Traumatic experiences and the human body:
A review of the evidence for yoga based treatments
Abstract

Estimates suggest that as many as 80% of individuals will experience some type of traumatic event over his or her lifespan (Breslau, 2009) and that up to 9% may develop Post-Traumatic Stress Disorder (PTSD) following the event (American Psychiatric Association, 2013). Given the psycho-physiological nature of PTSD and its symptoms, increased attention is being called to the potential healing effects of a regular yoga practice post-trauma exposure. The current paper (1) outlines the physiological effects of trauma on the human body; (2) reviews non-empirical claims/theories related to how yoga might benefit individuals who have experienced trauma; (3) presents empirical research findings with respect to the treatment effects of yoga as practiced by trauma survivors; (4) highlights evidence of the relational effects of trauma, particularly as seen in intimate partnerships and parent-child relationships; (5) discusses the potential treatment applicability of relational forms of yoga with couples and families affected by trauma.

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Every day, thousands of individuals are exposed to traumatic events ranging from child abuse, sexual abuse, intimate partner violence, assault, war, armed conflict, terrorism and natural disasters (Brown, 2007). According to Breslau (2009), up to 80% of individuals will experience some type of traumatic event over the lifespan, however, the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders suggests up to a 9% chance that a traumatic experience will be followed by Post-Traumatic Stress Disorder (PTSD) (American Psychiatric Association, 2013). Symptoms of PTSD include psychological and physiological experiences associated with re-experiencing the traumatic event (awake and/or during sleep), negative changes in cognition and mood and chronic increased physiological arousal (American Psychiatric Association, 2013). Additional symptoms of PTSD include the avoidance of stimuli associated with the trauma and emotional numbing, both of which have been linked to attempts to compensate for the chronic hyperarousal (Litz & Keane, 1989).

Despite physiological symptoms associated with PTSD and general exposure to trauma, traditional treatments address only the psychological symptoms (Ogden, Minton & Paine, 2006; van der Kolk, 1994). Although several books have been published within the past decade suggesting alternatives, these somatically based treatments have not been empirically validated. Within the past few years, however, empirical research investigating potential benefits of yoga for individuals who have experienced trauma has been published (e.g., van der Kolk, 2014). Yoga, an ancient practice that can take on mental and physical forms, is aimed at strengthening the connection between the body and the mind. This connection is said to foster a heightened ability to stay grounded in the present moment experience (Feuerstein, 2008; Farhi, 2000), which can often be difficult for survivors of trauma to do (Emerson & Hopper, 2011; Ogden et al., 2006).

The aims of this paper are fivefold. First, the physiological effects of traumatic experiences on the human body are outlined; Second, non-empirical claims and theories related to yoga and how the practice might benefit individuals who have experienced trauma are reviewed; Third, findings from empirical research studies investigating the treatment affects of yoga as practiced by trauma survivors are presented; Fourth, evidence of the relational effects of trauma, particularly as seen in intimate partnerships and parent-child relationships are highlighted; Fifth, the potential treatment applicability of relational forms of yoga with couples and families affected by trauma is discussed. Future directions and limitations of the evidence base and the current paper are also offered.

Physiological Effects of Trauma

Somatic Encoding

Since the beginnings of research investigating the human response to traumatic experiences, researchers have suggested that psychologically expressed symptoms have physiological underpinnings (van der Kolk, 1994). As early as 1889, it was argued that an event is experienced as traumatic when intense emotional reactions interfere with somatic encoding, such that the event becomes dissociated from consciousness and stored as emotional sensations and visual images (Janet, 1889, as cited in van der Kolk, 1994). This theory provided an explanation for both the anxiety and panic associated with the recall of a traumatic experience as well as the visual flashbacks during wake time and nightmares during sleep time. We now know this experience as “speechless terror” – when the emotional impact of an event is so great we are rendered incapable of capturing it with words or symbols.

Since Janet’s original proposal, his ideas have been further developed to suggest that traumatic experiences have such powerful effects on the human body because the memories are stored somatically (van der Kolk, 1994). According to van der Kolk and van der Hart (1991), trauma interferes with
declarative memory only – a type of long-term memory associated with facts, learned knowledge and events that can be actively and consciously recalled. This suggests that although conscious recall of the traumatic experience may not be possible, conditioned emotional responses, skills and habits and sensorimotor sensations related to the experience may be very much present. This phenomenon, driven by implicit memory, partially explains the observation that traumatic experiences seem to be timeless; that is, sensory experiences and visual images related to the event do not seem to fade with age (Janet, 1889, as cited in van der Kolk, 1994). Although beyond the scope of this paper, van der Kolk and van der Hart (1991) suggest the other part of the explanation may lie in excess secretions of neurohormones at the time of the trauma, leading memories of the event to become over-consolidated. Regardless of the mechanism, for those who have experienced a traumatic event, the trauma itself can be experienced as never-ending, giving rise to a sense of powerlessness within the individual (Herman, 1992).

Somatic encoding of trauma has been associated with various physiological experiences following a traumatic event. This ranges from hormonal and neurohormonal changes within the body (van der Kolk, 1994) to greater incidences of physical illness and even higher death rates (Emerson & Hopper, 2011). In no way negating the importance of these findings, only findings related to patterns of breath, Heart Rate Variability (HRV) and arousal dysregulation will be outlined here, given the focus of this particular paper.

Patterns of Breath

The oscillation of breathing is the perfect mirror of the fluctuations of life. Life is like a swinging pendulum, some changes bringing with them difficulties and pain, and other changes bringing with them ease and joy. If we are open to this process, life will move us. If we are unable to integrate life’s changes, we begin to resist by restricting our breath. When we hold the breath and try to control life or stop changes from happening, we are saying that we do not want to be moved. In those moments, our desire for certainty has become much stronger than our desire to be dynamically alive. (Farhi, 2000, p. 30).

