulation (Aldao et al., 2010; Gross & John, 2003). Furthermore, our analyses showed that longer yoga practice was more beneficial than shorter practice, especially for individuals with low levels of conscientiousness and extraversion (although the latter effect was marginally significant and should be treated with caution). For highly conscientious or highly extraverted individuals, who can benefit from shorter yoga training, a longer period of training may not result in a further increase of using reappraisal. In other words, extraversion and conscientiousness seem to facilitate the process of drawing benefits from practicing yoga. This result is in line with previous studies that showed the role of these two personality traits in effective implementation of healthy behavior, sports and exercise (O'Connor et al., 2009; Rhodes et al., 2002; Rhodes & Smith, 2006; Smith, 2006). Paraphrasing the argument made by Ingledew and colleagues (2004), individuals high in extraversion and those high in conscientiousness can draw most benefits from yoga practice, because, as with other forms of exercise, this kind of training satisfies two kinds of needs important for people high in conscientiousness and high in extraversion: need for competence and need for relatedness respectively.

Interestingly, we also found that the link between the length of the yoga training and using reappraisal depends on participants' level of neuroticism. Participants who were low in neuroticism benefited more from prolonged (vs. short) yoga practice. However, for those high in neuroticism, the length of yoga training seemed to be less important, or even irrelevant. These participants did not seem to draw additional benefits from a longer yoga practice period. This may indicate that these individuals may have higher difficulty in developing effective emotion regulation skills. This result is also very interesting because the link between neuroticism and the consequences of physical activity has not been given as much attention as similar links for extraversion and conscientiousness. However, our results are not surprising when considered in the light of the emotion regulation literature. Neuroticism, among the Big Five traits, has the strongest connection with emotion regulation abilities (Gross & John, 2003), as it is the trait that is most directly related to the emotional sphere. Moreover, neuroticism seems to be positively related with the use of ineffective ways of regulating emotions (Gross & John, 2003; Purnamaningsih, 2017; Wang, Shi, & Li, 2009). Also, in our study, we obtained a negative significant correlation between neuroticism and using reappraisal and a positive significant correlation between neuroticism and using suppression. Because of the strong connection between neuroticism and low emotion regulation abilities, it may be more difficult for participants high in neuroticism (compared to those low in neuroticism) to reap the benefits of yoga practice for their emotion regulation skills. We also have evidence that traits related to neuroticism, like anxiety, impede the learning process in different domains (MacIntyre, 1995; Mazzone et al., 2007; Tobias & Weissbrod, 1980). We argue that it may be similar in the case of learning new, effective emotion regulation habits during yoga training.

In contrast to reappraisal, our results indicate that the length of yoga training was not significantly connected with using suppression. Moreover, differently from reappraisal,

our analyses show that the effect of yoga training length on suppression is not significantly moderated by personality traits. This lack of significant results is however interesting, and, when compared to our results for reappraisal, theoretically important. In detail, our analysis supports the notion that compared to more elaborate ways of controlling emotions, suppression may not be dependent on training (Berkman, Kahn, & Merchant, 2014) and other variables related to higher cognitive functioning. Instead, using suppression seems to be a very basic tendency that is relatively easy to implement, and shows itself, for example, in situations when there is a sudden need to inhibit emotional expression and there is no time for preparation (Gross, 2015b; Gross & John, 2003). This pattern of results confirms our predictions about the tendency to use suppression being largely independent from yoga training.

Although the presented results confirm our predictions and are in line with the literature on the psychological benefits of yoga (Field, 2011; da Silva et al., 2009) and neuropsychiatric disorders (Balasubramaniam et al., 2013), we must admit it has some limitations. First of all, we used between participants comparisons, and our two groups may differ on some important psychological dimensions we did not capture. Maybe the obtained differences in emotion regulation do not result from yoga practice duration but rather from more general psychological differences between these two groups. Moreover, future research would do well to better establish the causality of described relationships in a longitudinal study or an experiment with a control group (e.g., individuals who did not practice yoga at all). In fact, it is important to make sure that it is the length of yoga training that influences emotion regulation strategies and not regulation strategies (e.g., individual tendency to use cognitive reappraisal) that influence the length of attending yoga classes.

