

Comparing Novice Yoga Participants and Yoga Practitioners on Emotion Regulation and  
Distress Tolerance

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### Abstract

Yoga is an ancient art form that has been associated with an abundance of physical and mental health benefits. Due to increases in the popularity of this practice, research is needed to understand the specific ways in which yoga provides these benefits. The literature on yoga is extensive, yet there is little focus on how yoga affects social-cognitive mechanisms in order to produce physical and mental health benefits. In this paper, I analyzed whether yoga practice is associated with two psychological variables, emotion regulation and distress tolerance, by comparing yoga-naive individuals ( $N=75$ ) and yoga practitioners ( $N=69$ ). I hypothesized that yoga practitioners would have superior distress tolerance and emotion regulation skills compared with novice yoga participants. Participants completed an online survey assessing demographics, yoga habits, as well as a number of social psychological variables of interest such as emotion regulation and distress tolerance. Results indicated no significant differences between the two groups on distress tolerance and emotion regulation. However, when assessing gender differences, men had higher expressive suppression scores relative to women across groups and there was a significant interaction between group type and gender in regard to distress tolerance. While the results did not support the hypothesis, they do provide a few constructs that should be further researched in accordance to yoga.

## Comparing Novice Yoga Participants and Yoga Practitioners on Emotion Regulation and Distress Tolerance

Since the 1960s, yoga has exploded in popularity with 31 million people in the United States practicing over the course of their lifetime; there has also been a 1% increase in the U.S. population practicing yoga from 2002 to 2007. Additionally, it is predicted that over 55 million people will practice yoga in 2020 (“Popularity of Yoga Growing Dramatically,” 2016; 20 Fresh Yoga Statistics & Facts You Should Know in 2020, 2020). However, this practice is mostly prevalent among women with 84.5% of yogis being women and 15.3% of yogis being men (“Gender and yoga practice: is there any relationship?”). Originating in India, yoga has been taught and practiced for more than 3,500 years with a primary goal of relieving suffering while also promoting peak physical and mental condition (Gard et al., 2014). Yoga has been researched for improving the physical and mental health of both healthy and clinical populations, including patients with health issues such as cancer and PTSD (Lopez et al., 2018; Dick, Niles, Street, DiMartino, & Mitchell, 2014; Rocha et al., 2012; Yoshihara, Hiramoto, Oka, Kubo, & Sudo, 2014). However, there is minimal research on the social-cognitive mechanisms through which yoga produces health benefits. Thus, further study is needed to explore how yoga might enhance physical and mental health through continuous practice.

### **Health Benefits of Yoga**

Yoga is often described as a practice that benefits physical and mental health, and self-report data indicate that practitioners agree with this notion (Ross, Friedmann, Bevan, & Thomas, 2013). Findings from this national survey suggest that most individuals who engage in yoga believe their health has improved as a result of the practice. As part of this survey, yoga practitioners were asked how healthy they feel, with various questions inquiring about their sleep

patterns, energy levels, and overall happiness. According to the survey, 89.5% of participants believed yoga improved their general health and 86.5% thought yoga increased their overall happiness (Ross, Friedmann, Bevan, & Thomas, 2013). Beyond personal beliefs, there are a couple other empirical studies that present the health benefits of yoga. For example, in a study examining the short-term effects of high intensity yoga exercises on general health characteristics, individuals were assigned to either a control group (i.e., no change in exercise behavior) or the experimental group, in which they completed one yoga class per week and were also encouraged to perform the exercises at home. While there were no significant differences between groups after the six-week intervention, participants in the experimental group who also practiced the yoga exercises at home had a decrease in depression symptoms, improved sleep quality, and experienced less insomnia (Papp, Nygren-Bonnier, Gullstrand, Wändell, & Lindfors, 2019). Yoga, when practiced regularly, seems to have a reliable effect on sleep quality and depression (Kwok et al., 2019; Rao et al., 2017); however, the benefits of yoga likely extend to other domains such as stress. For example, in a study assessing the psychological benefits of yoga in a sample of chronically stressed women, Harkess, Delfabbro, and Cohen-Woods (2016) found improvements in well-being following short-term yoga practice. However, the authors argued that the impact of long-term practice needs further investigation.

In addition to these and other psychological benefits, yoga is associated with a copious amount of physical health benefits. As an example, in a pilot study on the physical benefits of yoga, Cowen and Adams (2005) compared two types of yoga classes: hatha, which involves breathing, yoga poses, and meditation, and ashtanga, which uses a series of intense yoga poses and movements. Both classes saw an increase in upper body strength, endurance, and flexibility (Cowen & Adams, 2005). Interestingly, in a cross-sectional analysis, Birdee, Ayala, and

Wallston (2017) found a significant association between length of lifetime yoga practice and better physical health. This suggests that yoga may have a cumulative effect on health, with those who have practiced for a longer period of time benefiting more.

These and other studies, in general, support the notion that yoga is associated with a plethora of physical and mental health benefits. However, uncertainty remains as to how yoga produces these benefits, as little research has explored the underlying mechanisms. Two potential mechanisms that are potentially positively affected by yoga are distress tolerance and emotion regulation. As distress tolerance and emotion regulation themselves have important associations with health, studying them in the context of yoga should provide insight into yoga's health-promoting effects.

