Emotion regulation and rumination mediate the relation between yoga experience and psychological health in a non-clinical Indian population

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Abstract
This study was conducted in India, and the research plan was initially developed to provide further knowledge and perspective to the rapidly increased issues of psychological conditions in the country, regarding alternative treatments such as yoga and underlying mechanisms in the effects of yoga practice. The purpose of the study was to examine if emotion regulation and rumination may act as mediators between yoga experience and anxiety respectively depression. The study included 320 participants from eight different indian cities, four of the cities located in the north, three in the south and one city in the western part of India. This study had a quantitative design and had a questionnaire as a method for the data collecting. The results indicated that both emotion regulation and rumination at a significant level mediated the relationship between yoga experience and anxiety and depression respectively. These results can potentially bring further knowledge for countries (and individuals) that have higher levels of anxiety and depression in their populations, such as India, by providing a alternative perspective in the treatment and prevention of these conditions. In addition, the results can be beneficial for individuals that suffer from symptoms of anxiety, depression, difficulties with emotion regulation, and rumination.

Key words: Anxiety, Depression, Emotion regulation, Rumination, Yoga

**Abstrakt**

Föreliggande studie utfördes i Indien. Forskningsplanen utvecklades för att ge ytterligare kunskap och perspektiv till den växande problematiken med psykiska ohälsa i landet, med fokus på alternativa behandlingar som yoga samt möjliga underliggande mekanismer i effekter av yoga utövande. Syftet med studien var att undersöka om emotionsreglering och ältande medierar relationen mellan yoga erfarenhet, och ångest respektive depression. Studien inkluderande 320 deltagare från åtta olika indiska städer, fyra av städerna ligger i norra, tre städer i södra och en stad i västra Indien. Föreliggande studie hade en kvantitativ design och hade enkäter som datainsamlingsmetod. Resultatet indikerade att både emotionsreglering och ältande signifikant medierade relationen mellan yoga erfarenhet och ångest respektive depression. Dessa resultat kan potentiellt utöka kunskapen för länder (och individer) som har högre nivåer av ångest och depression i sina populationer, som exempelvis Indien, genom att ge ett alternativt perspektiv i behandlingen och i det förebyggande arbetet av dessa tillstånd. Vidare kan resultatet av studien vara användbart för individer som har symptom av ångest, depression, svårigheter med emotionsreglering, och ältande.

Nyckelord: Depression, Emotions reglering, Yoga, Ångest, Ältande
Globally over 300 million individuals are estimated to suffer from depression, furthermore nearly the same number suffers from a range of anxiety disorders and this estimation is rising each year (WHO, 2017). Most of these individuals experience both conditions simultaneously which makes it more severe (WHO, 2017). This can, not only lead to lost of health, but also death, since depression is also a major contributor to suicide deaths, with an estimated number of 800 000 deaths per year (WHO, 2017). A question one may ask is who is most likely to get depressed? Although anxiety and depression can and does affect individuals of all ages, in all stages of life, the risk of getting these conditions is increased by poverty, unemployment, physical illness and other life events such as a death of a loved one (WHO, 2017). The current treatments such as antidepressant medicine have been criticized (Kirsch et al., 2008), and also have different side effects (Ebmeyer, Donaghey & Steele, 2006; Trindade, Menon, Topfer & Coloma, 1998).

Statistics indicates that anxiety and depression are rising, not only globally, but mostly in low-income countries (WHO, 2017). The 31 December of 2017 the prime minister of India made a speech were he stated that India is on the brink of a mental health epidemic (The Hindu, 2017). A survey by the Indian National Institute of Mental Health and Neuro Sciences identified that nearly 11% of people over 18 years have a mental disorder (NMHS, 2016). Among the most common mental disorders reported were depression and anxiety disorders, and these conditions were often largely ignored and unaddressed in Indian health care programs (NMHS, 2016).

With individuals that suffer from these types of mental disorders other conditions may simultaneously rise, such as emotion regulatory difficulties. Emotion regulation deficiency is involved in a variety of anxiety disorders (Cisler, Olatunji, Feldner, & Forsyth, 2010), such deficits can result in ineffective coping (Berking & Wupperman, 2012). In addition, depression is conceptualized as consequence of dysfunctional emotion regulation (Gross & Munoz, 1995; Kring & Wemer, 2004; Hollon, Munoz, & Barlow, 2002). New and old treatments that include a variety of difficulties therefore tend to incorporate a focus on promoting adaptive emotion regulation skills (Gratz & Gunderson, 2006; Mennin, 2009).

The demand for alternative or complementary treatments for psychological conditions such as anxiety and depression has increased. As the cost of health care increases, the use of non-traditional complementary alternative treatments, also known as complementary alternative medicine or therapeutic recreation, has become more prevalent (Sareen, Kumari, Gajebasia & Gajebasia, 2007). One of the complementary methods used for reducing anxiety and depression today is yoga practice. Yoga has shown promising and effective results in reducing anxiety (Cramer et al., 2018) and depression (Ubelacker et. al., 2010) levels, and in several other health related conditions (Ubaelacker et al., 2010). Evidently yoga as a practice offers a perspective for the prevention, as well as for the treatment, of mental and physical conditions (Forfylow, 2011). However the research field of yoga have been limited in providing answers about the underlying mechanisms that are active in the effects of yoga practice, and how yoga practice may lead to increased psychological health (Field, 2016). It still remains unknown which aspects of yoga practice that are leading to the positive physical, cognitive and emotional effects (Field, 2016). Therefore, it is a matter of concern for psychosomatic research to find out more about the functional mechanisms of alternative methods such as yoga (Gaiswinkler & Unterrainer, 2010).

However, the field of mindfulness have been well research the past decade with over 3000 scientific publications on the topic (Black, 2015), and have provided a broader perspective of the possible underlying mechanisms in meditative practices through several models (Shapiro
et al., 2006; Deyo, Wilson, Ong, & Koopman, 2009; Fresco, Segal, Buis, & Kennedy, 2007) The practice of mindfulness is commonly used in yoga (Brisbon and Lowery, 2011; Knight et al., 2014; Salmon, Lush, Jablonski, & Sephton, 2009). Therefore, the possible mechanisms through which mindfulness practice may lead to increased psychological health effects, may also help to explain the increased positive health effects demonstrated by yoga practice as well. Additionally, in both mindfulness and yoga research, rumination and emotion regulation have been suggested as some of underlying mechanisms in the effects of those practices (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013; Menezes, Dalpiaz, Rossi, & De Oliveira, 2015; Grabovac & Wilett, 2011).

As it has been demonstrated above in the text, yoga research lacks in areas were the field of mindfulness may provide possible explanations. However, it has been clear, that the underlying mechanisms supporting potential beneficial effects of yoga practice also needs to be explored further (Daly, Haden, Hagins, Papuchis, & Ramirez, 2015). Since psychometric and design limits exists in yoga studies (Telles et. al., 2018; Hofmann et al., 2016; Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005), conducting more high quality research in this area is necessary. Most of the yoga studies that have included anxiety and depression respectively, are conducted in high-income countries and often with clinical populations. In addition, few studies have actually examined the relationship between yoga practice, anxiety, depression, emotion regulation, and rumination in a low-income and non-clinical population. Therefore it may be beneficial to examine results from a low-income country such as India, with a non-clinical population. In sum, the purpose of this current study is to examine if emotion regulation and rumination are possible mediators between yoga experience and psychological health (i.e. in this study anxiety and depression).