Secondly, we choose to treat one year as a point differentiating short-term and long-term yoga practice. Maybe using duration of practice as a more continuous variable could be of better use, as we do not know what is happening to yoga practitioners during this one year and we treat people who just started equally to those who practiced for half a year. Additionally, as we based our study on a between-group design and did not control for many participants' characteristics that may be related to emotion regulation strategy use, we cannot exclude the possibility that some additional, outside factors contributed to our findings.

Finally, the present study was conducted only among female participants, which let us avoid gender-related factors that might influence emotional responding (Bradley, Codispoti, Sabatinelli, & Lang, 2001; Wrase et al., 2003) or emotional regulation (McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008). However, potentially fertile ground for future research would be to investigate the relationship between the length of yoga training and emotion regulation strategies among male participants. So far we do not have data that could suggest that yoga effects in general would be different in men than women. However, there are some data showing differences in using suppression and reappraisal between men and women (McRae et al., 2008; Śmieja et al., 2011). Still, it is hard to speculate what the results of our study would be for men. Thus one should be cautious not to generalize the results for men and women populations.

To conclude, we believe that the study suggests that yoga can influence effective emotion regulation. Still the effectiveness of yoga in shaping emotion regulation skills needs further research. It seems that in planned research we must take personality traits into consideration, as they may moderate the consequences of yoga. For example, yoga practiced by a person with a high level of neuroticism may have little or no positive outcomes. Thus, our study suggests that personality is an important factor that should be remembered when general conclusions about the effectiveness of yoga for psychological health and well-being are drawn.

Supplementary Materials

Data and scripts for data analysis for this article are available at PsychArchives: <https://doi.org/10.23668/psycharchives.786>

Funding

The authors have no funding to report.

Competing Interests

The authors have declared that no competing interests exist.

Acknowledgments

The authors have no support to report.

References

- Aldao, A. (2013). The future of emotion regulation research: Capturing context. *Perspectives on Psychological Science*, 8, 155–172. <https://doi.org/10.1177/1745691612459518>
- Aldao, A., Jazaieri, H., Goldin, P. R., & Gross, J. J. (2014). Adaptive and maladaptive emotion regulation strategies: Interactive effects during CBT for social and anxiety disorder. *Journal of Anxiety Disorders*, 28, 382–389. <https://doi.org/10.1016/j.janxdis.2014.03.005>
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30, 217–237. <https://doi.org/10.1016/j.cpr.2009.11.004>
- Auty, K., Cope, A., & Liebling, A. (2017). A systematic review and meta-analysis of yoga and mindfulness meditation in prison: Effects on psychological well-being and behavioural functioning. *International Journal of Offender Therapy and Comparative Criminology*, 61, 689–710. <https://doi.org/10.1177/0306624X15602514>