Inhalations, exhalations and the pauses in between are essential to life. Through this process of breathing, oxygen is provided to the cells and tissues of the body while carbon dioxide is removed (Stephens, 2010). On average, humans take between 12 to 15 breaths per minute and muscles in the diaphragm account for approximately 75% of respiratory effort (Stephens, 2010). With this said, research has shown that the breath is influenced just as much by one’s psychological and emotional state as it is by the physical condition of one’s body and vice versa. Consider the following example: when an individual is feeling depressed, anxious, flighty or lethargic, he or she will tend to over-recruit secondary/accessory respiratory muscles instead of those in the diaphragm when breathing. In terms of oxygen delivery, this breath is just not as efficient as a diaphragm driven breath and eventually, it will lead to over-exertion and sore muscles (Kaminoff, 2007; Stephens, 2010). Contrarily, the breath has been said to influence all other human processes, including one’s physical, psychological and emotional states. Farhi (2000) has gone as far as saying that if our breath is restricted or distorted, so shall be our consciousness. One interpretation of this example is that the breath is as unique as the individual who breathes it (Stephens, 2010), however, it seems clear that some patterns of breath are more efficient than others.

The quotation at the beginning of this section is that of Donna Farhi, a yoga guru with over thirty-five years experience teaching and practicing yoga (Farhi, 2013). It was taken from a book she wrote with the intent of facilitating an understanding of how the mind-body connection can be fostered through the practice of yoga (Farhi, 2000). Although Farhi is not an academic, her words echo much of the empirical knowledge we have with respect to individuals who have experienced trauma and their relationship with their breath. These individuals have been found to have shallow and holding patterns of breath as oppose to deep, rhythmical inhalations and exhalations with even pauses in between (Ogden et al., 2006). As Farhi (2000) suggests, shallow breathing and breath holding can lead to states of tension, deregulation and
discomfort (Frewen & Lanius, 2006; Ogden et al., 2006; Siegel, 1999). Furthermore, these patterns of
breath can lead individuals to have less control over physiological responses, especially as related to
emotion (Frewen & Lanius, 2006; Ogden et al., 2006; Siegel, 1999).

Heart Rate Variability

Heart Rate Variability (HRV) is the capacity of our inhalations and exhalations to produce
rhythmic variations in our heart rate. The higher an individual’s HRV, the more rhythmic the heart
rate variations; the lower an individual’s HRV, the less rhythmic the heart rate variations (Emerson &
Hopper, 2011). Research has linked HRV with many physiological and psychological experiences and
has generally concluded that higher HRV is far superior to lower HRV. As compared to high HRV, low
HRV has been linked to increased rates of various physical illnesses and higher mortality rates (Dekker,
Schouten, Klootwijk, Pool, Sweeney & Kronhout, 1997); diminished capacity for attention (Porges 1992,
as cited in McCrategy, Atkinson, Tomasino & Stuppy, 2001); lower levels of emotional regulation and
greater impulsivity (Porges, 1991, as cited in McCrategy et al., 2001); and inhibited ability to modulate
emotional, behavioural, and physiological responses in the face of a changing environment (McCrategy et
al., 2001; Rechlin, Weis, M., Spitzer, A., & Kaschka, 1994). High HRV, on the other hand, has been
linked to greater resistance to stress (Porges, Doussard-Roosevelt, Portales & Greenspan, 1996). When
considering the physiological effects of exposure to trauma, HRV is an important factor, as research has
demonstrated that individuals who have survived one or more traumatic event have below average HRV.
This suggests that individuals suffering the aftereffects of trauma are at increased risk for all of the
physiological and psychological experiences associated with it (van der Kolk, 2006).

Arousal Dysregulation

Fluctuation between hyper and hypoaudal of the autonomic nervous system is considered a
defining characteristic of individuals who have experienced trauma (Ogden et al., 2006). According to
Ogden et al. (2006), although these extreme states of over and under arousal can be adaptive in the face of
traumatic events, on a day-to-day basis they are not so useful. In both these states, information cannot be
processed effectively, though the resulting experiences are quite disparate. When hyperaroused, incoming
information leads to sensory overwhelm, anxiety and even states of panic (Siegel, 1999); when
hypoaroused, a sense of numbness, emptiness and even paralysis can prevail (Bremner & Brett, 1997;

Siegel (1999) describes the states of arousal in between these two extremes as the “window of
tolerance” or in other words, one’s threshold to stay within an optimal zone of arousal where information
can be processed. Individuals who have experienced traumatic events have been found to have a very
limited window of tolerance for emotional, cognitive and somatic arousal (Siegel, 1999). This means that
even moderate emotional or physiological stimulation can activate traumatic memories, anxiety or states of
panic (Siegel, 1999). Alternatively, when these fight or flight responses associated with hyperarousal are unsuccessful in bringing perceived safety, numbness and dissociation can follow (Ogden et al., 2006).
This misinterpretation of innocuous environmental cues as dangerous explains the tendency among
individuals who have been exposed to trauma to move in and out of hyper and hypoaudal states quite
quickly (Ogden et al., 2006). Short term, these fluctuations can lead to difficulties with emotion
regulation and appear to the outsider as extreme moodiness- defensive one minute and completely
disengaged the next (Ogden et al., 2006). Long term, these fluctuations can impair one’s ability to make
adaptive decisions, as engagement in emotion-oriented meaning making processes becomes hindered
giving rise to an inability to trust in the sensations of the body (Ogden et al., 2006).