### **Distress Tolerance, Emotion Regulation, and Yoga**

At a broad level, distress tolerance and emotion regulation have been conceptualized as psychological, regulatory processes used to better control one's mental and emotional states. Gard et al. (2014) argues that self-regulation can be improved through the tools of yoga. Every yoga class consists of four basic tools: ethics, postures, breath regulation, and meditation. These tools, when combined, promote better overall control of one's impulses and responses to stimuli in everyday life (Gard et al., 2014). Given this beneficial effect of yoga on regulatory processes, it is perhaps reasonable to think that yoga could enhance an individual's emotion regulation and distress tolerance, especially if the individual has practiced the art for a prolonged period of time. While the literature suggests that yoga affects multiple psychological and physical variables, such as sleep quality, mental health disorders, endurance, and flexibility, little research has examined how yoga impacts distress tolerance and emotion regulation in healthy individuals.

**Distress Tolerance.** Past research has argued for two conceptually distinct forms of distress tolerance: the perceived capacity to tolerate any negative or aversive stimulus and the behavioral act of tolerating distressing states or situations (Zvolensky, Vujanovic, Bernstein, & Leyro, 2010). An individual may believe they are relatively high in distress tolerance, yet when an aversive stimulus is presented, their behavior reflects low distress tolerance. Individuals low in distress tolerance often cope with distressing situations or events in maladaptive ways, while those high in distress tolerance typically use adaptive coping strategies (Zvolensky et al., 2010). Distress tolerance is often studied in relation to mental health disorders, specifically anxiety. In a study exploring the relationship between distress tolerance and anxiety, Keough, Riccardi, Timpano, Mitchell, and Schmidt (2010) found that individuals with low distress tolerance were more vulnerable to certain anxiety symptoms such as general worry, panic, and social anxiety. Distress tolerance has also been studied in other areas of mental health such as PTSD. For example, in a study examining associations between distress tolerance, depression, PTSD, and alcohol misuse among male veterans, Holliday, Pedersen, and Leventhal (2016) found that distress tolerance could be a transdiagnostic variable that could explain the comorbidity of depression and PTSD with alcohol misuse.

Yoga's effect on distress tolerance has been minimally studied with both physical and mental illnesses. A study focusing on cancer patients and their caregivers investigated the effects of group yoga classes on mental and physical health. They found that attending a yoga class resulted in lower psychological distress ratings for both patients and caregivers; thus, while the study did not specifically examine distress tolerance, it did analyze the impact of yoga on distress (Lopez et al., 2018). Further, Medina, Hopkins, Powers, Baird, and Smits (2015) directly studied the effect of yoga on distress tolerance among women with stress-related emotional eating. As

suspected, the yoga class increased participants' distress tolerance while also reducing their emotional eating (Medina, Hopkins, Powers, Baird, & Smits, 2015). These studies suggest reliable effects on distress-related constructs as a result of practicing yoga.

The most common measurement tool to assess an individual's distress tolerance is self-report; however, behavioral tasks, such as how long an individual can tolerate standing extremely close to a stranger, are also often used. Distress tolerance involves withstanding aversive psychological states. Therefore, yoga postures, one of the four aforementioned tools described by Gard et al. (2014), should challenge and increase an individual's distress tolerance. Forcing one's body to stretch and hold different postures can be perceived as uncomfortable and difficult, but the longer an individual practices the postures, the more easily they are able to move through them. These postures put individuals in a potentially challenging situation and encourage them to become more comfortable with the uncomfortable — to increase their distress tolerance.

**Emotion Regulation.** Gross (1998) defines emotion regulation as the process of exerting control over one's emotions, such as when they occur and how they are expressed. Further, there are two primary categories of emotion regulatory strategies: adaptive and maladaptive. Adaptive emotion regulation strategies are typically thought of as superior because they involve coping appropriately, being more mindful, and causing no harm to oneself or others (Schäfer, Naumann, Holmes, Tuschen-Caffier, & Samson, 2016). Two examples of adaptive strategies are cognitive reappraisal and problem-solving. Maladaptive emotion regulation strategies are usually harmful towards the user and others around them when handling challenging emotions. These strategies, such as suppression and avoidance, do not necessarily deal with emotions, but rather place them aside to be dealt with at a later time.

Research on the connection between emotion regulation and mental health is abundant. Berking and Wupperman (2012) studied the relationship between emotion regulation and psychopathology; they found emotion regulation deficits in individuals with certain mental disorders such as depression, borderline personality disorder, and eating disorders (Berking & Wupperman, 2012). Further, maladaptive strategies, such as expressive suppression, are risk factors for depression, anxiety, and maladaptive behaviors such as substance abuse (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Additionally, lacking the knowledge or skills necessary to employ adaptive emotion regulation strategies in the context of challenges is a large factor in psychopathology (Berking & Wupperman, 2012). A study conducted by Aldao, Nolen-Hoeksema, and Schweizer (2010) analyzed the potential relationship between six different emotion regulation strategies (i.e., problem solving, acceptance, avoidance, reappraisal, rumination, and suppression) and symptoms of mental health disorders such as depression, anxiety, and disordered eating. Relative to the adaptive strategies, the researchers found larger associations between maladaptive strategies and psychopathology symptoms (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Taken together, these studies suggest that the frequent use of maladaptive emotion regulation strategies can lead to poor mental health.