- Balasubramaniam, M., Telles, S., & Doraiswamy, P. M. (2013). Yoga on our minds: A systematic review of yoga for neuropsychiatric disorders. *Frontiers in Psychiatry*, 3, Article 117. <https://doi.org/10.3389/fpsy.2012.00117>
- Berkman, E. T., Kahn, L. E., & Merchant, J. S. (2014). Training-induced changes in inhibitory control network activity. *The Journal of Neuroscience*, 34(1), 149–157. <https://doi.org/10.1523/JNEUROSCI.3564-13.2014>
- Bogg, T. (2008). Conscientiousness, the transtheoretical model of change, and exercise: A neo-socioanalytic integration of trait and social-cognitive frameworks in the prediction of behavior. *Journal of Personality*, 76, 775–802. <https://doi.org/10.1111/j.1467-6494.2008.00504.x>
- Bradley, M. M., Codispoti, M., Sabatinelli, D., & Lang, P. J. (2001). Emotion and motivation II: Sex differences in picture processing. *Emotion*, 1(3), 300–319. <https://doi.org/10.1037/1528-3542.1.3.300>
- 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, 822–848. <https://doi.org/10.1037/0022-3514.84.4.822>
- Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine*, 31, 23–33. <https://doi.org/10.1007/s10865-007-9130-7>
- Cervone, D. (2004). The architecture of personality. *Psychological Review*, 111, 183–204. <https://doi.org/10.1037/0033-295X.111.1.183>
- Conner, M., Rodgers, W., & Murray, T. (2007). Conscientiousness and the intention–behavior relationship: Predicting exercise behavior. *Journal of Sport & Exercise Psychology*, 29, 518–533. <https://doi.org/10.1123/jsep.29.4.518>
- Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PIR) and NEO Five Factor Inventory (NEO-FFI) professional manual*. Odessa, FL, USA: Psychological Assessment Resources.
- Courneya, K. S., & Hellsten, L.-A. M. (1998). Personality correlates of exercise behavior, motives, barriers and preferences: An application of the five-factor model. *Personality and Individual Differences*, 24, 625–633. [https://doi.org/10.1016/S0191-8869\(97\)00231-6](https://doi.org/10.1016/S0191-8869(97)00231-6)
- Dan-Glauser, E. S., & Gross, J. J. (2015). The temporal dynamics of emotional acceptance: experience, expression and physiology. *Biological Psychology*, 108, 1–12. <https://doi.org/10.1016/j.biopsycho.2015.03.005>
- da Silva, T. L., Ravindran, L. N., & Ravindran, A. V. (2009). Yoga in the treatment of mood and anxiety disorders: A review. *Asian Journal of Psychiatry*, 2, 6–16. <https://doi.org/10.1016/j.ajp.2008.12.002>
- DeSteno, D., Goss, J. J., & Kubzansky, L. (2013). Affective science and health: The importance of emotion and emotion regulation. *Health Psychology*, 32, 474–486. <https://doi.org/10.1037/a0030259>
- Dick, A. M., Niles, B. L., Street, A. E., & DiMartino, D. M. (2014). Examining mechanisms of change in a yoga intervention for women: The influence of mindfulness, psychological flexibility and