Trauma and Treatment

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Despite the vast array of physiological responses to trauma, widely accepted and highly researched trauma treatments such as pharmacotherapy, cognitive behaviour therapy, dialectical behaviour therapy, exposure therapy and eye movement desensitization and reprocessing therapy target only the psychological symptoms of trauma (for meta-analyses, see Bradley, Greene, Russ, Dutra & Westen, 2005; Van Etten & Taylor, 1998; Watts et al., 2013). Furthermore, a recent meta-analysis investigating the efficacy of these therapies in treating PTSD found that not only did an average of 25% to 30% of individuals drop out of treatment before completion, 45% remained symptomatic even after treatment completion (Van Etten & Taylor, 1998) and over 60% who initially improved relapsed within six months (Bradley et al., 2005). These results speak to the importance of continued exploration of potential treatment options for individuals struggling with symptoms associated with exposure to trauma (Emerson, Sharma, Chaudhry & Turner, 2009).

As this exploration continues, many experts working within the field of PTSD and trauma now recognize that the most effective treatments likely incorporate at least some work with the physical body, also referred to as “body work” or “somatic work” (Ogden et al., 2006; Ogden & Minton, 2000; van der Kolk, 1994). Within the last decade, several books offering alternative or adjunctive trauma treatments incorporating somatic work have been published. In 2006, Ogden et al. published about a trauma focused sensorimotor approach to psychotherapy; in 2008, Levine published about healing trauma through a pioneering program for restoring the body’s wisdom; in 2011, Emerson and Hopper published about reclaiming the body and overcoming trauma through yoga; in 2012, Heller and LaPierre published The NeuroAffective Relational Model for restoring connection post-trauma. Although these books serve as inspirational reading material, an unfortunate reality is that it has proven difficult for researchers to secure funds to empirically study treatments such as these. In a recent interview with The Boston Globe, van der Kolk (2014) attributed this to the dominance of the large drug companies and pharmacological treatments. Whatever the reason, the result is a limited number of published, empirical research studies investigating the efficacy of these treatments.

Although the power of the pharmaceutical industry cannot be denied, research recently funded by The National Institutes of Health holds promise that the future of trauma treatment could be changing. Bessel van der Kolk, a major proponent of somatic and mindfulness based approaches to treating trauma, is the first to receive funds to investigate the validity of age-old claims about the healing properties of yoga, specifically as related to individuals who have suffered the effects of trauma (van der Kolk, 2014). The remainder of this paper will outline the non-empirical foundation for this research, as well as explore empirical evidence available to date regarding the physiological and psychological benefits of practicing yoga. Interpersonal aspects of trauma will also be highlighted, with particular attention given to how future treatments for trauma might incorporate this.

**Yoga and the Mind-Body Connection**

The word yoga is etymologically derived from the Sanskrit root “yuji”, which means to “bind together” or “to yoke” and refers to the goal of the practice of yoga; that is, to unite the body and mind, fostering a “mind-body connection” (Feuerstein, 2008). According to Farhi (2000), yoga is “a way of remembering our true nature, which is essentially joyful and peaceful… a process of deconstructing all the barriers we may have erected that prevent us from having an authentic connection with ourselves and with the world” (p. 5). Emerson and Hopper (2011) take this definition one step further, suggesting that yoga is an ancient system originally developed to address human suffering via the connection between the mind and the body. Given (1) the link between psychological and physiological symptoms experienced by individuals who have experienced trauma and (2) the various definitions of yoga, it seems logical that a regular yoga practice may have many benefits to offer these individuals.

**Yoga as a Treatment for Trauma: Non-Empirical Literature**
Learning to listen to the breath and the body. According to those who write about the practice of yoga, the link between the mind and the body is found within the breath (Clennell, Clennell & Kushida, 2009; Farhi, 2000). Although breathing typically happens naturally, involuntarily and unconsciously (Stephens, 2010), with practice one can learn to manipulate and control their breath on a highly conscious level (Farhi, 2000). In yoga, practitioners are taught, first, to listen to their breath; that is, use their inhaled and exhaled breath as cues to the physiological and psychological experience they are having as they hold and move from one physical posture to the next. Once this skill has been learned, practitioners can begin developing the skill of breath control; that is, controlling the breath in a way that controls the physiological and psychological experience one is having (Clennell, Clennell & Kushida, 2009; Emerson & Hopper, 2011).

In practicing breath control, it has been suggested that deep, rhythmical breathing is one way to facilitate feelings of comfort in body and mind, even during uncomfortable physiological and psychological experiences (Clennell, Clennell & Kushida, 2009; Emerson & Hopper, 2011). It has also been suggested that in learning to listen to breath and body, individuals are able to establish a healthy threshold for the level of arousal one can comfortably tolerate (Farhi, 2000; Stephens, 2010; van der Kolk, 2006). For example, where pushing through physical and emotional pain can lead to hyperarousal or dissociation, yoga teaches recognition of experience via breath, and honouring of experience via practice modification; easing out of postures when signs of discomfort present themselves and going deeper when the threshold for arousal allows it (Farhi, 2000; Stephens, 2010; van der Kolk, 2006). Not only is this said to foster a gentle and tolerant connection with the body, this skill is also said to give rise to an internal sense of safety, personal agency, and an increase in the capacity for self-awareness and self-regulation (Farhi, 2000; Stevens, 2010).

Practicing present moment awareness. Traumatic events from the past can be experienced as ongoing and never-ending (Emerson & Hopper, 2011). As noted above, this can lead individuals to develop the tendency to panic or dissociate in the face of discomfort and/or when feeling overwhelmed (Ogden et al., 2006; Siegel, 1999). Although both responses carry protective intentions, they can be equally distressing when they occur without conscious intention (Frewen & Lanius, 2006). One argument that has stemmed from this response pattern is that treatments for trauma should have the goal of helping individuals live in the present, rather than feel or behave according to memories of the past (van der Kolk, 1994).