Importantly, yoga has been shown to impact emotion regulation, as well as related constructs such as emotional awareness. For example, Daubenmier et al. (2012) compared yoga and meditation practitioners on measures of body awareness, pain, and emotional awareness. Yoga practitioners were higher in emotional awareness than meditators, but both groups had better management of their emotions compared to the general public (Daubenmier et al., 2012). This finding is supported by two other studies that measured respiratory rate and brain activity when yoga practitioners viewed negative images; yoga practitioners were better able to manage



their emotions and showed less reactivity to negative stimuli than their novice yoga counterparts (Froeliger, Garland, Modlin, & McClernon, 2012; Mocanu, Mohr, Pouyan, Thuillard, & Danguauser, 2018). Further, yoga might also impact the accessibility of certain emotion regulatory strategies. Dick, Niles, Street, DiMartino, and Mitchell (2014) assessed emotion regulation strategies of women suffering from PTSD before and after a six-week yoga class. They found that expressive suppression, a maladaptive emotion regulation strategy, decreased significantly after the women participated in the yoga class (Dick, Niles, Street, DiMartino, & Mitchell, 2014).

While all four tools of yoga help to improve a practitioner's well-being, ethics likely exert the strongest influence on emotion regulation. Ethical precepts encourage yoga practitioners to accept their current mental and emotional state while offering moral advice. Ethical precepts, which may be thought of as self-restraints, help individuals control their impulses and responses and, therefore, could theoretically contribute to better emotion regulation. Referring back to Gross's (1998) definition of emotion regulation — managing emotions, including how and when they occur — we can infer that emotions often dictate behavioral responses (Gross, 1998). Ethical precepts guide individuals on how to react to stimuli in order to achieve their goals and live a moral life. Because ethics help individuals to better control their impulses, which could involve an emotional response, ethics likely directly impact emotion regulation.

In order to investigate whether the continuous practice of yoga promotes health by affecting distress tolerance and emotion regulation, I will compare novice yoga participants (i.e., those who have taken five or fewer yoga classes in the past) and regular practitioners (i.e., those who have taken 30 or more yoga classes in the past) on these two variables. These data were

collected as a part of a larger study examining the self-regulatory mechanisms of yoga (PI: Charleen Gust). The data included in this analysis were measures of distress tolerance and emotion regulation, along with many other self-regulatory variables, of both novice yoga participants and experienced yoga practitioners; these data were gathered using an online survey (Gust, 2020). Based on past research, I predicted that experienced yoga practitioners will have higher distress tolerance and emotion regulation skills compared with novice yoga participants. I also examined gender and its interaction of group type within these constructs. For this, I predicted that women in the yoga practitioner group will better regulate their emotions as well as have a higher distress tolerance than men and women in the novice yoga participant group.

## **Method**

### **Design**

This was an online self-report survey comparing novice yoga participants and experienced yoga practitioners on a number of outcomes including affect and fatigue, distress tolerance, discomfort tolerance, emotion regulation, self-control, mindfulness, and self-regulation. However, this study only focused on distress tolerance and emotion regulation. G\*Power 3.1.9.4 was used in order to determine the number of participants needed to detect the hypothesized effects (Erdfelder, Faul, & Buchner, 1996). The power analysis was based on an effect size of  $d = .40$ ,  $\alpha = .05$ , two-tailed and indicated the need for a minimum of 200 participants, 100 participants in the novice group and 100 participants in the practitioner group, to observe significant effects with power of .80.

### **Participants**

For this study, 200 participants were recruited using Amazon MTurk. The only inclusion criterion was being a resident of the U.S. In order to be able to complete tasks on MTurk,

Amazon has two additional prerequisites: 1) having an electronic device that can connect to the internet, and 2) being at least 18 years of age. However, 56 participants were dropped from analyses because they did not meet the criteria to be considered a novice yogi or regular practitioner; these participants had taken more than five but less than 30 yoga classes. Thus, the final sample size for this analysis was 144 participants.

### **Procedure**

All procedures were reviewed and approved by the University of Colorado Boulder Institutional Review Board. Participants were asked to give electronic consent before taking part in the study. They then completed an online survey assessing a number of variables that are theoretically relevant to yoga, including distress tolerance and emotion regulation. Data were collected through Qualtrics and participants were compensated at a rate of \$12 per hour. The mean time to complete the survey was 14.03 minutes with a range of 5.67 to 47.18 minutes.

### **Measures**

#### ***Demographics***

Participants were asked to self-report their gender, ethnicity, age, educational attainment, employment status, weight (in pounds), and height (in inches). Participants were also asked about their exercise habits such as quantity, frequency, and intensity of exercise; these exercise characteristics were assessed using the Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985). Lastly, participants were asked, “How many yoga classes have you been to in your lifetime?” It should be noted that while there are several branches of yoga that include a variety of classes, in this study, yoga is an all-encompassing term that includes all types of yoga classes.