- emotion regulation on PTSD symptoms. *Journal of Clinical Psychology*, 70, 1170–1182. <https://doi.org/10.1002/jclp.22104>
- Ekman, P., & Davidson, R. J. (Eds.). (1994). *The nature of emotion: Fundamental questions*. New York, NY, USA: Oxford University Press.
- Eliade, M. (1984). *Joga. Nieśmiertelność i wolność* [Yoga, immortality, freedom]. Warsaw, Poland: Wydawnictwo Naukowe PWN.
- Emerson, D., & Hopper, E. (2011). *Overcoming trauma through yoga: Reclaiming your body*. Berkeley, CA, USA: North Atlantic Books.
- Emerson, D., Sharma, R., Chaudhry, S., & Turner, J. (2009). Trauma-sensitive yoga: Principles, practice, and research. *International Journal of Yoga Therapy*, 19, 123–128.
- Field, T. (2011). Yoga clinical research review. *Complementary Therapies in Clinical Practice*, 17, 1–8. <https://doi.org/10.1016/j.ctcp.2010.09.007>
- Frijda, N. H. (1994). Emotions are functional, most of the time. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 112–122). New York, NY, USA: Oxford University Press.
- Frijda, N. H. (2008). The psychologists' point of view. In M. Lewis, J. M. Haviland-Jones, & L. Feldman Barrett (Eds.), *Handbook of emotions* (pp. 68–88). New York, NY, USA: Guilford.
- 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, Article 770. <https://doi.org/10.3389/fnhum.2014.00770>
- Garfinkel, M., & Schumacher, H. R., Jr. (2000). Yoga. *Rheumatic Diseases Clinics of North America*, 26, 125–132. [https://doi.org/10.1016/S0889-857X\(05\)70126-5](https://doi.org/10.1016/S0889-857X(05)70126-5)
- Goldin, P. R., & Gross, J. J. (2010). Effects of Mindfulness-Based Stress Reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*, 10, 83–91. <https://doi.org/10.1037/a0018441>
- Goldin, P. R., Morrison, A., Jazaieri, H., Brozovich, F., Heimberg, R., & Gross, J. J. (2016). Group CBT versus MBSR for social anxiety disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 84, 427–437. <https://doi.org/10.1037/ccp0000092>
- Goldin, P. R., Ziv, M., Jazaieri, H., Hahn, K., & Gross, J. J. (2013). MBSR versus aerobic exercise in social anxiety: fMRI of emotion regulation of negative self-beliefs. *Social Cognitive and Affective Neuroscience*, 8, 65–72. <https://doi.org/10.1093/scan/nss054>
- Gootjes, L., Franken, I. H. A., & Van Strien, J. W. (2011). Cognitive emotion regulation in yogic meditative practitioners: Sustained modulation of electrical brain potentials. *Journal of Psychophysiology*, 25, 87–94. <https://doi.org/10.1027/0269-8803/a000043>
- Govindaraj, R., Karmani, S., Varambally, S., & Gangadhar, B. N. (2016). Yoga and physical exercise – A review and comparison. *International Review of Psychiatry*, 28, 242–253. <https://doi.org/10.3109/09540261.2016.1160878>
- Grant, A. M., & Schwartz, B. (2011). Too much of a good thing: The challenge and opportunity of the inverted U. *Perspectives on Psychological Science*, 6, 61–76. <https://doi.org/10.1177/1745691610393523>
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2, 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>

- Gross, J. J. (2008). Emotion and emotion regulation: Personality processes and individual differences. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 701–723). New York, NY, USA: Guilford.
- Gross, J. J. (Ed.). (2014). *Handbook of emotion regulation* (2nd ed.). New York, NY, USA: Guilford.
- Gross, J. J. (2015a). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 26, 1–26. <https://doi.org/10.1080/1047840X.2014.940781>
- Gross, J. J. (2015b). The extended process model of emotion regulation: Elaborations, applications, and future directions. *Psychological Inquiry*, 26, 130–137. <https://doi.org/10.1080/1047840X.2015.989751>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotional regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348–362. <https://doi.org/10.1037/0022-3514.85.2.348>
- Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, 64, 970–986. <https://doi.org/10.1037/0022-3514.64.6.970>
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57, 35–43. [https://doi.org/10.1016/S0022-3999\(03\)00573-7](https://doi.org/10.1016/S0022-3999(03)00573-7)
- Ingledeu, D. K., Markland, D., & Sheppard, K. E. (2004). Personality and self-determination of exercise behavior. *Personality and Individual Differences*, 36, 1921–1932. <https://doi.org/10.1016/j.paid.2003.08.021>
- Janakiramaiah, N., Gangadhar, B. N., Naga Venkatesha Murthy, P. J., Subbakrishna, D. K., & Vedamurthachar, A. (2000). Antidepressant efficacy of Sudarshan Kirya Yoga (SKY) in melancholia: A randomized comparison with electroconvulsive therapy (ECT) and imipramine. *Journal of Affective Disorders*, 57, 255–259. [https://doi.org/10.1016/S0165-0327\(99\)00079-8](https://doi.org/10.1016/S0165-0327(99)00079-8)
- John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, 72, 1301–1334. <https://doi.org/10.1111/j.1467-6494.2004.00298.x>
- Kamei, T., Toriumi, Y., & Kimura, H. (2000). Decrease in serum cortisol during yoga exercise is correlated with alpha wave activation. *Perceptual and Motor Skills*, 90, 1027–1032. <https://doi.org/10.2466/pms.2000.90.3.1027>
- Kernberg, O. F. (2016). What is personality? *Journal of Personality Disorders*, 30, 145–156. <https://doi.org/10.1521/pedi.2106.30.2.145>
- Khalsa, S. B., Hickey-Schultz, L., Cohen, D., Steiner, N., & Cope, S. (2012). Evaluation of the mental health benefits of yoga in a secondary school: A preliminary randomized controlled trial. *The Journal of Behavioral Health Services & Research*, 39, 80–90. <https://doi.org/10.1007/s11414-011-9249-8>
- Kobylińska, D., & Marchlewska, M. (2016). Orientacja na działanie a regulacja emocji. *Psychologia-Etologia-Genetyka*, 34, 25–42.
- Krygier, J. R., Heathers, J. A., Shahrestani, S., Abbott, M., Gross, J. J., & Kemp, A. H. (2013). Mindfulness meditation, well-being, and heart rate variability: A preliminary investigation into the im-