The practice of yoga places a particular emphasis on present experience. Farhi (2000) describes yoga as a technology for present moment awareness and Stephens (2010) notes that yoga constantly reminds us to stay present. Yoga fosters present moment awareness primarily through (1) coming back to/reconnecting with the breath; (2) checking-in with the body; (3) grounding down; (4) recognizing the present moment for the present moment (Emerson & Hopper, 2011; Farhi, 2000; Stephens, 2010). In terms of attending to the present moment through the breath and the body, continuous physiological check-ins during physical postures can provide cues to one’s psychological experience. This allows for stronger mind-body connections to be created, which in turn, allows for a better sense of self from moment to moment (Farhi, 2000; Stephens, 2010). Similarly, “grounding down” – intentionally pressing and rooting one’s feet into the yoga mat or floor – while practicing standing yoga postures can increase feelings of being grounded and connected to the earth. With practice, this can be a useful strategy for remaining in the present moment, even when faced with the risk of panic or dissociation (Emerson & Hopper, 2011). Finally, recognizing the present moment for what it is can remind individuals that experience will inevitably differ moment to moment and that no experience is unremitting. One example how this reminder can be provided through yoga is the “countdown technique”. By counting down the number of moments a particular posture will be held for, instructors reassure practitioners that the present moment experience will indeed end (Emerson & Hopper, 2011).
**Restoring a sense of control.** Following traumatic experiences, affected individuals often limit their choices in life by avoiding certain feelings, people, situations and places (Levine, 2008). According to Herman (1992), the guiding principle of recovery after trauma is restoring a sense of power and control within the survivor. One of the best lessons yoga offers to those who practice it is that every individual has the power of choice and, should this power be embraced, it allows for control over experience (Emerson & Hopper, 2011). Through the practice of physical postures and present moment awareness, individuals realize their power to choose the posture they wish to be in as well as control the level of intensity experienced within that posture by modifying until the desired level is achieved (Emerson & Hopper, 2011). Although it can take time, with patience and repetition yoga can foster an internal sense of safety, personal agency, and ability to make choices by increasing the capacity for self-awareness, self-regulation, and emotional control (Emerson & Hopper, 2011; Feuerstein, 2008).

**Yoga as a Treatment for Trauma: Empirical Evidence Base**

Several empirical studies supporting the benefits of yoga as related to mental health struggles have been published within the past decade. In particular, studies investigating the effects of yoga intervention programs on symptoms of depression and anxiety are common (for respective systematic reviews, see Cramer, Lauche, Langhorst, & Dobos, 2013; Li & Goldsmith, 2012). Given the specific focus of this paper, the empirical literature review that follows is limited to research investigating the impact of yoga on physiological and psychological symptoms of post-traumatic stress.

**Yoga and physiological symptoms of post-traumatic stress.** Empirical studies measuring human physiological response can often require complex and expensive equipment. Perhaps because of this, a relatively limited number of peer-reviewed publications measuring physiological responses to yoga exist. The publications that are available, however, outline promising findings with respect to effects of yoga on symptoms of trauma. Two of these studies investigated the physiological effects of one-week yoga programs implemented with survivors of natural disasters. The first, Telles, Naveen and Dash (2007) found the program to lead to a significant decrease in breath rate among survivors of the Indian Ocean Tsunami, all of whom met criteria for PTSD. Researchers suggested the findings were potentially representative of decreased psychophysiological arousal in those individuals with PTSD (Telles et al., 2007). The second study, however, found the program to have no significant impact on HRV in survivors of the Bihar flood (Telles, Singh, Joshi & Balkrishna, 2010). One potential limitation of this study is that a daily 60-minute yoga practice may need to be implemented for longer than one week before significant differences in HRV could be measured. The small sample size in this study also decreased the power available to detect significant differences between the control and yoga groups (Telles et al., 2010).

On the other hand, Van der Kolk (2006) reported a significant increase in HRV over eight sessions of yoga in a control group of only 11 individuals, suggesting that a daily yoga practice can lead to changes in HRV quite quickly, at least for individuals without PTSD. With this said, individuals with PTSD had “muscular and vascular concomitants” (p. 286) that seemed to interfere with HRV measurements (van der Kolk, 2006). In a final study of the physiological effects of yoga on individuals with PTSD found a one week, 21 hour yoga intensive intervention to reduce the respiration rate and physiological hyperarousal symptoms (as measured by eye-blink startle test) of male military veterans with PTSD immediately following, one-month following, and one-year following the intervention (Seppala et al., 2014). The long follow-up in this study is unique and suggests long-lasting physiological results after an intensive yoga program; however, the veterans who took part were not representative of the demographic diversity found within the military population (Seppala et al., 2014).

Two additional studies have empirically investigated the physiological effects of yoga, specifically during savasana – the final supine resting posture ending the majority of yoga classes – which emphasizes present moment awareness of body and breath (Farhi, 2000; Stevens, 2010). In a study comparing the physiological restorative effects of three resting postures after induced physiological...
distress found savasana to be associated with a significantly quicker reduction in heart rate and blood pressure than sitting in a chair or lying down (Bera, Gore & Oak, 1998). Results of another study investigating the effects of savasana showed reductions in heart and respiratory rates as well as in blood pressure after thirty minutes in the posture (Sukhsohale, Phatak, Sukhsohale & Agrawal, 2000). Suggestions as to why savasana might lead to a different physiological state than lying down centre around the elements of the posture that lead to a state of deep relaxation (Bera et al., 1998). With the eyes closed, the attention turned inward, and an intentional focus on the body and the breath the fight or flight response so often activated in individuals with PTSD (Ogden et al., 2006) may have a chance to be reversed, at least temporarily (Bera et al., 1998).