#### ***Emotion Regulation***

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was used to gauge the tendency for participants to regulate their emotions either through cognitive reappraisal or expressive suppression. Cognitive reappraisal is an adaptive emotion regulation strategy where an individual actively changes their thoughts to be more positive, while expressive suppression is a maladaptive emotion regulation strategy where an individual regulates their emotions by not expressing them. This questionnaire consists of 10 items rated on a 7-point Likert scale with 1 being strongly disagree and 7 being strongly agree. Sample items include, “When I want to feel less *negative* emotion, I *change the way I’m thinking* about the situation” and “I keep my emotions to myself.” Past research has supported the validity and reliability of the ERQ; for example, Brady, Kneebone, and Bailey (2018) reported alphas of .89 for cognitive reappraisal and .80 for expressive suppression. The internal consistency of the cognitive appraisal facet for the current sample was  $\alpha = .84$  and the internal consistency for expressive suppression was  $\alpha = .86$ .

### ***Distress Tolerance***

In order to assess participants’ distress tolerance, we used the Distress Tolerance Scale (DTS). The scale, created by Simons and Gaher (2005), includes 15 items rated on a 5-point Likert scale with 1 being strongly disagree and 5 being strongly agree. This scale measures four different attributes of distress tolerance: 1) three items measure tolerance, or how tolerable an individual views distress (e.g., “I can’t handle feeling distressed or upset”); 2) six items measure appraisal, or an individual’s acceptance of distress and whether or not they feel their coping strategy is capable (e.g., “I can tolerate being distressed or upset as well as most people”); 3) three items measure absorption, or the extent to which negative emotions completely absorb attention (e.g., “When I feel distressed or upset, all I can think about is how bad I feel”); and 4)

three items measure regulation, or how well an individual regulates negative emotions and distress (e.g., “I’ll do anything to stop feeling distressed or upset”). The DTS has been found to have valid measurement properties according to Simons and Gaher (2005), with alpha reliabilities ranging from .82-.85 across two time points. The alpha reliability for this study was .80.

## **Results**

### ***Demographics***

Out of the 144 participants, 54.9% identified as male, 43% as female, and 0.7% as transgender. It should be noted that two participants did not answer which gender they identified as. Age ranged from 19 to 72 years ( $M = 36.28$ ,  $SD = 11.04$ ). In terms of ethnicity, the majority of participants reported being White (75.7%), though 6.9% identified as Asian, 5.5% as Hispanic-American, and 1.3% as African American; the remainder of participants reported a combination of races and/or ethnicities. Participants’ educational attainment varied; 2% reported having obtained some high school, 10.4% obtained a high school diploma, 4.1% obtained trade, technical, or vocational training, 11% obtained some college, 7.6% obtained an associate’s degree, 46.5% obtained a bachelor’s degree, 14.6% obtained a master’s degree, 2% had a professional degree, and 1.4% had a doctorate degree. Lastly, the number of past yoga classes ranged from 0 to 350 ( $M = 43.69$ ,  $SD = 60.79$ ).

### ***Group Differences***

As previously mentioned, participants who had taken five or fewer yoga classes were considered yoga naive ( $n = 75$ ) and participants who had taken 30 or more yoga classes were considered yoga practitioners ( $n = 69$ ). Independent samples t-tests were used to compare these groups on distress tolerance and emotion regulation.

**Emotion regulation.** Novice yoga participants ( $M = 5.24$ ,  $SD = 1.05$ ) and yoga practitioners ( $M = 5.29$ ,  $SD = 1.07$ ) did not differ in terms of using cognitive reappraisal to regulate their emotions [ $t(142) = -0.27$ ,  $p = .790$ ]. Results for expressive suppression were similar in that novice yoga participants ( $M = 4.02$ ,  $SD = 1.63$ ) and yoga practitioners ( $M = 4.07$ ,  $SD = 1.58$ ) did not differ in terms of utilizing expressive suppression to regulate their emotions [ $t(142) = -0.18$ ,  $p = 0.855$ ] (see Figure 1).

**Distress Tolerance.** As was the case with cognitive reappraisal and expressive suppression, novice yoga participants ( $M = 2.82$ ,  $SD = 0.91$ ) did not differ from yoga practitioners ( $M = 2.66$ ,  $SD = 0.88$ ) in their distress tolerance [ $t(142) = 1.08$ ,  $p = .280$ ] (see Figure 1).

### ***Gender Differences***

There were 79 males, 62 females, and 1 non-binary individual in this study. We ran factorial ANOVAs on cognitive reappraisal, expressive suppression, and distress tolerance with group (novice versus practitioner) and gender (male versus female) as independent variables to detect if there were main effects on type of group and gender and the interaction between group and gender on all three outcomes. It should be noted that because of the limited number of non-binary individuals, we could not collect a reliable amount of data in order to properly compare them among males and females. Therefore, they were not included in this analysis.