- pact of intensive Vipassana meditation. *International Journal of Psychophysiology*, 89, 305–313. <https://doi.org/10.1016/j.ijpsycho.2013.06.017>
- Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, 44, 1–21. <https://doi.org/10.1146/annurev.ps.44.020193.000245>
- Li, A. W., & Goldsmith, C. A. W. (2012). The effects of yoga on anxiety and stress. *Alternative Medicine Review*, 17, 21–35.
- MacIntyre, P. D. (1995). How does anxiety affect second language learning? A reply to Sparks and Ganschow. *Modern Language Journal*, 79, 90–99. <https://doi.org/10.1111/j.1540-4781.1995.tb05418.x>
- Mauss, I. B., & Gross, J. J. (2004). Emotion suppression and cardiovascular disease: Is hiding feelings bad for your heart? In I. Nyklicek, L. Temoshok, & A. Vingerhoets (Eds.), *Emotional expression and health: Advances in theory, assessment, and clinical applications* (pp. 62–81). New York, NY, USA: Brunner-Routledge.
- Mazzone, L., Ducci, F., Scoto, M. C., Passaniti, E., D'Arrigo, V. G., & Vitiello, B. (2007). The role of anxiety symptoms in school performance in a community sample of children and adolescents. *BMC Public Health*, 7, Article 347. <https://doi.org/10.1186/1471-2458-7-347>
- McRae, K., Jacobs, S. E., Ray, R. D., John, O. P., & Gross, J. J. (2012). Individual differences in reappraisal ability: Links to reappraisal frequency, well-being, and cognitive control. *Journal of Research in Personality*, 46, 2–7. <https://doi.org/10.1016/j.jrp.2011.10.003>
- McRae, K., Ochsner, K. N., Mauss, I. B., Gabrieli, J. D., & Gross, J. J. (2008). Gender differences in emotion regulation: An fMRI study of cognitive reappraisal. *Group Processes & Intergroup Relations*, 11(2), 143–162. <https://doi.org/10.1177/1368430207088035>
- Menezes, C. B., Dalpiaz, N. R., Kiesow, L. G., Sperb, W., Herzberg, J., & Oliviera, A. A. (2015). Yoga and emotion regulation: A review of primary psychological outcomes and their physiological correlates. *Psychology & Neuroscience*, 8, 82–101. <https://doi.org/10.1037/h0100353>
- Mischel, W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality. *Psychological Review*, 102, 246–268. <https://doi.org/10.1037/0033-295X.102.2.246>
- Ochsner, K. N., & Gross, J. J. (2008). Cognitive emotion regulation: Insights from social cognitive and affective neuroscience. *Current Directions in Psychological Science*, 17, 153–158. <https://doi.org/10.1111/j.1467-8721.2008.00566.x>
- O'Connor, D. B., Conner, M., Jones, F., McMillan, B., & Ferguson, E. (2009). Exploring the benefits of conscientiousness: An investigation of the role of daily stressors and health behaviors. *Annals of Behavioral Medicine*, 37, 184–196. <https://doi.org/10.1007/s12160-009-9087-6>
- Pilkington, K., Kirkwood, G., Rampes, H., & Richardson, J. (2005). Yoga for depression: The research evidence. *Journal of Affective Disorders*, 89, 13–24. <https://doi.org/10.1016/j.jad.2005.08.013>
- Purnamaningsih, E. H. (2017). Personality and emotion regulation strategies. *International Journal of Psychological Research*, 10, 53–60. <https://doi.org/10.21500/20112084.2040>
- Ramel, W., Goldin, P. R., Carmona, P. E., & McQuaid, J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive Therapy and Research*, 28, 433–455. <https://doi.org/10.1023/B:COTR.0000045557.15923.96>