**Yoga**

Yoga is an ancient discipline that emerged approximately 2800 b.c. in India (Fraser, 2002), and is developed to unify body, mind and spirit (Cuomo, 2007; Iyengar, 1976). The word yoga comes from the indian ancient language sanskrit and translates to “unify” (Cuomo, 2007) or “connection” (Fraser, 2002, Iyengar, 1976). Meaning the unification of the individual consciousness (atman) with the consciousness of humanity (brahman), or in simpler terms the unification of body, mind and spirit (Iyengar, 1976). There is eight limbs of yoga but the most commonly used is asanas (physical postures), pranayama (breath awareness), dharana (concentration) and dyana (meditation) (Iyengar, 1976). Yoga practice can be performed in various forms and there is a lot of pionniers with different styles of yoga practice. In the western world the most common yoga form is hatha-yoga (Fraser, 2002). A typical yoga class is based on the limbs above, and includes movements, physical postures and stretching that is integrated with breathing exercises to prepare for meditation, instructed by a yoga teacher or instructor (Cuomo, 2007; Fraser, 2002). The individual is encouraged to have a introspective and transparent mindset and two other important limbs of yoga, yama and niyama, involves the individuals attitude towards his/her environment and one self (Iyengar, 1976). The popular practice of yoga that once originated from India has become increasingly more common in today's society (Ross & Thomas, 2010; Cramer et al., 2016). Furthermore, with the multidimensional aspects that are included in yoga, e.g. physical postures, breath awareness, concentration and meditation, it is not surprising that researchers have found positive relations between yoga and many health advantages (Ubaelacker et al., 2010; Ross and Thomas, 2010). Yoga is a comprehensive and open exercise form and it is cost-effective, which also means it is available for many people.
Meditation is an important part of yoga practice, and Yoo et. al. (2016) have evidence in their research that meditation techniques can help change maladaptive thinking and emotion regulation which can foster permanent structural changes in the brain. These changes can reduce the relapse risk for depressed individuals, therefore meditation also has an prevention aspect, which only few other treatments have (Yoo et al., 2016).

The construct of mindfulness has also been related to yoga practice since mindfulness is often considered the active ingredient in yoga and linked to reported positive effects on psychological health (Brisbon and Lowery, 2011; Knight et al., 2014; Salmon, Lush, Jablonski, & Sephton, 2009). Mindfulness is commonly defined as a way of paying attention to the present-moment experience in a non-judgmental way, with an attitude of acceptance (Kabat-Zinn, 1994). There is also several interventions combining yoga and mindfulness such as Mindfulness-based stress reduction (MBSR) which includes not only a non-judgemental mindful awareness, but also some hatha yoga postures (Kabat-Zinn, 1990). Even though mindfulness-based practices emphasize the mental form of training some elements of yoga such as physical postures (asanas) and pranayama (breath control) remain active in MBSR (Gard, Noggle, Park, Vago, & Wilson, 2014).

Furthermore, yoga has shown to improve psychological, physical, and emotional health (Field, 2016). In a review of yoga research (Field, 2016), yoga practice has shown promising effects in decreasing both anxiety (Mullur, Khodnapur, Bagali, Aithala, & Dhanakshirur, 2014) and depression (Thirthali et al., 2013). In sum, yoga can be both healing and preventive for mental and physical conditions (Gaiswinkler & Unterrainer, 2016).

**Yoga and anxiety**

Anxiety disorders is more than temporary worry or behaviour that is motivated by fear. For a individual with an anxiety disorder the anxiety can get worse in time and does not decrease (NIMH, 2018). There are several types of anxiety disorders for example generalized anxiety disorder (GAD), social anxiety, panic disorder, post-traumatic stress disorder (PTSD) and other phobias (WHO, 2017; NIMH, 2018). The symptoms of these types of anxiety disorders include; feeling restless, wound-up, being easily fatigued, having difficulty concentrating (mind going blank), being irritable, having muscle tension, difficulty controlling feelings of worry, having sleep problems, such as difficulty falling or staying asleep, restlessness, or unsatisfying sleep (NIMH, 2018). For a person in this condition the anxiety can easily interfere with daily life activities such as social interactions, work and school.

In a meta-analysis that examined 17 studies Hofmann, Andreoli, Carpenter, & Curtiss (2016) found that hatha-yoga is a promising treatment for reducing anxiety. The within-group analyses showed a moderate effect size on anxiety of Hedges’ $g = 0.44$, meanwhile the between-group analyses comparing yoga to a waitlist control group showed an moderate to large effect size of Hedges’ $g= 0.61$ (Hofmann et al., 2016). In addition, the review exhibited that more yoga practice was associated with greater benefits and the higher the level of anxiety in the beginning, the more beneficial the practice was (Hofmann et al., 2016). An experimental study in an Indian population (Telles et al., 2018) showed that a 15 day residential yoga intervention significantly reduced state anxiety and increased all aspects of mental well-being in the yoga group compared with a empty control group (Telles et al., 2018).

Studies have shown that yoga practice have reduced anxiety levels, however a systematic review on yoga and anxiety by Kirkwood, Rampes, Tuffrey, Richardson, Pilkington (2005) shows that design and methodological problems exists in studies, such as high dropout rates and
low participation. Also the authors mention that the ability and commitment to complete a yoga intervention for individuals with anxiety disorders may be an issue in the studies, therefore more research need to been done in this area (Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005). In addition, yoga practice have shown sufficient evidence in research of its ability to increase mindfulness, which further may lead to an increased individual capacity to self-regulate and decrease stress levels (Rocha et al., 2012). Menezes, Dalpiaz, Rossi, and De Oliveira (2015), also suggests that yoga practice may improve self-regulatory skills as well as decreasing anxiety levels. Furthermore, mindfulness practice have also been linked to reported positive effects on anxiety (Brisbon and Lowery, 2011; Knight et al., 2014; Salmon et al., 2009).

In addition, a more recent review suggests that yoga might be an effective for individuals with elevated levels of anxiety (Cramer et al., 2018). According to Cramer et al. (2018), yoga is considered a safe intervention for anxiety because of the fact that yoga practice has proven not be associated with increased injury.

**Yoga and depression**

Depression is characterized by repetitive sadness and also a loss of interest in activities that the individual normally enjoys (WHO, 2018). Furthermore it is accompanied by an inability to carry out daily activities, such as work or school (WHO, 2018). In addition to this other common symptoms that individuals with depression are experiencing is psychological (e.g., anxiety; feelings of worthlessness; guilt; hopelessness; thoughts of self-harm or suicide; grief; low self-esteem), cognitive (e.g., reduced concentration and focus; indecisiveness), physiological (e.g., a change in appetite) and physical (e.g. a loss of energy; sleeping more or less; restlessness; symptoms (WHO, 2018; WHO, 2017). A meta-analysis shows that antidepressant medication does not have a clinical significant effect on mild and moderate depression compared to placebo-treatment (Kirsch et al., 2008). Research has also shown high dropout rates resulting in lower reduction of depression (Turner, Matthews, Linardatos, Tell & Rosenthal, 2008; Matthew & Charney, 2009; Pigott, Leventhal, Alter & Boren, 2010), which shows that there is perhaps a demand for alternative treatments, such as yoga practice.

Yoga practice has in a number of studies and reviews shown its feasibility and effectiveness in reducing depression levels of participants (Schuver & Lewis, 2016; Pilkington, Kirkwood, Rampes, & Richardson, 2005; Uebelacker et. al., 2010). In an eight-week yoga intervention for MDD results indicate lower levels of depression in the yoga group in comparison to the control group (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). In a follow up study, results showed sustainability of the positive effects of the yoga intervention after one year (Kinser, Elswick, & Kornstein, 2014). According to Kinser, Elswick, and Kornstein (2014), to simply be exposed to a yoga intervention appears to provide sustained benefits to the individual, regardless of continued practice or not. Some of the participants in the study also mentioned that yoga helped their mood because it provided a coping strategy to deal with persistent negative thoughts in their lives (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). Mindfulness has also shown to decrease depression in several studies (Vøllestad, Sivertsen, & Nielsen, 2011; Geschwind, Peeters, Huibers, Van-Os, & Wichers, 2012; & Greeson et al., 2015). The effects of mindfulness practice lasted from six up to 12 months after the interventions (Vøllestad et al., 2011; Geschwind et al., 2015).

In addition, studies have also shown that women that have a depression diagnosis often experience ruminations (Hallbreich & Kahn, 2007; Marcus et al., 2008).

**Yoga and rumination**
Rumination is a possible mechanism that underlies the effects of yoga practice (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013), and may therefore be a possible mechanism in yoga interventions in relation to increased psychological health.

The construct of rumination is a complex concept, but it can be seen as repetitive negative thought processes about your depression and life situation, and is commonly found in depressed individuals (Smith & Alloy, 2009). Rumination is characterized by loss of spontaneity, pessimism, and falling into a bottomless pit of reflection upon reflection (Van Woerkom, 2010). People with a ruminative behaviour think repetitively and passively about their negative emotions, with a focus on their symptoms of distress and worrying about the meaning of their distress (Lyubomirsky, Cadwell, & Nolen-Hoeksema, 1998; Nolen-Hoeksema, 1991). The more an individual have a ruminative thinking style, the higher risk they have of getting depressed (Nolen-Hoeksema, 2000). Nolen-Hoeksema (2000) suggests that rumination may be one of the reasons for the common comorbidity of anxiety and depression. Furthermore, rumination seems to be motivated by perceived threats, losses, or injustices to the self, and can be seen as a type of self-focused attention (Trapnell & Campbell, 1999).