While there were no significant main effects or interaction on cognitive reappraisal, expressive suppression showed one significant main effect: gender. There were significant gender differences in regards to expressive suppression, showing males having a higher expressive suppression in both the novice group ( $M=4.26$ ,  $SD= 1.57$ ) and the practitioner group

( $M= 4.51$ ,  $SD= 1.36$ ) than females in the novice group ( $M= 3.69$ ,  $SD= 1.74$ ) and in the practitioner group ( $M= 3.72$ ,  $SD= 1.68$ ) ( $F(1,138)=6.971$ ,  $p= .009$ ).

There were no significant main effects of type of group or gender on distress tolerance, however, there was a significant interaction between the two variables on distress tolerance ( $F(1, 138)= 6.48$ ,  $p= .012$ ). This result suggested a cross-over interaction; novice-yogis maintained a similar distress tolerance score regardless of gender, but yoga practitioners who identified as male had a higher distress tolerance score ( $M= 2.97$ ,  $SD= 0.88$ ) than yoga practitioners who identified as female ( $M= 2.39$ ,  $SD= 0.79$ ). Male yoga practitioners also had a higher distress tolerance score than male novice-yogis ( $M= 2.79$ ,  $SD= 0.88$ ); however, female yoga practitioners had a lower distress tolerance score than female novice-yogis ( $M= 2.86$ ,  $SD= 0.96$ ) (see Figure 2).

### Discussion

In this study, I hypothesized that yoga practitioners would have better distress tolerance and emotion regulation skills than novice yoga participants. However, the results do not support this hypothesis. There were no statistically significant differences between yoga practitioners and novice yoga participants in terms of distress tolerance and emotion regulation. These results are inconsistent with findings from past studies. Results from the factorial ANOVAs indicated a gender difference in expressive suppression, with men having higher scores than women across groups. This result is not particularly surprising. One of the larger stereotypes and societal pressure of men is the lack of visible emotion except for anger. The majority of men, in order to display masculine characteristics and follow the concept of hegemonic masculinity, will tend to not express emotion, unlike women who have no societal pressure to conceal their emotions (Wang et al., 2017; Fladung & Kiefer, 2016). However, while this main effect is statistically

significant, it is regardless of number of yoga classes taken. Another result from the factorial ANOVAs indicated an interaction between gender and group type on distress tolerance. My hypothesis was incorrect. It was men rather than women in the yoga practitioner group that had higher distress tolerance than men in the novice yoga participant group and women in both groups. This suggests that practicing yoga for a prolonged period of time increases men's distress tolerance and decreases women's distress tolerance.

Several studies have shown that yoga has an impact on emotion regulation. Daubenmier et al. (2012) found yoga practitioners tend to employ adaptive emotion regulation strategies rather than maladaptive emotion regulation strategies and have high emotional awareness while two other studies found that yoga practitioners tend to be less reactive than yoga-naive individuals when presented with negative stimuli (Froeliger, Garland, Modlin, & McClernon, 2012; Mocanu, Mohr, Pouyan, Thuillard, & Dan-Glauser, 2018). All of these studies concluded that yoga benefits emotion regulation by encouraging yoga students to use more adaptive emotion regulation strategies (e.g., cognitive reappraisal; Dick, Niles, Street, DiMartino, & Mitchell, 2014).

Similar to emotion regulation, findings from previous studies investigating the effects of yoga on distress tolerance are inconsistent with the present results. Lopez et al. (2018) found that yoga reduced distress among both cancer patients and caregivers over several group classes. Another study, focusing on women suffering from emotional eating, concluded that yoga increased their distress tolerance (Medina, Hopkins, Powers, Baird, & Smits, 2015). In regard to my result of a significant interaction between gender and group type on distress tolerance, the reason being is inconclusive. There is an abundance of literature describing ways to increase distress tolerance in order to decrease maladaptive behavior, such as alcohol misuse, and



comparing the effects with gender; improving distress tolerance could be a mechanism to decrease alcohol misuse in women, but not in men (Gilmore et al., 2018). However, there seems to be a lack of research comparing distress tolerance on gender after an intervention such as yoga. Further investigation into this interaction is needed in order to clarify the reasoning behind it.

There are a number of possible explanations that could clarify these inconsistent results. First, all participants scored just above the mid-point of the scale for distress tolerance and were more likely to use adaptive emotion regulation strategies with cognitive reappraisal scores being higher than expressive suppression scores (see Figure 1). While yoga is supported by research to produce health benefits, it is not the only activity that does so. Spending time with friends or family and recreational sports are life activities that better an individual's mental health (Taylor, Taylor, Nguyen, & Chatters, 2020; Bristol, Clench-Aas, Roy, & Raanaas, 2017). These activities could be a large part of our participants' lives which contributed to their distress tolerance and their emotion regulation rather than yoga. Additionally, the survey did not ask the participants about past or present mental health issues or disorders. Those burdened with a mental health disorder often have low distress tolerance and use maladaptive emotion regulation strategies (Keough et al., 2010; Dick et al., 2014). We did not thoroughly investigate the participants' life routines and health history in order to truly know that yoga is a large contribution of mental health benefits for them rather than other activities. In addition, most studies employing direct comparisons between yoga-naive individuals and yoga practitioners had a much higher threshold for classifying individuals as yoga practitioners (e.g., practicing yoga for at least 45 minutes per day, 3-4 times a week, for at least 3 years; Froeliger, Garland, Modlin, & McClernon, 2012; Mocanu, Mohr, Pouyan, Thuillard, & Dan-Glauser, 2018). In this study, we

split participants into two groups of relatively equal size by observing the data for natural cut points. Had we set our threshold higher, we might have seen larger differences between novice yogis and yoga practitioners.