- Rhodes, R. E., Courneya, K. S., & Jones, L. W. (2002). Personality, the theory of planned behavior, and exercise: A unique role for extroversion's activity facet. *Journal of Applied Social Psychology*, 32, 1721–1736. <https://doi.org/10.1111/j.1559-1816.2002.tb02772.x>
- Rhodes, R. E., & Smith, N. E. (2006). Personality correlates of physical activity: A review and meta-analysis. *British Journal of Sports Medicine*, 40, 958–965. <https://doi.org/10.1136/bjsem.2006.028860>
- Riley, K. E., & Park, C. L. (2015). How does yoga reduce stress? A systematic review of mechanisms of change and guide to future inquiry. *Health Psychology Review*, 9, 379–396. <https://doi.org/10.1080/17437199.2014.981778>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist*, 55, 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine*, 16, 3–12. <https://doi.org/10.1089/acm.2009.0044>
- Sahasi, G., Mohan, D., & Kacker, C. (1989). Effectiveness of yogic techniques in the management of anxiety. *Journal of Personality and Clinical Studies*, 5, 51–55.
- Salmon, P., Lush, E., Jablonski, M., & Sephton, S. E. (2009). Yoga and mindfulness: Clinical aspects of an ancient mind/body practice. *Cognitive and Behavioral Practice*, 16, 59–72. <https://doi.org/10.1016/j.cbpra.2008.07.002>
- Shapiro, D., & Cline, K. (2004). Mood changes associated with Iyengar yoga practices: A pilot study. *International Journal of Yoga Therapy*, 14, 35–44.
- Sheppes, G., Scheibe, S., Suri, G., Radu, P., Blechert, J., & Gross, J. J. (2014). Emotion regulation choice: A conceptual framework and supporting evidence. *Journal of Experimental Psychology*, 143, 163–181. <https://doi.org/10.1037/a0030831>
- Śmieja, M., Mrozowicz, M., & Kobylńska, D. (2011). Emotional intelligence and emotion regulation strategies. *Studia Psychologiczne*, 49, 55–64.
- Smith, B. R. (2007). Body, mind and spirit? Towards an analysis of the practice of yoga. *Body & Society*, 13, 25–46. <https://doi.org/10.1177/1357034X07077771>
- Smith, K. B., & Pukall, C. F. (2009). An evidence-based review of yoga as a complementary intervention for patients with cancer. *Psycho-Oncology*, 18, 465–475. <https://doi.org/10.1002/pon.1411>
- Smith, T. W. (2006). Personality as risk and resilience in physical health. *Current Directions in Psychological Science*, 15, 227–231. <https://doi.org/10.1111/j.1467-8721.2006.00441.x>
- Srivastava, S., Tamir, M., McGonigal, K. M., John, O. P., & Gross, J. J. (2009). The social cost of emotional suppression: A prospective study of the transition to college. *Journal of Personality and Social Psychology*, 96, 883–897. <https://doi.org/10.1037/a0014755>
- Stemplewska-Żakowicz, K., Zalewski, B., Suszek, H., Kobylńska, D., & Szymczyk, B. (2014). The discursive mind model. *Psychology of Language and Communication*, 18, 1–21. <https://doi.org/10.2478/plc-2014-0001>
- Stephens, I. (2017). Medical yoga therapy. *Children*, 4, Article 12. <https://doi.org/10.3390/children4020012>