**Yoga and psychological symptoms of posttraumatic stress.** The availability of empirical studies investigating the effects of yoga on self-reported physiological and psychological symptoms of PTSD is more robust than those including actual physiological measures. Although the reliability and validity of self-report measures has been subject to questioning, self-report methods allow room for the valuable insight that can be found in qualitative data. With respect to this topic, the populations included within self-report studies are also more diverse, though all of these studies have small sample sizes. In one of these studies, Stoller, Greuel, Cimini, Fowler and Koomar (2012) investigated the effects of a 75-minute yoga program on PTSD symptomatology in female and male military personnel over the course of three weeks. Results indicated that, as compared to those in a non-treatment control group, individuals participating in the yoga program experienced a greater decrease in state and trait anxiety scores. Individuals in the yoga program also experienced greater improvement on 16 of 18 Quality of Life Survey items, many of which are associated with symptoms of PTSD, such as avoidance of socializing, difficulty sleeping, distressing dreams, intrusive thoughts or images and feelings of constantly being on guard or having to watch one’s back (Stoller et al., 2012). Beyond the small sample size, limitations of this study include lack of data on deployment length of the personnel as well as level of combat exposure and potential ongoing combat exposure throughout the study. In addition, participants in the treatment group were required to attend at least two yoga classes per week out of the seven offered and a total of at least nine classes over the three-week study period; however, the study did not distinguish between those who completed more versus fewer classes (Stoller et al., 2012). In a similar study offering military veterans with PTSD 12 yoga sessions over a six-week period, veterans reported decreased hyperarousal symptoms, improved overall sleep quality and decreased daytime dysfunction due to poor sleep quality (Staples, Hamilton & Uddo, 2013). Again, limitations include the small sample size and lack of control group for comparison. On the other hand, ethical dilemmas that can arise when treatment is withheld from participants in a control group while given to those in the treatment group were avoided.

Two additional studies investigating the effects of yoga on PTSD symptoms of United States military veterans focus explicitly on males and females respectively. The first, a study of military veteran and civilian women with full or subthreshold PTSD symptomology found twelve 75-minute yoga sessions to lead to reductions in hyperarousal symptoms as well as re-experiencing symptoms of PTSD. In this study, individuals in the control group who participated in self-monitoring via group questionnaire completion also showed a reduction in re-experiencing symptoms. Given that the sample size in this study allowed for less than 10% power to detect group differences, it is unknown whether a significantly greater reduction in re-experiencing symptoms would have been found among those in the yoga group had there been a larger sample (Mitchell et al., 2014). In a second study reviewed in detail above, Seppala et al. (2014) reported reductions in PTSD scores and anxiety symptoms, immediately following, one-month following, and one-year following a week-long yoga intervention (Seppala et al., 2014).

Research with other PTSD affected populations yield similarly promising results. In a study of survivors of the 2004 Indian Ocean Tsunami screening positive for PTSD, Descilo et al. (2010) assigned participants to three groups: a yoga breath only group, a yoga breath plus exposure therapy group, and a wait-list control group. Results showed that individuals in both yoga treatment groups experienced a 60% reduction in PTSD symptoms immediately post-treatment as well as six and 24 weeks post-treatment.

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(Descilo et al., 2010). Although the reductions in PTSD symptoms found among the treatment groups did not significantly differ from one another, both significantly differed from the control group. This suggests that a regular yoga practice may be just as efficacious in reducing symptoms of PTSD as a regular yoga practice combined with a more traditional treatment for PTSD. With this said, it should be noted that this was not a blind study nor was assignment to the three groups systematic, though groups comparable on many characteristics still emerged (Descilo et al., 2010).

Similar results were found in a mixed-methods pilot by van der Kolk (2006). In this study, females with PTSD were randomly assigned to either eight sessions of dialectical behaviour therapy or eight 75-minute yoga sessions. Quantitative results revealed significant decreases in frequency of intrusions and hyperarousal symptoms for the yoga group only (van der Kolk, 2006). Qualitative results revealed individuals in the yoga group saying things like “I have always hated my body and I learned how to take care of it; I learned to be able to focus and sense where my body was; I was able to go shopping and know what I needed; Having grown up obese and self-conscious it was wonderful to be able to move gently; I learned for the first time how to focus” (van der Kolk, 2012, p. 286-287). The methods used in this pilot study were unique from many other studies of yoga and PTSD in that the subjective reports collected from participants allowed them to become people – each woman was given her own voice and an opportunity to name her unique experience of the yoga intervention.

One additional qualitative study investigated the implementation of a yoga program into residential facilities serving youth affected by trauma and included two case examples (Spinazzola, Rhodes, Emerson, Earle and Monroe, 2011). The first case example outlines Samantha’s story, a sixteen-year-old female of mixed Caucasian and African American ethnicity. Prior to taking part in the yoga intervention, Samantha was characterized by “sudden, escalating episodes of tearfulness and irritation, culminating in explosive self-harming or aggressive behaviors… followed by long periods of social withdrawal, shame and dysphoria” (Spinazzola et al., 2011, p. 435). Three months into the yoga intervention, staff of the residential facility noted a 50% decrease in Samantha’s behavioural incidents, heightened somatic awareness and greater responsiveness to bodily needs, skills that transferred well into her daily life. The authors suggested that Samantha’s yoga practice allowed her to learn how to pay greater attention to the sensations occurring in her body and experiment with modifying her practice according to these sensations and needs (Spinazzola et al., 2011).

The second case example outlines Danny’s story, a Caucasian male 17 years of age. Danny was described as “six feet tall with a nearly 190 pound muscled frame. He spent hours every day lifting weights and had honed a very strong, very tense, very dangerous body” (Spinazzola et al., 2011, p. 439). Among other concerns, he was said to experience difficulties developing relationships safely and appropriately, display an exaggerated startle response, and have a tendency to interpret neutral interactions as threatening (Spinazzola et al., 2011). In Danny’s case, yoga turned out to be quite complimentary to psychotherapy. After several weeks of yoga practice, Danny reported greater awareness of his bodily feelings and sensations, a skill that allowed him to begin incorporating this awareness into his individual psychotherapy sessions. Eventually, Danny and his therapist were able to explore the idea of internal strength and ways of being that did not recruit violence (Spinazzola et al., 2011). The following quote is very telling of Danny’s initial experience with yoga, which began with a very angry, hyperventilating version of himself:

“Danny’s physical presentation began to change dramatically. His facial muscles unclenched. His shoulders dropped. His breathing lengthened and slowed noticeably. At the end of the session, after about a minute of sitting quietly, Danny smiled and reported feeling much more at ease… what Danny needed more than anything was to feel safe in his body. He needed some way to be.” (Spinazzola et al., 2011, p. 440).
Very recently the first ever randomized controlled trial investigating the efficacy of yoga as a treatment for PTSD was published (van der Kolk et al., 2014). In this trial, women described as suffering from chronic, treatment non-responsive PTSD were randomly assigned to ten weeks of yoga sessions or supportive therapy sessions, each session one hour in duration. Results indicated that although five weeks into treatment individuals in both groups had experienced a decrease in PTSD symptoms, many of those receiving supportive therapy lost these gains by the end of treatment. In comparison, the women in the yoga group maintained gains such that, at the end of the ten-week treatment, 52% no longer met criteria for PTSD as oppose to only 21% in the supportive therapy group (van der Kolk et al., 2014). As the first randomized controlled trial of this nature, this study offers very promising evidence for the efficacy of yoga as a treatment for those who have experienced traumatic events. Effect sizes were comparable to well-researched psychotherapeutic and psychopharmacologic approaches (van der Kolk et al., 2014). In the future, studies of this nature could be strengthened by inclusion of follow-up assessments in order to investigate the length of time over which treatment benefits may be maintained.

**Trauma and Relationships**

The effects of traumatic life events extend well beyond the individuals who experience them. Those who have been exposed to trauma often encounter difficulties on an interpersonal level, perhaps the most distressing being impaired interactions with intimate others such as partners and children (Galoiski & Lyons, 2004). According to results of the 2011 Canada Census, almost 58% of individuals over age 15 and living in Canada were in a marriage or common-law relationship and an additional 11.5% were divorced or separated (Statistics Canada, 2011a). At the same time, approximately 42% of households in Canada were comprised of at least one adult and one child (Statistics Canada, 2011b). Given the large number of individuals affected by trauma who will also be in an intimate relationship and/or have children over the lifespan, understanding the relationship between traumatic experiences and interpersonal functioning bears great importance for couples and families affected by trauma.

**Trauma and Intimate Partnerships**

Associations between PTSD and various aspects of relationship dysfunction have been well researched. Before reviewing the most recent publications, it should be noted that many of these studies have been conducted with male military veterans in heterosexual relationships. Given that heterosexual male veterans are not the only individuals who experience trauma and/or battle symptoms of PTSD, the generalizability of some of these findings to the general population may be limited. In fact, the only study that has been conducted with a nationally representative sample of 8,098 Americans found PTSD to predict marital dissatisfaction in women with the disorder but not in men (Whisman, 1999). No discussion was offered with respect to potential variables underlying the inconsistency of these findings with the majority of research results that came before it. One such example is results from a study published one year prior indicating that over 70% of male veterans with PTSD and their partners reported clinically significant levels of relationship distress, as related to intimacy and steps taken toward separation or divorce, compared to only 30% of male veterans without PTSD (Riggs, Byrne, Weathers & Litz, 1998).

Results reported by Riggs et al. (1998) have been replicated and expanded on since the time of publication. Nelson Goff, Crow, Reisbig and Hamilton (2007) investigated the relationship satisfaction of male soldiers recently returned from military deployments to Iraq or Afghanistan, and their female spouse or partner. Results of this study indicated an inverse relationship between symptoms of trauma and relationship satisfaction as reported by soldiers and their partners. Specific symptoms of trauma that predicted lower levels of relationship satisfaction included sleep problems, dissociation, and trauma related sexual problems (Nelson Goff et al., 2007). Another study of male World War II ex-prisoners of war revealed that those with PTSD were 20% more likely to report relationship problems with their intimate partners than those without, specifically as related to adjustment, communication and intimacy (Cook, Riggs, Thompson & Coyne, 2004). In a rare study of female Vietnam veterans and their male
partners, PTSD symptom severity in females was not found to be significantly associated with relationship or marital adjustment (Gold et al., 2007), contrary to findings reported by Whisman (1999). Conversely, results from a recent study of females with flood-induced PTSD are consistent with those reported by Whisman (1999). In this study, relationship adjustment and PTSD symptomatology in females in heterosexual marriages were negatively related (Monson, Gradus, La Bash, Griffin and Resick, 2009).

Several researchers interested in the impact of trauma on relationships have also considered the topic from an intimate partner violence perspective. Sherman, Sautter, Jackson, Lyons and Han (2006) aggregated self-report intake data from couples seeking relationship therapy at a Veterans Affairs Clinic. Data indicated that 80% of the veterans with PTSD had perpetrated violence in their relationship during the past one year prior to intake and that the average number of violent acts perpetrated during that same year was 42. Both of these rates were much higher than those found among veterans without PTSD (Sherman et al., 2006). Samper, Taft, King and King (2004) also found that male Vietnam veterans were more likely to perpetrate intimate partner violence as their PTSD symptom severity increased. In a study of male military veterans serving in wars against Iraq, Afghanistan and Vietnam, Teten et al. (2010) found veterans with PTSD to be more likely to be perpetrators and victims of intimate partner violence within heterosexual relationships. Though some comparisons did not reach significance, as compared to veterans without PTSD and Vietnam veterans, veterans with PTSD who served in Iraq and Afghanistan wars were found to be up to three times more likely to have used violence against their female partners and up to six times more likely to have had violence used against them by these same partners. These veterans were also more likely to subject their partners to psychological abuse as well as be subjected to this type of abuse within their relationships (Teten et al., 2010). Similar findings were reported by Gold et al. (2007) for female veterans and by Glenn et al. (2002) for male veterans, who were each more likely to engage in psychological abuse toward their partners as their own PTSD symptom severity increased. One additional study of combat veterans also found a significant positive association between the veterans’ PTSD symptoms and acts of physical and psychological aggression toward their intimate partners (Taft, Street, Marshall, Dowdall, & Riggs, 2007). Further analyses indicated that individual differences among veterans in their likelihood to experience anger, mediated the relationship between PTSD symptoms and both forms of relationship aggression; however, little discussion was offered with respect to the potential significance of these findings. The small convenience sample also raises questions about the generalizability of the findings (Taft et al., 2007).