Yoga interventions have shown to be uniquely effective against reducing ruminations in women (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013), in both clinical and non-clinical populations (Campbell, Labelle, Bacon, Faris & Carlson, 2012; Jain, Shapiro & Swanick, 2007). In addition, mindful yoga and sitting meditation has shown to decrease rumination (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2012). For example, a participant of an eight-week yoga intervention commented that learning to be mindful of the breath and body through yoga helped her break patterns of self-judging thoughts (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013), which is one of the distinctive parts of the ruminative and depressive thinking process. Furthermore, Vine, Aldao, and Nolen-Hoeksema (2014) have results in their research that supports the notion that ruminative processing sometimes may function as a search for answers or clarity of ones emotions. Since rumination have also been found to predict depression as well as anxiety (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), the author of this current study believe this construct is of importance in the high comorbidity between anxiety and depressive disorders (Kessler et al., 1996; and WHO, 2017). In a review about rumination (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), it was found that rumination predicted depressive symptoms and disorders and impaired thinking, problem solving, instrumental behavior, and social relationships, also inducing rumination prolongs the experience of negative mood in dysphoric individuals. In sum, earlier research indicates the possibility of rumination as a possible mediator between yoga practice and psychological health (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013; Jain, Shapiro & Swanick, 2007).

**Yoga and emotion regulation**

The attention for the construct of emotion regulation has increased in research the past decade and studies show that difficulties with emotion regulation may underlie many clinical behaviours and psychological difficulties, including depression and anxiety (Tull, Stipelman, Salters-pedneault, & Gratz, 2009; Vujnovic, Zvolensky, & Bernstein, 2008), deliberate self-harm (Gratz & Chapman, 2007; Gratz & Roemer, 2008), worry (Vujnovic et. al., 2008), and generalized anxiety disorder (Mennin, Heimberg, Turk, & Fresco, 2005). Researchers have observed links between emotion dysregulation and anxiety (Folk, Zeman, Poon, & Dallaire, 2014), and depression (Crowell et. al., 2014). Therefore emotion dysregulation is an accurate transdiagnostic indicator of vulnerability and may contribute to high rates of comorbidity across
many diagnosis (Beauchaine & Thayer, 2015).

Despite the rising interest for emotion regulation there is no consensus in the definition of the construct (Putnam & Silk, 2005), and there is disagreement regarding the most clinically relevant definition. Psychological research has offered empirical insights into individuals attempts to influence which emotions they have, when they have them, and how they experience and express these emotions (Gross, 1998).

Gratz and Roemer (2004) proposes an integrative conceptualization of emotion regulation which includes a) awareness and understanding of emotions, b) acceptance of emotions, c) ability to control impulsive behaviours and behave in accordance with desired goals when experiencing negative emotions, and d) ability to use situationally appropriate emotion regulation strategies flexibly to modulate emotional responses as desired in order to meet individual goals and situational demands (Gratz & Roemer, 2004). The relative absence of any or all of these abilities would indicate the presence of difficulties in emotion regulation, or emotion dysregulation (Gratz & Roemer, 2004). Others have proposed similar views of emotion regulation (Cole et al., 1994; Eisenberg & Spinrad, 2004; Thompson, 1994).

Even though yoga practice have shown decrease difficulties in emotion regulation (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2013), there are only a few studies that have specifically investigated positive effects of yoga practice on emotion regulation. In a review of yoga and emotion regulation the results demonstrate that yoga may be helpful in fostering healthier psychological responses, indicating its potential as an emotion regulation strategy (Menezes et al., 2015). In addition, another study provides initial evidence of the positive effects of yoga on the emotion regulation (Daly, Haden, Hagins, Papuchi, & Ramirez, 2015). Furthermore, rising evidence support the idea that mindfulness-based interventions are related to an improved ability to regulate negative emotions in clinical populations (Roemer, Willistion, & Rollins, 2015).

Emotion regulation, similar to rumination, has found to be a mediator in the relation between dispositional mindfulness and psychological distress and well-being (Coffey, Hartman, & Fredrickson, 2010). Since it is still unclear if these mechanisms could explain positive effects of yoga as well, more research on emotion regulation and yoga is needed to clarify the process in which the individual develops increased health through yoga practice.

In addition, depressed and anxious individuals report emotion regulatory difficulties such as identifying emotions and poorer understanding of emotions (Rude & McCarthy, 2003; Tull, Stipelman, Salters-Pedneault, & Gratz, 2009; Mennin, Heimberg, Turk, & Fresco, 2005), the construct of emotion regulation therefore seems to be of importance to examine further.

**Buddhist Psychological Model (BPM)**

As mentioned earlier, yoga research have been limited in providing explanations for how yoga practice leads to positive health effects (Field, 2016), therefore it may be appropriate and helpful to turn to the related area of mindfulness for possible explanations. Several models of change have been proposed to explain the processes by which mindfulness-based interventions exert their physical, psychological and emotional effects (Shapiro, Carlson, Astin, & Freedman, 2006; Deyo, Wilson, Ong, & Koopman, 2009; Fresco, Sefal, Buis, & Kennedy, 2007). However, none of these models seem to be sufficiently comprehensive in describing the mechanistics details of this change process (Grabovac & Wilett, 2011). The BPM is a proposed model that is useful in describing mechanisms in mindfulness-based interventions (Grabovac & Wilett, 2011).
The BPM tries to explain the relationship between mindfulness and cognitive processes, and the changes to those processes that are brought by mindfulness training (Grabovac & Wilett, 2011). BPM then continues to hypothesize the mechanisms by which mindfulness practice leads to symptom reduction and well-being in individuals (Grabovac & Wilett, 2011).

**Model 1. Buddhist Psychological Model by Grabovac and Wilett (2011)**

In the BPM, awareness of an object occurs when either a stimulus enters our field of perception and makes contact with a sense organ, or when a object of cognition arises in the mind (Grabovac & Wilett, 2011), this awareness lasts only for a brief moment in time and then ceases. Furthermore, according to BPM our attentional resources are limited, which means that an individual can only be aware of one object at a time (Grabovac & Wilett, 2011). With the awareness of any object, there is a concomitant feeling tone, which the BPM divides into three categories; pleasant, unpleasant, or natural (neither pleasant or unpleasant). In addition, sense these feelings constantly and rapidly, arises and passes away, they often go unnoticed and can serve as the key trigger to a chain reaction of thoughts (including emotions) and actions that can lead to suffering (Grabovac & Wilett, 2011). Furthermore, our habitual reactions to these feelings are to pursue those that are pleasant and to avoid those that are unpleasant, the buddhist terms for these reactions are *attachment* and *aversion* respectively (Grabovac & Wilett, 2011).
These reactions are expressed by the individual in the form of thoughts, memories or emotions, that rapidly follows the initial sense impression. According to the BPM attachment and aversion arise in reaction to the feeling state itself rather than to the object (Grabovac & Wilett, 2011). For instance when a particular object is given attention by the individual, depending on one’s past experiences, culture and other influences, the feeling that arise in reaction to that object, will be either pleasant, unpleasant, or neutral (Grabovac & Wilett, 2011). In addition, no matter what the feeling tone might be the individual will habitually react with thoughts, emotions, and/or actions oriented towards ending/or continuing the pleasant/unpleasant/or natural feeling (Grabovac & Wilett, 2011). Further mental elaboration occurs when there is attachment or aversion to the feelings that are arising with the mental events themselves, this process leads to the production of additional mental events (Grabovac & Wilett, 2011). This process, called mental proliferation, is simply a series of these mental events that have been triggered by an initial mental event or sense impression (Grabovac & Wilett, 2011). According to the BPM, if an individual is not aware of how this pattern of attachment and aversion can lead to mental proliferation, this helps to keep the entire process habitual (Grabovac & Wilett, 2011). Finally the BPM emphasize on three central parts of mindfulness practice that are common to all sense impressions and mental events; First, sense impressions and mental events are transient, they arise and pass away. Secondly, habitual reactions (i.e., attachment and aversion) to the feelings of a sense impression or mental event, and a lack of awareness of this process, leads to suffering. Lastly, sense impressions and mental events do not contain or constitute any lasting (Grabovac & Wilett, 2011). From the perspective of BPM, improvement in well-being occurs when sensory and mental events are allowed to naturally arise and fall away, without subsequent cognitive processing arising from either attachment or aversion. Sense impressions and mental events are still experienced as pleasant, unpleasant, or natural; however if there is no attachment, aversion, and thus no mental proliferation, adventitious suffering is not experienced (Grabovac & Wilett, 2011). An untrained mind can easily be distracted by ruminative or narrative thought processes, therefore attention must be refocused many times (Grabovac & Wilett, 2011). Through mindfulness practice the mind is repeatedly refocused, with an attitude of acceptance, and this leads to the prevention of negative thought patterns, such as self-judgement and resultant mental proliferation (Grabovac & Wilett, 2011).