- Stueck, M., & Gloeckner, N. (2005). Yoga for children in the mirror of the science: Working spectrum and practice fields of the training of relaxation with elements of yoga for children. *Early Child Development and Care*, 175, 371–377. <https://doi.org/10.1080/0300443042000230537>
- Takahashi, T., Murata, T., Hamada, T., Omori, M., Kosaka, H., Kikuchi, M., . . . Wada, Y. (2005). Changes in EEG and autonomic nervous activity during meditation and their association with personality traits. *International Journal of Psychophysiology*, 55, 199–207. <https://doi.org/10.1016/j.ijpsycho.2004.07.004>
- Tamagawa, R., Specca, M., Stephen, J., Pickering, B., Lawlor-Savage, L., & Carlson, L. E. (2015). Predictors and effects of class attendance and home practice of yoga and meditation among breast cancer survivors in a Mindfulness-Based Cancer Recovery (MBCR) program. *Mindfulness*, 6, 1201–1210. <https://doi.org/10.1007/s12671-014-0381-4>
- Tobias, S., & Weissbrod, C. (1980). Anxiety and mathematics: An update. *Harvard Educational Review*, 50, 63–70. <https://doi.org/10.17763/haer.50.1.xw483257j6035084>
- Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science*, 24, 2505–2514. <https://doi.org/10.1177/0956797613496434>
- Uebelacker, L. A., Epstein-Lubow, G., Gaudio, B. A., Tremont, G., Battle, C. L., & Miller, I. W. (2010). Hatha yoga for depression: Critical review of the evidence for efficacy, plausible mechanisms of action, and directions for future research. *Journal of Psychiatric Practice*, 16, 22–33. <https://doi.org/10.1097/01.pra.0000367775.88388.96>
- Vadiraja, H. S., Raghavendra, R. M., Nagarathna, R., Nagendra, H. R., Rekha, M., Vanitha, N., . . . Kumar, V. (2009). Effects of a yoga program on cortisol rhythm and mood states in early breast cancer patients undergoing adjuvant radiotherapy: A randomized controlled trial. *Integrative Cancer Therapies*, 8, 37–46. <https://doi.org/10.1177/1534735409331456>
- Vahia, N. S., Doongaji, D., Jeste, D., Kapoor, S., Ardhapurkar, I., & Ravindranath, S. (1973). Further experience with the therapy based upon concepts of Patanjali in the treatment of psychiatric disorders. *Indian Journal of Psychiatry*, 15, 32–37.
- Wang, L., Shi, Z., & Li, H. (2009). Neuroticism, extraversion, emotion regulation, negative affect and positive affect: The mediating roles of reappraisal and suppression. *Social Behavior and Personality*, 37, 193–194. <https://doi.org/10.2224/sbp.2009.37.2.193>
- West, J., Otte, C., Geher, K., Johnson, J., & Mohr, D. C. (2004). Effects of hatha yoga and African dance on perceived stress, affect and salivary cortisol. *Annals of Behavioral Medicine*, 28, 114–118. https://doi.org/10.1207/s15324796abm2802_6
- Wrase, J., Klein, S., Gruesser, S. M., Hermann, D., Flor, H., Mann, K., . . . Heinz, A. (2003). Gender differences in the processing of standardized emotional visual stimuli in humans: A functional magnetic resonance imaging study. *Neuroscience Letters*, 348, 41–45. [https://doi.org/10.1016/S0304-3940\(03\)00565-2](https://doi.org/10.1016/S0304-3940(03)00565-2)
- Zawadzki, B., Strelau, J., Szczepaniak, P., & Śliwińska, M. (1998). *Inwentarz osobowości NEO-FFI. Adaptacja polska. Podręcznik*. Warsaw, Poland: Pracownia Testów PTP.