### **Limitations**

As with any study, several limitations should be noted. One limitation is the use of self-report. While self-report is an easy and convenient way to measure multiple variables at once, reliability concerns arise because of self-report biases (Mortel, 2008). An additional limitation relates to environmental and/or contextual factors. As this was an online survey, the environments in which participants completed the survey were likely quite variable, which could have affected their responses and, in turn, our results.

Further, this study was not adequately powered. The power analysis indicated the need for 100 participants in each group, but we were only able to recruit 75 novice yogis and 69 yoga practitioners. Had we recruited more participants, we may have observed larger group differences. Our sample was also not equally representative in terms of race and ethnicity. The majority of our sample was white (75.5%) which easily outnumbers all other races and ethnicities included in our study; we did not have a sufficient number of individuals of color who practice yoga extensively, or not, in order to make an accurate generalization of individuals of color. Lastly, this study took place during the COVID-19 pandemic. Reactions to the pandemic, including increased stress, job loss, and fewer opportunities for social connection, likely varied across participants. At a broad level, the pandemic may have resulted in participants feeling unlike their usual selves, which in turn could have distorted their answers on the scales.

### **Future Implications**

While we primarily found null results in the current project (i.e., novice yogis and regular practitioners did not differ in terms of cognitive reappraisal, expressive suppression, or distress tolerance), one general implication is the need for further research comparing novice yoga participants and yoga practitioners. There is a sizable gap in the literature analyzing the psychological differences between these two groups of individuals, which is crucial research to perform in order to elucidate the potential mechanisms underlying the health benefits of yoga.

Another implication is the need for longitudinal research. Instead of having distinct categories of yoga participants (i.e. novice yoga participants and yoga practitioners), further research could test the correlation between the number of yoga classes and the outcome variables (i.e. distress tolerance and emotion regulation). A regression study could show more significant results than a study with a binary group distinction.

Furthermore, future research needs to focus on how these variables change within demographic variables. My analysis showed a gender difference, but not a yoga group difference for expressive suppression; it also showed a significant interaction with distress tolerance. Further research is needed to identify if gender and yoga interact in order to affect emotion regulation and why the interaction of group type and gender affect distress tolerance. Along with gender, researchers could focus on educational differences, racial and ethnicity differences, and employment differences. In order to partake in a group yoga class, a fee is often required. Therefore, yoga could be identified as a privilege only certain people of socio-economic class can participate in. These demographic differences should be explored in order to further understand how yoga affects all types of individuals in regard to distress tolerance and emotion regulation.

## References

- 20 *Fresh Yoga Statistics & Facts You Should Know in 2020*. (2020). Retrieved September 8, 2020, from <https://loudcloudhealth.com/resources/yoga-statistics/>
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. In *Clinical Psychology Review* (Vol. 30, Issue 2, pp. 217–237). Pergamon. <https://doi.org/10.1016/j.cpr.2009.11.004>
- Berking, M., & Wupperman, P. (2012). Emotion regulation and mental health: Recent findings, current challenges, and future directions. In *Current Opinion in Psychiatry* (Vol. 25, Issue 2, pp. 128–134). <https://doi.org/10.1097/YCO.0b013e3283503669>
- Birdee, G. S., Ayala, S. G., & Wallston, K. A. (2017). *Cross-sectional analysis of health-related quality of life and elements of yoga practice*. <https://doi.org/10.1186/s12906-017-1599-1>
- Brady, B., Kneebone, I. I., & Bailey, P. E. (2019). Validation of the Emotion Regulation Questionnaire in older community-dwelling adults. *British Journal of Clinical Psychology*, 58(1), 110–122. <https://doi.org/10.1111/bjc.12203>
- Cowen, V. S., & Adams, T. B. (2005). Physical and perceptual benefits of yoga asana practice: Results of a pilot study. *Journal of Bodywork and Movement Therapies*, 9(3), 211–219. <https://doi.org/10.1016/j.jbmt.2004.08.001>
- Daubenmier, J., Mehling, W., Price, C., Bartmess-Levasseur, E., Acree, M., & Stewart, A. (2012). OA14.02. Exploration of body awareness and pain and emotion regulation among yoga and meditation practitioners: does type of mind-body practice matter? *BMC Complementary and Alternative Medicine*, 12(Suppl 1), O54. <https://doi.org/10.1186/1472-6882-12-s1-o54>