In sum, the model proposes that insight in these three characteristics, leads to decreased attachment and aversion to the feelings that are arising, which further leads to decreased mental proliferation (Grabovac & Wilett, 2011). The BPM explains how acceptance, concentration/attention-regulation and ethical practices also affects this process (Grabovac & Wilett, 2011). According to BPM, the main element that leads to symptom reduction and increased well-being is the effect of mindfulness practice in decreasing mental proliferation (Grabovac & Wilett, 2011). Since yoga is a type of meditative practice that include mindfulness practice, the BPM might help to explain underlying mechanisms of yoga practice in this current
study.

**Present study**

This study is aimed to investigate if emotion regulation and rumination mediates the relationship between yoga experience and anxiety, and depression respectively (see model 2 and 3 below). By using the BPM as an theoretical framework and earlier research studies, these two possible mediators can help to explain how yoga practice have demonstrated positive psychological health in effects.

![Diagram](image)

**Model 2.** The relationship between yoga experience and anxiety, and depression respectively, through emotion regulation

![Diagram](image)

**Model 3.** The relationship between yoga experience and anxiety, and depression respectively, through rumination
Method

Participants and sampling

In this current study 320 participants, from ages 19 to 62 years (185 women and 128 men) were included. Some participants were excluded because of missing values (N=7) since the participant did not fill in the form correctly. The final analysis included a total of 313 participants. The participants in the yoga group consisted of 158 individuals from ages 19 to 62 years (101 females and 57 men, M= 31 years, SD= 8.6). Represented yoga forms was; Hatha (N=95), Ashtanga (N= 20), Raja (N=15), Yin (N=8) and other types (N=11). In the non-yoga group 155 individuals were identified from ages 19 to 51 years (84 females and 71 men M= 30 years, SD= 7.1). The participants were derived from a convenience sampling (Breakwell, Smith & Wright, 2012). The criteria for inclusion in the yoga group was a minimum of six months of yoga experience and practicing yoga regularly today. To be a part of the non-yoga group it was required that you do not practice yoga today and have not earlier practiced yoga for more than six months.

Instrument

Background questions regarding age, sex, occupation and exercise habits was included.

Yoga experience

To measure the participants experience of yoga practice five questions was addressed; Have you practiced yoga?, Do you practice yoga today on regularly basis?, How many months or years have you practiced yoga?, What type of yoga have you practiced?, and How often do yoga practice yoga a week?.

To further investigate related exercise types close to yoga, the question; Have you practiced other meditative practices?, was included. The measurement of ‘‘Yoga experience’’ in this study derived from the questions; frequency of months/years- and frequency of yoga practice per week.

Hospitalized Anxiety and Depression Scale (HADS)

Hospital Anxiety Depression Scale is a self-assessed questionnaire developed by Zigmond and Snaith (1983; ref in Herrman, 1997) to measure how a individual is feeling and focuses on cognitive and emotional aspects of general anxiety and depression. The instrument consists of 14 items that aims to measure individual levels of anxiety and depression during the past seven days. The scale consists of four options per statement, and is coded with 0-3 points, were high values indicate higher levels of anxiety and/or depression. The statements are divided into two subscales, whereas one is measuring anxiety (HAD-A) and the other measuring depression (HAD-D) (Bjelland, Dahl, Tangen Haug & Neckelmann, 2002). Each subscale include seven items, and the statements included may look like the following; ‘Worrying thoughts go through my mind’ for measurement of anxiety, and for depression ‘I look forward with enjoyment to things’. HADS measures anxiety and depression independently and for each subscale participants receive a value from 0-21 points. The limit for the subscale anxiety: 0-6 normal to no anxiety, 7-10 mild to moderate anxiety, >10 indicate a higher probable presence of anxiety disorder. And for subscale depression: 0-6 normal to no depression, 7-10 mild to moderate depression, >10 indicates a risk of depression-state so severe that it may need medical treatment. HADS has performed well in assessing the symptom severity and caseness of anxiety disorders and depression in both clinical and nonclinical populations (Bjelland et al., 2002). Cronbach’s alpha for the current study was 0.85 for depression subscale and 0.81 for anxiety.
subscale.

**Difficulties in Emotion Regulation Scale (DERS)**

Difficulties in Emotion Regulation Scale is a questionnaire that measures emotional regulation (and dysregulation) and is one of the most widely used self-report measures in this area (Kaufman, Xia, Fosco, Yaptangco, Skidmore, and Crowell, 2016). It has been developed to capture clinical relevant problems that are associated with clinical diagnosis (Gratz and Roemer, 2004). Furthermore it has been used to, for example, examining psychophysiological responding which is associated with emotion regulation functioning (Mirzaei, Gharraee, and Birashk, 2014). The instrument of DERS includes 36 items that are divided into six separate subscales wherein difficulties in emotion regulation may occur, including; (1) lack of awareness of emotional responses, which measures inattention to emotional responses, (2) lack of clarity of emotional responses, reflects to which extent the individual is unclear about which emotions they are experiencing, (3) non-acceptance of emotional responses, to which extent do the individual have a tendency to have negative secondary emotional responses to one’s negative emotions, or non-accepting reactions to distress, (4) limited access to emotion regulation strategies perceived as effective, includes items that reflect the belief that there is little that one can do to regulate emotions effectively, once the individual is upset, (5) difficulties controlling impulses when experiencing negative emotions, is composed of items regarding struggles to control one’s emotions and behaviour when the individual is upset, (6) difficulties engaging in goal-directed behaviors when experiencing negative emotions, measures difficulties in concentrating and accomplishing tasks when the individual is experiencing negative emotions (Gratz and Roemer, 2004; Kaufman et. al., 2016). Participants receive a score for each subscale and a total score for all subscales. In this current study only the total score of DERS is included in the analysis. Each subscale contains five to eight statements related to that specific subscale, and participants are asked to self-assess to which extent they feel that the statement applies to them with a point-scale ranging from one to five. The range goes from 1= almost never (0-10%), 2= sometimes (11-35%), 3= about half of the time (36-65%), 4= most of the time (66-90%), and 5= almost always (91-100%). Higher scores indicate greater difficulties in emotion regulation (Gratz and Roemer, 2004). DERS focuses more on negative emotions which is related to the aim of this current study. Cronbach’s alpha for the DERS total score was 0.97 in this current study.

**Rumination and Reflection Questionnaire (RRQ)**

Rumination and Reflection Questionnaire is a self-assessed questionnaire developed by Trapnell and Campbell (1999). The 24-item questionnaire has an independent factor for both subscales (Rumination and Reflection) as well as a respectable coefficient alpha in the low .90s. The Rumination subscale measures a tendency to repeatedly self-focus on one’s past actions, and the Reflection subscale measures a philosophical love of self-exploration. The authors constructed the Rumination subscale to capture the self-focused dimensions of Neuroticism and constructed the Reflection subscale to capture the self-focused dimensions for Openness to experience, from the personality trait theory Big Five. The respective subscales has seven items each and participants are asked to self-asses to which extent they agree or disagree with the statements with a value from 1-5. The range goes from; 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree. For this study only the rumination subscale will be used in the analyses. Higher scores indicate higher levels of rumination (Trapnell and Campbell, 1999). Cronbach’s alpha was 0.95 for the subscale of rumination, in this current study.
Data collecting and procedure

The data-collecting took place across eight different Indian cities, four of the cities located in the north, three in the south and one city in the western part of India. Participants for the yoga group were reached out to in yoga studios and centers, meanwhile participants for the non-yoga group were reached out to in public areas like libraries, universities, cafés and other public places. Participants for the yoga group was reached out to before yoga practice, so the effects of yoga practice may not affect the participants answers.