**Trauma and Parent-Child Relations**

Similar to the affects of trauma on intimate partnerships, the affects of trauma on parent-child relationships have also been well researched. Studies on this topic can be largely grouped into two categories, some studies falling under both: those that investigate the relationship between parenting variables and PTSD generally, and those that go one step further and look at these variables in relation to specific symptoms of PTSD. Considering studies falling into the first grouping, a study of mothers described as having a history of complex trauma exposure, parenting satisfaction was found to significantly decrease as exposure to trauma increased (Banyard, Williams & Siegel, 2003). Increased levels of exposure to trauma among the women were also significantly and positively related to their reports of child neglect, use of physical punishment and protective services involvement. Further analyses revealed that these relationships were partially mediated by reports of maternal depression (Banyard et al., 2003). In a study of male Vietnam veterans, on the other hand, parenting satisfaction was found to decrease as symptoms PTSD increased even after controlling for maternal depression (Samper et al., 2004). In another study of female Vietnam veterans, PTSD symptom severity was significantly negatively associated not only with parenting satisfaction, but also with measures of family adaptability and family cohesion (Gold et al., 2007).

Two studies falling within the first grouping that view trauma through an intergenerational lens offer a critical perspective other studies do not. The first study, which compared the family functioning of

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Vietnam veterans with and without PTSD to civilian controls, found that veterans with PTSD reported their families to be less effective at problem solving, less capable of responding to family problems with an appropriate level of affect, less interested and involved in the family and more likely to use indirect, vague or unhealthy means of communication than the other two groups (Davidson & Mellor, 2001). In general, veterans with PTSD as well as their children rated their families as less healthy and more dysfunctional than parents and children in the non-PTSD and civilian control groups (Davidson & Mellor, 2001). The second study, which examined family functioning as reported by partners and children of male Vietnam veterans as well the veterans themselves, revealed increasing rates of intra-familial violence and hostility among all members of the family as PTSD symptomology increased among veterans (Glenn et al., 2002). Results reported by Davidson and Mellor (2001) and Glenn et al. (2002) suggest that although only one member of a family may experience the physiological and psychological symptoms associated with PTSD (in the case of these two studies, the veterans), this experience can have a vast impact on the well being and functioning of all members within a family.

Studies falling into the second grouping, which investigate the relationship between parenting variables and specific symptoms of PTSD, yield consistent results, particularly with regards to avoidance and emotional numbing symptom clusters. In a study of perceived father-son relationship quality among male veterans, results indicated that the emotional numbing symptom cluster was the only cluster significantly related to all five parent-child relationship variables measured and also accounted for 11-29% of the variance in parent-child relationship scores (Ruscio, Weathers, King & King, 2002). PTSD symptoms related to re-experiencing, avoidance and hyperarousal were also significantly correlated with one or more of the parenting variables but never all five and the correlations generally not as strongly (Ruscio et al., 2002). In the study described above by Samper et al. (2004), more intricate data analyses revealed that avoidance and emotional numbing symptoms of PTSD had a particularly negative impact on parenting satisfaction in the nationally representative sample of male veterans studied (Samper et al., 2004). Similar findings were reported for a group of female Vietnam veterans in which symptoms of hyperarousal, avoidance and emotional numbing were negatively related to the female veterans parenting satisfaction with respect to their biological children (Berz, Taft, Watkins & Monson, 2008).

In a study specifically related to familial anger and aggression as perpetrated by male veterans, Taft et al. (2007) found aggression to be directly and positively predicted by hyperarousal symptoms; directly and negatively predicted by avoidance and emotional numbing symptoms; and indirectly predicted by re-experiencing symptoms through the symptom cluster’s positive association with physiological reactivity and negative association with alcohol use (Taft et al., 2007). Evans, McHugh, Hopwood and Watt (2003) also found avoidance related symptoms of PTSD to directly and negatively predict family functioning in a sample of Vietnam veterans. Although intrusive and arousal related PTSD symptoms were significantly and negatively correlated with family functioning, neither symptom cluster evidenced the same predictive relationship found among avoidance symptoms and family functioning (Evans et al., 2003). Authors also caution that the complex meditational models examined in this study accounted for only small amounts of variance in family functioning. This suggests that other explanations for the relationship between family functioning/parenting variables and PTSD symptomology likely exist (Evans et al., 2003); a suggestion that any individual interested in this area of research would be hard-pressed to argue with.

**Future Directions in Trauma Research**

The evidence above indicates a need for interventions aimed at couples and families dealing with the affects of exposure to trauma, yet evidence-based treatments are extremely limited to date (Galovski & Lyons, 2004; Dekel & Monson, 2010). In addition, similar to traditional individuals treatments for trauma, none of these treatments focus on the physiological symptoms associated with trauma exposure. In order to begin filling this gap in our knowledge, researchers interested in the affects of trauma and the efficacy of trauma treatments – most especially those in the field of couple and family therapy – should
Consider rigorous investigations of treatments for trauma that can be applied in relational contexts. Given the literature presented throughout this paper, yoga interventions for couples and families would likely be an exciting new direction for future research to take. This also seems like a logical direction given that, in addition to yoga for individuals, several forms of relational yoga already exist. For example, there is yoga for intimate partners or individuals in any type of close relationship, yoga for expectant mothers and yoga for parents and babies/toddlers. Often referred to as partner or couples yoga, prenatal yoga and mom and baby yoga, in my personal experience of some of these practices, not only do they strengthen one’s own mind-body connection, they also facilitate a deep awareness of the subtle physiological responses of the other, likely even a baby in the womb. With practice, this awareness can provide cues to the other’s psychological experience and then used to guide responses in ways that are sensitive to the other’s experience. Further support for this idea is provided by Elysabeth Williamson, founder of Principle-Based Partner Yoga, who claims the practice integrates compassion, trust, balance and creativity (Williamson, 2014).