- Dick, A. M., Niles, B. L., Street, A. E., DiMartino, D. M., & Mitchell, K. S. (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*(12), 1170–1182. <https://doi.org/10.1002/jclp.22104>
- Fladung, A. K., & Kiefer, M. (2016). Keep calm! Gender differences in mental rotation performance are modulated by habitual expressive suppression. *Psychological Research, 80*(6), 985–996. <https://doi.org/10.1007/s00426-015-0704-7>
- Froeliger, B. E., Garland, E. L., Modlin, L. A., & McClernon, F. J. (2012). Neurocognitive correlates of the effects of yoga meditation practice on emotion and cognition: A pilot study. *Frontiers in Integrative Neuroscience, 6*(JULY 2012). <https://doi.org/10.3389/fnint.2012.00048>
- 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*(SEP), 1–20. <https://doi.org/10.3389/fnhum.2014.00770>
- Gender and yoga practice: is there any relationship?* (n.d.). Retrieved October 17, 2020, from <https://www.yoganatomy.com/gender-and-yoga-practice/>
- Gilmore, A. K., Jones, J. L., Moreland, A. D., Hahn, C. K., Brady, K. T., & Back, S. E. (2018). Gender moderates the association between distress tolerance and alcohol use among individuals with opioid use disorder. *Drug and Alcohol Dependence, 190*, 9–12. <https://doi.org/10.1016/j.drugalcdep.2018.05.016>
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci, 10*, 141-146.

- Gross, J. J. (1998). The Emerging Field of Emotion Regulation: An Integrative Review. *Review of General Psychology*, 2(3), 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348-362.
- Gust, C. J. (2020). *Yoga for improved physical and psychological health: Understanding the self-regulatory mechanisms of an ancient practice* (Unpublished master's thesis). University of Colorado Boulder, Boulder, Colorado.
- Harkess, K. N., Delfabbro, P., & Cohen-Woods, S. (2016). The longitudinal mental health benefits of a yoga intervention in women experiencing chronic stress: A clinical trial. *Cogent Psychology*, 3(1). <https://doi.org/10.1080/23311908.2016.1256037>
- Keough, M. E., Riccardi, C. J., Timpano, K. R., Mitchell, M. A., & Schmidt, N. B. (2010). Anxiety Symptomatology: The Association With Distress Tolerance and Anxiety Sensitivity. *Behavior Therapy*, 41(4). <https://doi.org/10.1016/j.beth.2010.04.002>
- Kwok, J. Y. Y., Kwan, J. C. Y., Auyeung, M., & Mok, V. C. T. (2019). Effects of Mindfulness Yoga vs Stretching and Resistance Training Exercises on Anxiety and Depression for People With Parkinson Disease: A Randomized Clinical Trial. *JAMA Neurology*, 76(7). <https://doi.org/10.1001/jamaneurol.2019.0534>
- Lopez, G., Chaoul, A., Powers-James, C., Eddy, C. A., Mallaiah, S., Gomez, T. I., Williams, J. L., Wei, Q., Bruera, E., & Cohen, L. (2018). Group Yoga Effects on Cancer Patient and Caregiver Symptom Distress: Assessment of Self-reported Symptoms at a Comprehensive Cancer Center. *Integrative Cancer Therapies*, 17(4), 1087–1094. <https://doi.org/10.1177/1534735418795301>

- Medina, J., Hopkins, L., Powers, M., Baird, S. O., & Smits, J. (2015). The Effects of a Hatha Yoga Intervention on Facets of Distress Tolerance. *Cognitive Behaviour Therapy, 44*(4), 288–300. <https://doi.org/10.1080/16506073.2015.1028433>
- Mocanu, E., Mohr, C., Pouyan, N., Thuillard, S., & Dan-Glauser, E. S. (2018). Reasons, years and frequency of yoga practice: Effect on emotion response reactivity. *Frontiers in Human Neuroscience, 12*. <https://doi.org/10.3389/fnhum.2018.00264>
- Mortel, T. F. van de. (2008). *Faking it: social desirability response bias in self-report research - ProQuest*. Retrieved September 27, 2020, from <https://search-proquest-com.colorado.idm.oclc.org/docview/204204655?pq-origsite=summon>
- Papp, M. E., Nygren-Bonnier, M., Gullstrand, L., Wändell, P. E., & Lindfors, P. (2019). A randomized controlled pilot study of the effects of 6-week high intensity hatha yoga protocol on health-related outcomes among students. *Journal of Bodywork and Movement Therapies, 23*(4), 766–772. <https://doi.org/10.1016/j.jbmt.2019.05.013>
- Popularity of Yoga Growing Dramatically. (2016). *The Back Letter, 31*(3), 26. <https://doi.org/10.1097/01.back.0000481329.59447.44>
- Rao, R. M., Vadiraja, H. S., Nagaratna, R., Gopinath, K. S., Patil, S., Diwakar, R. B., Shahsidhara, H. P., Ajaikumar, B. S., & Nagendra, H. R. (2017). Effect of yoga on sleep quality and neuroendocrine immune response in metastatic breast cancer patients. *Indian Journal of Palliative Care, 23*(3), 253–260. [https://doi.org/10.4103/IJPC.IJPC\\_102\\_17](https://doi.org/10.4103/IJPC.IJPC_102_17)
- Rocha, K. K. F., Ribeiro, A. M., Rocha, K. C. F., Sousa, M. B. C., Albuquerque, F. S., Ribeiro, S., & Silva, R. H. (2012). Improvement in physiological and psychological parameters after 6months of yoga practice. *Consciousness and Cognition, 21*(2), 843–850. <https://doi.org/10.1016/j.concog.2012.01.014>