A introduction letter was given to all participants before answering the questions and was attached to the questionnaires front page, also the author was present at all time for any questions or to clarify items in the questionnaires. In the information letter it was clear that the data was only to be used for research purposes and individuals were also informed about voluntary participation. Furthermore it was written that the participant had the right to end their participation at any time without an explanation, both before and after finishing the questionnaire. Anonymous participation was also pointed out, meaning that the participant remains anonymous throughout the entire study and will never be asked of any personal information such as name or id-number.

The information letter was conducted with the guidance of the research ethical principles based on the demand for informed consent, confidentiality, anonymisation and usage of the data. Participants gave their consent on the front page of the introduction letter with a signature. Contact information about the author and supervisor was also included if any questions remained about the study.

Analyses

All participants data was analysed using SPSS (Statistical Package for the Social Sciences). Descriptive analysis was conducted to show a relevant overview of the participants and the variables. Total scores for the participants on each of subscales was also analysed and gave a procentual outcome, with relevant information. Furthermore a pearson's correlations analysis was used to investigate in the relationship between yoga experience (frequency of months/years and times/per week), anxiety, depression, difficulties in emotion regulation, health, reflection and rumination. Lastly, to examine any differences between yoga practitioners and non-yoga practitioners levels of anxiety, depression, difficulties in emotion regulation, and rumination, an independent t-test was used.

The mediation models were tested through a additional program to SPSS, called PROCESS (Hayes, 2013). A mediation analysis is used to examine the effects of an independent variable (X) on a dependent variable (Y) through a third variable (M), referred to as a mediator (Preacher and Hayes, 2008). The mediator, also sometimes called mechanism (Hoyle & Robinson, 2004), can help to explain how a given effect occurs (Preacher and Hayes, 2008). According to Preacher and Hayes (2008), the indirect effects are not reported through a p-value, instead it is presented as a 95% confidence interval (CI). If zero is not included in the 95% confidence interval, we can conclude that the indirect effect is indeed significantly different from zero at $p<.05$ (Preacher & Hayes, 2008).

In this current study the relationship between the independent variable yoga experience and two dependent variables anxiety and depression was investigated through the two possible mediators rumination and emotion regulation. Through the method of mediation analysis the data is tested through four different pathways, which is demonstrated in the models (see model 2 and 3). First we have (line a), which is the relationship between the independent variable yoga
experience and the mediators (emotion regulation and rumination), as well as the relationship between the mediators and the dependent variables anxiety and depression respectively (line b). Furthermore, the relationship between the independent and the dependent variable was tested through two pathways, both without the mediator (direct effect; line c) and through the mediator (indirect effect; line č).

**Results**

The first section of the results are the descriptive statistics regarding the HADS subscales, the correlation analysis and the independent t-test, to clarify and provide more information about the relationship between anxiety, depression, emotion regulation, and rumination. In the last section of the results the four mediation models are presented.

**Descriptive statistics of HADS**

*Table 1. Frequencies and percentage of depression and anxiety according to subscales HAD-A and HAD-D*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yoga group</th>
<th>Non-yoga group</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAD Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6</td>
<td>145 (91.8%)</td>
<td>34 (22%)</td>
</tr>
<tr>
<td>7-10</td>
<td>13 (8.2%)</td>
<td>34 (22%)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>0 (0%)</td>
<td>87 (56%)</td>
</tr>
<tr>
<td>HAD Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6</td>
<td>156 (98.7%)</td>
<td>71 (45.8%)</td>
</tr>
<tr>
<td>7-10</td>
<td>2 (1.3%)</td>
<td>62 (40%)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>0 (0%)</td>
<td>22 (14.2%)</td>
</tr>
</tbody>
</table>

Note: HADS Anxiety: 0-6 normal to no anxiety, 7-10 mild to moderate anxiety, >10 indicates a higher probable presence of anxiety disorder. HADS Depression: 0-6 normal to no depression, 7-10 mild to moderate depression, >10 indicates a risk of depression-state so severe that it may need medical treatment, (N=313)

**Correlation analysis**

*Table 3. Correlation analysis between frequency of months of yoga practice, frequency of yoga practice per week, anxiety, depression, difficulties in emotion regulation, general health, reflection and rumination. Mean (M) and Standard deviation (SD)*

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequency of months</td>
<td>0.711**</td>
<td>-0.418**</td>
<td>-0.402**</td>
<td>-0.476**</td>
<td>-0.452**</td>
<td>49.38</td>
<td>76.23</td>
<td></td>
</tr>
</tbody>
</table>
2. Frequency of practice/week

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>df</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS Anxiety</td>
<td>4.12</td>
<td>1.64</td>
<td>-16.7</td>
<td>.001</td>
<td>205</td>
<td>1.9</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>2.46</td>
<td>1.59</td>
<td>-14.7</td>
<td>.001</td>
<td>204</td>
<td>1.6</td>
</tr>
<tr>
<td>DERS Total</td>
<td>54.99</td>
<td>3.79</td>
<td>-18.6</td>
<td>.001</td>
<td>158</td>
<td>1.9</td>
</tr>
<tr>
<td>RRQ Rumination</td>
<td>20.48</td>
<td>2.46</td>
<td>-18.2</td>
<td>.001</td>
<td>168</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Note: Yoga group (N= 158), Non-yoga group (N=155), d=Cohen’s effect size

Differences between yoga and non-yoga practitioners

Yoga practitioners had lower levels of anxiety, depression, difficulties in emotion regulation, and rumination in comparison to the non-yoga practitioners. Furthermore, participants in the yoga group reported higher levels of general health and reflection in comparison to the non-yoga group (see table 4).

Table 4: Differences between yoga practitioners and non-yoga practitioners in anxiety, depression, difficulties in emotion regulation, general health, reflection, and rumination

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yoga practitioners</th>
<th>Non-yoga practitioners</th>
<th>t</th>
<th>p</th>
<th>df</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS Anxiety</td>
<td>4.12 (1.64)</td>
<td>9.87 (3.95)</td>
<td>-16.7</td>
<td>.001</td>
<td>205</td>
<td>1.9</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>2.46 (1.59)</td>
<td>7.41 (3.88)</td>
<td>-14.7</td>
<td>.001</td>
<td>204</td>
<td>1.6</td>
</tr>
<tr>
<td>DERS Total</td>
<td>54.99 (3.79)</td>
<td>104.4 (32.84)</td>
<td>-18.6</td>
<td>.001</td>
<td>158</td>
<td>1.9</td>
</tr>
<tr>
<td>RRQ Rumination</td>
<td>20.48 (2.46)</td>
<td>37.83 (11.64)</td>
<td>-18.2</td>
<td>.001</td>
<td>168</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Note: **Correlation is significant, p<0.01, N=313

Mediation analyses

The results from the mediation analysis showed that yoga experience had a statistical indirect effect on anxiety through difficulties in emotion regulation (aβ=-0.022, = p<.05). The variables yoga experience and difficulties in emotion regulation together explained 72.6% of the variance in anxiety. This indicates that individuals that have less yoga experience and higher levels of difficulties in emotion regulation also have higher levels of anxiety. Additionally, yoga experience explained 22.7% of the variance in emotion regulation.
Table 6. Regression results from mediation analysis of the effect of yoga experience on anxiety via emotion regulation

<table>
<thead>
<tr>
<th>Model</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model without mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE HAD-A</td>
<td>-0.023</td>
<td>0.003</td>
<td>0.00</td>
<td>-0.028</td>
<td>-0.017</td>
</tr>
<tr>
<td>$R^2$-x-y</td>
<td></td>
<td>0.175</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model with mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE DERS</td>
<td>-0.476</td>
<td>0.022</td>
<td>0.00</td>
<td>-0.256</td>
<td>-0.168</td>
</tr>
<tr>
<td>DERS HAD-A</td>
<td>0.104</td>
<td>0.004</td>
<td>0.00</td>
<td>0.096</td>
<td>0.112</td>
</tr>
<tr>
<td>YE HAD-A</td>
<td>-0.0009</td>
<td>0.002</td>
<td>0.628</td>
<td>-0.005</td>
<td>-0.003</td>
</tr>
<tr>
<td>Indirect effect</td>
<td>-0.022</td>
<td>0.003</td>
<td></td>
<td>-0.028</td>
<td>-0.018</td>
</tr>
<tr>
<td>$R^2$-m</td>
<td>0.227</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$-y</td>
<td>0.726</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: YE = Yoga experience, DERS = Total score of difficulties in emotion regulation scale, HAD-A = Anxiety subscale; x= YE, y=HAD-A, m= DERS

A second mediation model showed that yoga experience had a significant indirect effect on depression through difficulties in emotion regulation ($αβ=-0.018$, $p<.05$). Yoga experience and emotion regulation together explained 58.5% of the variance in depression. This means that individuals with less yoga experience and higher levels of difficulties in emotion regulation also have higher levels of depression. Furthermore, yoga experience explained 22.7% of the variance in emotion regulation.