Should Williamson’s above claim be true to individuals’ experiences of a relational yoga practice such as partner yoga, the implications could be great, especially for couples and families where one or more individual is struggling with symptoms related to exposure to trauma. For example, how might learning new ways to foster compassion and trust within relationships change interpersonal interactions? How might learning new ways to communicate with and be mindful of the other individual’s experience allow a partner, parent or child to better support his her respective partner, child or parent with symptoms associated with trauma? How might a multitude of factors associated with a woman’s postnatal experience, parenting factors and otherwise, be affected by a regular prenatal yoga practice? These are just a few of the questions that future research might ask; many of which fall in line with interventions therapists are already successfully practicing when there is more than one client in the room. Just one example of this is when therapists take on a structural therapeutic approach in order to enhance relational learning and create collaborative healing and change. When working in this modality, therapists will often use in session “enactments” to help couples and families experience new and more adaptive ways of interacting, communicating and “being” with one another (Simon, 2008).

As research continues to advance in the field of trauma as a whole, it is imperative that populations beyond war veterans be included in empirical studies. Although research in the field itself is plentiful, it is overwhelmingly focussed on military personnel. As a result, this research lacks applicability to the general population and further dismisses the experiences of already marginalized populations, many of whom are at increased risk for experiences of trauma and/or development of PTSD such as immigrants and refugees (Rousseau, Pottie, Thombs, Munoz & Jurcik, 2011), several minority populations (Alegria, Molina & Chen, 2014; Roberts, Gilman, Breslau, Breslau & Koenen, 2011) as well as families living in poverty (Brewin, Andrews & Valentine, 2000). Future research should also incorporate physiological and psychological/cognitive/emotional measures whenever possible, in order to better assess the multidimensional impacts that treatment interventions may have. Both of these recommendations speak to problematic dynamics inherent in attempts to secure research funding – the grants that are most often successful are often those that pose research questions about population and topics that seem to bear great importance to current provincial/state, federal/national and worldwide issues. Similarly, researchers may also cater their research questions in order to fit the mission of a particular funding body that may or may not have put out a special call for research proposals.

As research continues to advance specifically with respect to yoga as a treatment for trauma, researchers should consider that in addition to different types of yoga (e.g., individual versus relational), there are also different styles such as hatha, vinyasa flow, bikram, iyengar, anusara and ashtanga (for descriptions of each see Stephens, 2010). Once again drawing from my personal experience, it seems possible that some types of yoga may have more treatment benefits than others for individuals who have experienced trauma, given certain “yoga cultures” that certain styles of yoga seem to follow. For example,
where hatha yoga tends to emphasize slow movements and listening to the breath and the body, ashtanga yoga seems to be taught with less attention to functional movement and greater pressure to “just get into a pose” so that the next posture in the sequence can be attempted and mastered. “The Dialogue”, a script for teachers of Bikram yoga includes statements like “lock the knees… keep pushing!... go beyond your flexibility!” (Asana, 2012). It is possible that these latter two styles of yoga could actually be harmful for individuals struggling with symptoms of exposure to trauma, especially if the teacher is not well versed regarding the affects of trauma and/or pushes a competitive, push through the pain mindset onto the student. Research reviewed within the context of this paper tended to include yoga interventions of a gentler nature, such as hatha yoga, emphasizing breath and body awareness. Future research would likely yield the best treatment results by following the lead of those who have developed a trauma-sensitive approach to teaching and practicing yoga (see Clark et al., 2014; Emerson et al., 2009; Emerson & Hopper, 2011; Spinazzola et al., 2011). In addition, just as 30% of the treatments effects of traditional psychotherapy are attributed to factors associated with the therapist and only 15% to the model applied (see, for example, Hubble, Duncan & Miller, 1999), future research should examine the possibility that the same is also true of yoga interventions for individuals with PTSD or otherwise. Based on the above statistics, it seems likely that the individual who delivers the yoga intervention (psychotherapist, yoga teacher or both) will be equally or more impactful on treatment results than the style of yoga practiced by the student (for an exploration of integrating yoga and psychotherapy, see Keane 1995).

Finally, throughout this paper, PTSD and exposure to trauma have been used interchangeably in order to not exclude populations suffering the aftereffects of trauma but who do not meet criteria or do not wish to receive of diagnosis of PTSD. In addition, the majority of studies cited throughout this paper did not operationally define PTSD as meeting criteria for or being diagnosed with PTSD as outlined by the DSM-5. Instead, PTSD symptomology was measured using several different measurement instruments and often times was defined in terms of symptom severity on a continual scale rather than using a cut-off to indicate the presence or absence of a PTSD diagnosis. Therefore, it also did not seem reasonable to limit this paper to studies that diagnosed individuals with PTSD using the DSM-5. Future research, however, should be mindful of this distinction and how PTSD and PTSD symptoms are measured and operationalized such that findings can be applied with confidence to specific populations. Whenever possible, however, researchers are encouraged to continue to measure symptoms associated with trauma continually rather than diagnostically as a formal diagnosis of PTSD is not required in order for an individual to suffer from symptoms associated with exposure to trauma.

In conclusion, evidence available to date clearly suggests a link between human physiology and symptoms of exposure to trauma and further indicates yoga as a promising intervention to help individuals cope with and possibly even eliminate these symptoms. Based on the literature put forth throughout this paper, researchers are recommended to continue to look in this direction while investigating treatment options for those who have personally experienced or been impacted by another’s experience of a traumatic event over the lifetime, both in terms of intrapersonal and interpersonal well-being and functioning.
References


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