- Ross, A., Friedmann, E., Bevens, M., & Thomas, S. (2013). National survey of yoga practitioners: Mental and physical health benefits. *Complementary Therapies in Medicine, 21*(4), 313–323. <https://doi.org/10.1016/j.ctim.2013.04.001>
- Schäfer, J. Ö., Naumann, E., Holmes, E. A., Tuschen-Caffier, B., & Samson, A. C. (2017). Emotion Regulation Strategies in Depressive and Anxiety Symptoms in Youth: A Meta-Analytic Review. *Journal of Youth and Adolescence, 46*(2), 261–276. <https://doi.org/10.1007/s10964-016-0585-0>
- Simons, J. S., & Gaher, R. M. (2005). The Distress Tolerance Scale: Development and validation of a self-report measure. *Motivation and Emotion, 29*(2), 83-102.
- Taylor, R. J., Taylor, H. O., Nguyen, A. W., & Chatters, L. M. (2020). Social isolation from family and friends and mental health among African americans and black caribbeans. *American Journal of Orthopsychiatry, 90*(4), 468–478. <https://doi.org/10.1037/ort0000448>
- Wang, K., Huang, H., Chen, L., Hou, X., Zhang, Y., Yang, J., Hao, X., & Qiu, J. (2017). MRI correlates of interaction between gender and expressive suppression among the Chinese population. *Neuroscience, 347*, 76–84. <https://doi.org/10.1016/j.neuroscience.2017.01.042>
- Yoshihara, K., Hiramoto, T., Oka, T., Kubo, C., & Sudo, N. (2014). Effect of 12 weeks of yoga training on the somatization, psychological symptoms, and stress-related biomarkers of healthy women. *BioPsychoSocial Medicine, 8*(1), 1. <https://doi.org/10.1186/1751-0759-8-1>



Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., & Leyro, T. (2010). Distress Tolerance.

*Current Directions in Psychological Science*, 19(6), 406–410.

<https://doi.org/10.1177/0963721410388642>

Figure 1

Cognitive reappraisal, expressive suppression, and distress tolerance means by group type

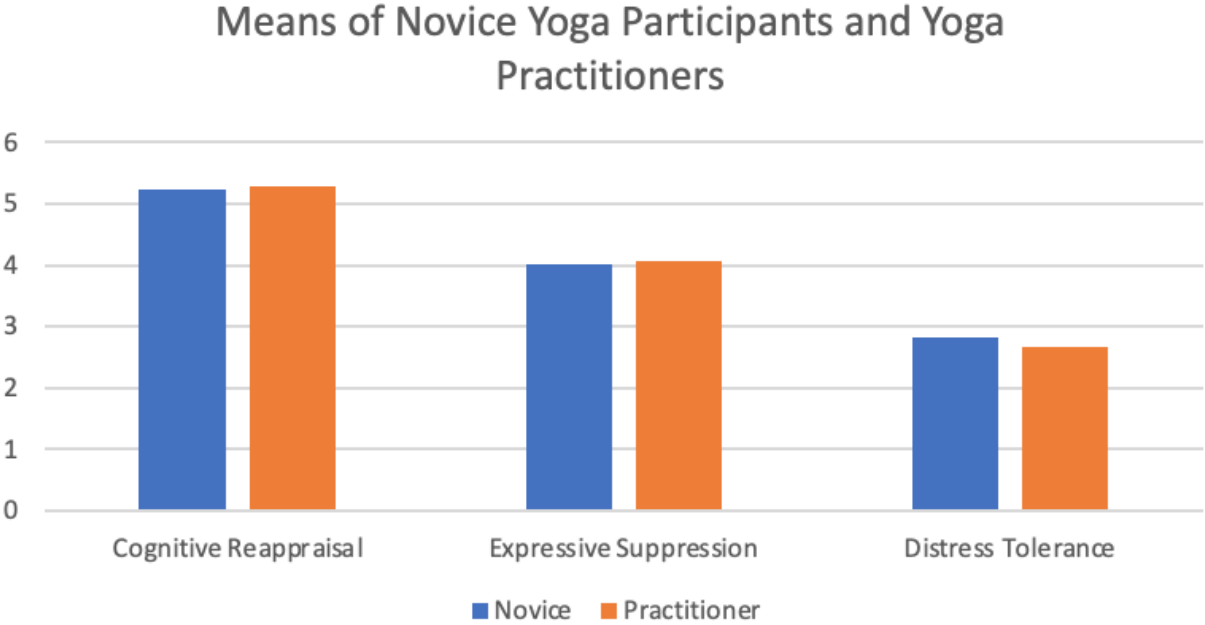


Figure 2

Distress tolerance means by gender and group type