Table 5. Regression results from mediation analysis of the effect of yoga experience on depression via emotion regulation

<table>
<thead>
<tr>
<th>Model</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model without mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE HAD-D</td>
<td>-0.02</td>
<td>0.003</td>
<td>0.00</td>
<td>-0.026</td>
<td>-0.015</td>
</tr>
<tr>
<td>$R^2$-x-y</td>
<td></td>
<td>0.162</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model with mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE DERS</td>
<td>-0.48</td>
<td>0.022</td>
<td>0.00</td>
<td>-0.255</td>
<td>-0.168</td>
</tr>
<tr>
<td>DERS HAD-D</td>
<td>0.74</td>
<td>0.004</td>
<td>0.00</td>
<td>0.074</td>
<td>0.093</td>
</tr>
<tr>
<td>YE HAD-D</td>
<td>-0.003</td>
<td>0.002</td>
<td>0.22</td>
<td>-0.006</td>
<td>0.002</td>
</tr>
<tr>
<td>Indirect effect</td>
<td>-0.018</td>
<td>0.002</td>
<td></td>
<td>-0.023</td>
<td>-0.014</td>
</tr>
<tr>
<td>$R^2$-m</td>
<td>0.227</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$-y</td>
<td>0.585</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: YE = Yoga experience, DERS = Total score of difficulties in emotion regulation scale, HAD-D = Depression subscale; x= YE, y=HAD-D, m= DERS
The results from another mediation analysis showed that yoga experience had a statistically significant indirect effect on anxiety via rumination (αβ = -0.021, p < .05). Yoga experience and rumination could together explain 74.2% of the variance in anxiety. This means that individuals with less yoga experience and higher levels of rumination, also had higher levels of anxiety. In addition, yoga experience explained 20.4% of the variance in rumination, which indicates that more yoga experience leads to lower rumination levels in this current study.

Table 7. Regression results from mediation analysis of the effect of yoga experience on anxiety via rumination

<table>
<thead>
<tr>
<th>Model without mediator</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YE  HAD-A</td>
<td>-0.023</td>
<td>.003</td>
<td>0.0</td>
<td>-0.028</td>
<td>-0.017</td>
</tr>
<tr>
<td>$R^2$-x-y</td>
<td>-0.175</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model with mediator</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YE  RRQ</td>
<td>-0.452</td>
<td>0.008</td>
<td>0.0</td>
<td>-0.087</td>
<td>-0.056</td>
</tr>
<tr>
<td>RRQ HAD-A</td>
<td>0.844</td>
<td>0.011</td>
<td>0.0</td>
<td>0.269</td>
<td>0.314</td>
</tr>
<tr>
<td>YE HAD-A</td>
<td>-0.002</td>
<td>0.002</td>
<td>0.255</td>
<td>-0.006</td>
<td>0.001</td>
</tr>
<tr>
<td>Indirect effect</td>
<td>-0.021</td>
<td>0.003</td>
<td></td>
<td>-0.027</td>
<td>-0.017</td>
</tr>
<tr>
<td>$R^2$-m</td>
<td>0.204</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$-y</td>
<td>0.742</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: YE = Yoga experience, DERS = Total score of difficulties in emotion regulation scale, HAD-A = Anxiety subscale; x= YE, y=HAD-A, m= RRQ

The last mediation model showed that yoga experience had a statistically significant indirect effect on depression via rumination (αβ = -0.016, p < .05). Yoga experience and rumination could together explain 54.2% of the variance in depression. This means that individuals with less yoga experience and higher levels of rumination also had higher levels of depression. Furthermore yoga experience explained 20.4% of the variance in rumination, which indicates that more yoga experience leads to lower rumination.

Table 8. Regression results from mediation analysis of the effect of yoga experience on depression via rumination

<table>
<thead>
<tr>
<th>Model without mediator</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YE  HAD-D</td>
<td>-0.0204</td>
<td>0.002</td>
<td>0.0</td>
<td>-0.026</td>
<td>-0.015</td>
</tr>
<tr>
<td>$R^2$-x-y</td>
<td>0.162</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model with mediator</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI 95%</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YE  RRQ</td>
<td>-0.45</td>
<td>0.008</td>
<td>0.0</td>
<td>-0.08</td>
<td>-0.06</td>
</tr>
<tr>
<td>RRQ HAD-D</td>
<td>0.69</td>
<td>0.014</td>
<td>0.0</td>
<td>0.19</td>
<td>0.25</td>
</tr>
<tr>
<td>YE HAD-D</td>
<td>-0.09</td>
<td>0.002</td>
<td>0.38</td>
<td>-0.0003</td>
<td>-0.08</td>
</tr>
</tbody>
</table>
Indirect effect                               -0.016             0.002                        -0.02               -0.01

\[ R^2 \]

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>0.204</th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td></td>
<td>0.542</td>
</tr>
</tbody>
</table>

Note: YE = Yoga experience, HAD-D = Depression subscale, RRQ = Rumination subscale; x= YE, y=HAD-D, m= RRQ

**Discussion**

The purpose of this current study was to examine if emotion regulation and rumination are possible mediators between yoga experience and anxiety, and depression respectively. The results from the mediation analyses indicated that both emotion regulation and rumination at a statistical significant level, mediated the relationship between yoga experience, and anxiety and depression respectively. These results indicates that participants with more yoga experience and lower levels of rumination and difficulties with emotion regulation, also had lower levels of anxiety and depression.

In this current study the results from the mediation analyses demonstrated indrects effects of yoga experience on anxiety and depression respectively, through rumination, rumination can therefore be a mechanism that explains why yoga practice reduces anxiety and depression. Earlier research have also suggested similarly that rumination could be an explanation of why yoga practice have demonstrated positive health effects (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). However it is still unclear why and how yoga practice have demonstrated positive health effects (Field, 2016).

According to the Buddhist Psychological Model (BPM), the main element that leads to symptom reduction and increased well-being is the effect of mindfulness practice in decreasing mental proliferation (Grabovac & Wilett, 2011). The mindfulness aspect of yoga practice, can perhaps help to explain how yoga reduces anxiety and depression levels through rumination, by decreasing mental proliferation. The BPM posits that the mind can easily be distracted by ruminative thought processes and this can be a key trigger to a chain reaction of thoughts (including emotions), and therefore attention needs to be refocused many times (Grabovac & Wilett, 2011). Furthermore, during this repeated refocusing through mindfulness practice, an attitude of acceptance prevents negative thoughts, such as self-judgement and resultant mental proliferation, from arising and prevents the practice itself from becoming a source of aversion (Grabovac & Wilett, 2011). Additionally, in qualitative research conducted after yoga interventions, participants have expressed that yoga have given them a coping strategy to stand up to repetitive negative thoughts and life stress, and another participant specifically expressed that through focusing on breath and body awareness in yoga, she learned how to break patterns of negative self-judgemental thinking (Kinser et al., 2013). These participants expressed experiences supports the possible given explanation of the mediating effect of rumination in the process of positive health effects in yoga practice. Schuver and Lewis (2016 have suggested that during yoga, the mindfulness aspect may decrease rumination by giving participants an opportunity to focus on alternative thoughts or sensations (i.e. breathing and physical poses). Earlier research is in line with this suggestion, Grabovac & Wilett (2011) proposes that if attention in mindfulness practice is sustained on a object of cognition, such as the breath, the BPM posits that this will prevent the awareness of any other objects in that moment, resulting in decreased mental proliferation.
Rumination is characterized by falling into a bottomless pit of reflection upon reflection (Van Woerkom, 2010), about negative emotions, with a focus on symptoms of distress and worrying about the meaning of this distress (Lyubomirsky, Cadwell, & Nolen-Hoeksema, 1998; Nolen-Hoeksema, 1991). It seems like mindfulness interrupts this process of negative reflection pattern, perhaps not by changing the content of the reflections, rather as proposed through the BPM, by allowing these sensory and mental events to arise and fall away, without subsequent cognitive processing arising from either attachment or aversion, and with an attitude of acceptance (Grabovac & Wilett, 2011). Furthermore, yoga practice has been proven to be uniquely effective in reducing rumination in both clinical and non-clinical populations (Campbell, Labelle, Bacon, Faris & Carlson, 2012; Jain, Shapiro & Swanick, 2007), and rumination has earlier been proposed as a mechanism underlying the positive health effects of yoga practice (Jain, Shapiro & Swanick, 2007; Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). This current study results are confirms and are in line with earlier results. Therefore the explanations that the BPM provides, such as decreased mental proliferation and thus prevention of negative thoughts (Grabovac & Wilett, 2011), for the effects of mindfulness practice, is also accurate for explaining why yoga experience mediated the relation between anxiety and depression respectively, through rumination in this current study.

If we look at yoga as a practice, it emphasizes on meditation, concentration and breath awareness as the central parts of practice, and through yoga practice individuals are encouraged to have a mindful and non-judgemental awareness to oneself and the environment, and an self-acceptance towards thoughts and emotions that arises both in practice and outside practice (Iyengar, 1976), mindfulness similarly have these elements (Kabat-Zinn, 1994). The author of this study suggests that elements in mindfulness and yoga practice counteracts with the elements in anxiety, depression and rumination processes. It seems like, through yoga practice individuals acquire different tools that give them a way to counteract with the symptoms of these psychological processes, such as feelings of guilt, worry, worthlessness, negative self-critical thinking, low self-esteem and repetitive sadness (NIMH, 2018; WHO, 2018; WHO, 2017; Smith & Alloy, 2009). Instead yoga practice promotes a sense of self-worth and a non-judgemental self-acceptance to oneself and the world around them (Iyengar, 1976). Earlier research supports this suggestion, and have also suggested that yoga practice may develop self-regulatory and coping skills, which leads to better psychological health (Menezes, Dalpiaz, Rossi, & De Oliveira, 2015; Kinser et al., 2013). These possible explanations may together provide a clearer perspective in how yoga practice leads to increased positive psychological health effects, in addition they could also explain the role of the identified mediator rumination in this current study.

Furthermore, the results of the mediation analyses demonstrated indirect effects of yoga experience on anxiety and depression respectively, through emotion regulation. Therefore emotion regulation can be a possible mechanism which further explains why and how yoga practice reduces anxiety and depression. The results demonstrates that individuals with more yoga experience and lower levels of difficulties with emotion regulation also had lower levels of anxiety and depression, in this current study.

Additionally, earlier research have also suggested emotion regulation as a possible mechanism in meditative and yoga interventions (Gard, Noggle, Park, Vago, & Wilson, 2014). Emotion regulation, similar to rumination, has been found to be a mediator in the relation between dispositional mindfulness and psychological distress and well-being (Coffey, Hartman, &
Fredrickson, 2010). Earlier studies have observed links between emotional dysregulation, and anxiety (Folk et. al., 2014), and depression (Crowell et al., 2014), which this current study’s results also indicates. Furthermore, depressed and anxious individuals have reported emotion regulatory difficulties such as identifying emotions and poorer understanding of emotions in earlier research (Rude & McCarthy, 2003; Tull, Stipelman, Salter-Pedneault, & Gratz, 2009; Menin, Heimberg, Turk, & Fresco, 2005). Therefore it may be useful to use the proposed integrative conceptualization of emotion regulation by Gratz and Roemer (2004), to explain why emotion regulation have been found to mediate the relation between yoga experience and psychological health (i.e. anxiety and depression) in this current study. This conceptualization of emotion regulation have some overlaps with the processes of mindfulness and yoga practice. Emotion regulation involves being accepting of one’s internal experience (in particular, emotions), as well as compassionate towards oneself when experiencing emotions (Gratz & Tull, 2010), which is also central in mindfulness practice (Kabat-Zinn, 1994) and in yoga practice (Iyengar, 1976). In addition, both mindfulness and emotion regulation emphasize on observing and describing emotions, as well as participating in present moment activities even in the context of distress (Gratz & Tull, 2010). Therefore, parts of the conceptualization of emotion regulation (Gratz & Roemer, 2004) such as; a) awareness and understanding of emotions, and b) acceptance of emotions, and c) ability to control impulsive behaviours and behave in accordance with desired goals when experiencing negative emotions, may provide help in explaining how meditative practices (i.e, mindfulness and yoga) leads to an increase in emotional regulation skills. Other studies have similarly suggested that treatments that emphasize on mindfulness and acceptance should in theory also facilitate more adaptive emotion regulation (Gratz & Tull, 2010). This can potentially explain why emotion regulation mediates the relation between yoga experience and anxiety, and depression respectively, and that yoga may lead to more adaptive emotion regulation.

Yoga practice have shown to increase emotion regulation (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2012; Daly, Haden, Hagins, Papuchis, & Ramirez, 2015), emotional well-being (Meissner, Cantell, Steiner, & Sanchez, 2016), and proven to be beneficial in fostering healthier psychological responses (Menezes et. al., 2015). As the earlier explanation for the mediation analysis on rumination, one of the coping tools that may derive from yoga practice may be of an emotional regulatory aspect. Yoga practice may lead to more emotional health benefits such as healthier psychological responses to emotions and thoughts, and a coping strategy to deal with negative emotions and a increased mindful awareness to thoughts and emotions. Earlier research (Gard et al., 2012) have proposed similar views, components in yoga practice is thought to facilitate self-regulation of emotions and thoughts, and further lead to increased psychological health and utilization of coping strategies. In addition the element of acceptance in mindfulness and yoga practice might improve emotion regulation by functioning as an antagonist of supression and rumination (Menezes et. al., 2015).

The BPM can also provide some explanation, mindfulness practice may help individuals to decrease attachment and aversion to their emotions, which means that emotions are allowed to naturally arise and fall away, without subsequent cognitive processing (Grabovac & Wilett, 2011). In addition, if there is no attachment, aversion, and thus no mental proliferation, adventitious suffering is not experienced (Grabovac & Wilett, 2011). This process can further lead to symptom reduction and increased well-being (Grabovac & Wilett, 2011). Earlier research have highlighted the importance of targeting emotion regulation difficulties within mindfulness- and acceptance
Based interventions (Gratz & Tull, 2010), the results and explanations of this present study also supports that notion.

Furthermore, in this current study the yoga practitioners who had longer yoga experience had less anxiety, depression, rumination, and difficulties with emotion regulation. Gaiswinkler och Underrainer (2016) says that yoga can have influence on all parts of the individuals life, depending on how involved the yoga practitioner is in her/his practice. The effect that yoga may have on the subject well-being of the individual therefore depends on to which degree the individual is involved in the yoga practice (Gaiswinkler & Underrainer, 2016). When yoga is regularly practiced during a longer time it becomes a continuously part of the individuals life, which promotes health. There is also growing evidence for the positive effects of subjective well-being through yoga practice, this have been proven and explained by neural correlates in the brain (Gaiswinkler & Unterrainer, 2016). Yoo et al. (2016) also have support in their research of techniques such as changing maladaptive thinking and emotion regulation in meditation could help to promote permanent structural changes in the brain, and in that way reducing the relapse risk for depressed individuals.

In this current study many of the practitioners in the yoga group had long yoga experience, ranging from 7 months to 30 years of experience, with a mean value of 4 years. During this long involvement in yoga, the yoga practice may have had an effect on the brain's neural processes (Gaiswinkler & Unterrainer, 2016), changed their maladaptive thinking (Yoo et al., 2016), created a deeper commitment from the individual and made yoga a lifestyle for them (Gaiswinkler & Unterrainer, 2016) and furthermore may have contributed to the lower levels of anxiety, depression, and difficulties with emotion regulation amongst the yoga practitioners.

In sum, as mentioned in the beginning of this study, yoga research have been limited in providing sufficient answers for how and why yoga practice have demonstrated positive health effects (Daly, Haden, Hagins, Papuchis, & Ramirez, 2015; Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005). However, several suggestions have been proposed for the explanation of the mediating effects (i.e. indirect effects) of rumination and emotion regulation in this current study. Both rumination and emotion regulation are complex constructs (Smith & Alloy, 2009; Gratz & Tull, 2010), however they both seem to be of importance in understanding the process in which individuals may acquire positive health effects after practising yoga.

Limitations

I wish to emphasize and remind the reader that this study's results should be taken in with caution. Non-yoga practitioners showed very high values of anxiety and depression (see table 1). In the non-yoga group nearly 78% of the participants reported anxiety symptoms and for depression it was 54% according to the subscale limits of HAD scale. Compared to the yoga groups values, 8.2% anxiety and 1.3% depression, these extreme differences stand out and may indicate that some of the participants had clinical issues. Since the participants of this study was supposed derive from a non-clinical population this might be seen as problematic and a limitation, these numbers demonstrate that several participants may have anxiety and depression symptoms, perhaps even disorders. The participants were derived from a convenience sampling (Breakwell, Smith & Wright, 2012), in a yoga and non-yoga population in India spread across eight different cities. The current author believes that this aspect can increase the generalizability of the results since the participants were collected from four cities located in the north, three in the south and one city in the western
part of India. However, the non-yoga group were mostly derived from areas in India were poverty exists and some families also have difficulty with electricity and clean water, which may have lead to the high levels of anxiety and depression levels, since poverty does increase the risk of getting these conditions (WHO, 2017). Therefore there are several other factors that may have contributed to these results. This study is has a cross sectional design which is considered a limitation for several reasons, the data is only collected once in a specific period of time and there is no repeated measuring so therefore should be referenced to with caution. In addition, since the actual study do not have a experimental design, no conclusions can be drawn related to causality which is also a limitation.

Lastly, the language and cultural barrier could have lead to some misunderstandings regarding the questionnaire, but since the author (and in some cases a translator) was available at all time this risk was considered relatively small.

Implications

Anxiety and depression have a high comorbidity (Kessler et al., 1996; Moras et al., 1996; and WHO, 2017), and these conditions are rising not only in India (The Hindu, 2017), but also globally (WHO, 2017). Yoga practice have shown to decrease both anxiety (Hofmann et al., 2016) and depression (Pilkington, Kirkwood, Rampes, & Richardson, 2005) in earlier research. In addition emotion dysregulation and rumination seems to be a part of these two conditions (Tull, Stipelman, Salters-pedneault, & Gratz, 2009; Vujanovic, Zvolensky, & Bernstein, 2008; Nolen-Hoeksema, 2000). Still little is known about how and what it is in yoga practice that leads to these effects, however the current results of this study provides more information about how individuals may acquire the positive effects of yoga practice. In this current study emotion regulation and rumination mediated the effects between yoga experience and anxiety, and depression respectively, which means that more yoga experience leads to lower levels of difficulties with emotion regulation and rumination. These results can potentially bring further knowledge for countries (and individuals) that have higher levels of anxiety and depression in their populations, such as India, by providing a alternative perspective in the treatment and prevention of these conditions. Yoga is a comprehensive and open exercise form and it is cost-effective, which also means it is available for many people. Yoga practice should therefore be considered as a option when discussing treatment of individuals with anxiety, depression and rumination symptoms or difficulties with emotion regulation. Furthermore, based on the current results and earlier studies, treatments should include mindfulness and acceptance-based perspectives to facilitate adaptive emotion regulation. Yoga practice also have the potential to help these types of individuals in form of a coping strategy to deal with regular life stress, break negative self-critical thought patterns, regulate negative emotions and increase self-acceptance. Health institutions such as hospitals could also benefit from these results (i.e. the two mediators emotion regulation and rumination), by considering alternative treatments for anxiety and depression that specifically increases and promotes emotion regulation skills and self-acceptance, such as yoga practice. The two mediators rumination and emotion regulation have similar qualities, both constructs affect our cognitive, emotional and psychological health (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Folk et. al., 2014; Crowell et. al., 2014). It seems like that the effects an individual acquires after practicing yoga are many and rather complex to comprehend, but rumination and emotion regulation seems to be a important part in understanding the process in which individuals may acquire positive health effects after practising yoga. Still little is known about effects of yoga practice, therefore it is a matter of concern for
psychosomatic research to find out more about the functional mechanisms of alternative methods such as yoga (Gaiswinkler & Unterrainer, 2010).

**Future research**

Both emotion regulation and rumination in relation to yoga, are two areas were little research has been conducted. Since the constructs of rumination and emotion regulation seem to be of importance in relation to effects of yoga practice, these fields should be explored further. Future research should perhaps study the specific effects of yoga practice on emotion regulation and rumination through experimental intervention studies. These two constructs are two possible mechanisms in which yoga practice may affect individuals, and by conducting more research it may clarify their role in the process. Studies on anxiety, depression and yoga are still inconclusive, therefore a suggestion is to conduct a experimental study with a longitudinal design and a yoga intervention. With such a design you can examine effects of yoga practice on depression and anxiety, and at the same time also examine two of the possible mechanisms in yoga, emotion regulation respectively rumination. Yoga and depression is a well researched area, but most studies have involved participants with Major Depression Disorder (MDD), therefore it may be beneficial to look at effects of yoga practice on mild and moderate depression symptoms. The author of this current study would like to emphasize the potential benefit of studying psychological health in a non clinical population, since these current studies findings indicated that individuals suffering from anxiety and depression disorders are more common in society than statistics shows.

**Conclusion**

The findings in this current study support the earlier notion that yoga practice may lead to better psychological health and emotion regulation. The main results of the study indicated that rumination and emotion regulation mediated the relation between yoga experience, and anxiety and depression respectively. This indicates that emotion regulation and rumination are possible mechanisms which may help to explain how and why yoga practice is related to positive health effects and are two important constructs to consider in future research in the field of yoga. Earlier studies have also suggested emotion regulation and rumination as possible mechanisms in yoga practice (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013; Menezes, Dalpiaz, Rossi, & De Oliveiras, 2015). Furthermore, the results of this study confirms earlier research, yoga practice may lead to increased positive health effects, by reducing ruminative thought patterns through reducing mental proliferation (Grabovac & Wilett, 2010), and through providing a coping strategy to cope with negative emotions (Gard et al., 2012). In addition, the results support the notion that meditative practices that include mindfulness and acceptance (i.e. yoga practice), might lead to increased awareness and acceptance towards thoughts and emotions that arise (Gratz & Tull, 2010).

In addition, the author would like to emphasize that since anxiety usually involves fears and worries of the future and depression involves depressive and ruminative thought processes of the past, yoga may be a good method to keep individuals mindfully aware of the present with a non judgemental self-attitude towards thoughts and emotions, which may lead to increased psychological health.
References


and increasing access. Biol Psychiatry; 52:610 – 630


The Hindu (2017) *India is facing a possible mental health epidemic says president.*


Appendix A

Exercise habits and general health - a quantitative study

Hi there! My name is Hanna, and I’m a student at Halmstad University and i’ll be writing my bachelor’s thesis in India about health, exercise and yoga. I appreciate you for taking your time to read this!

As a participant you will be asked to answer questions about your exercise habits and health status. This is voluntary and you have the right to end your participation at any time before during and after you’ve answered the questions, without giving an explanation. The ethical principles of conducting research applies to this study. The data collected will only be used in research purposes and statistical analysis for my essay, and of course treated with the highest confidentiality. You remain anonymous throughout the study and will not at any point be asked to leave personal information like your name or anything that can be traced back to you. The only people that will have access to the questionnaire is me and my supervisor, and after the study ends the data collecting will be destroyed through a careful process. The main purpose of this study is to gather data of regular indian people and their health habits.

Answering the questions will only take 10-15 minutes of your time and by signing below and answering the questions you approve your participation in this study. I will be present if you have any questions while you're writing your answers.

Thank you for your participation and time!

Sign here: ________________________________

For further questions about the study or other concerns your welcome to contact me or my supervisor at any time, contact information to us is written below. Thank you!

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