

# Black Belt Anxiety Control in Jiu-Jitsu

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## **Abstract**

This quasi-experimental correlational study contrasts self-reported anxiety levels of 32 black belt level Jiu-Jitsu practitioners against 32 non-practitioners before, during, and after a high stress event. Likert scale-based questions were used to survey two subject groups regarding levels of anxiety experienced. Results show that black belt level practitioners experience lower levels of anxiety at all time points of a high stress event when compared to non-practitioners. Lower self-reported anxiety levels suggest a correlation between participation in Jiu-Jitsu the psychophysiological ability to control anxiety levels. Implications of these findings may yield beneficial therapeutic tools for helping individuals who suffer from high anxiety and other anxiety disorders such as PTSD (post-traumatic stress disorder) as related to deficiency in self-regulation.

## **Keywords**

Jiu-Jitsu, anxiety, stress, breath, black belt, Bjj

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## Introduction

Self-regulation of anxiety through breath control is foundational to teaching individuals how to maintain calm during times of emotional duress. Learning self-regulation through breath control will help individuals who struggle with managing their stress, anxiety, PTSD, trauma, panic attacks and a large variety of psychological disorders (Jerath et al., 2015). It is well understood that the prefrontal cortex (PFC) of the human brain competes with the amygdala for cognitive control when one experiences heightened activation of the nervous system. This means that high level executive functioning and decision making will be compromised during emotional overwhelm. McKlveen et al. (2015, p. 450) state that in reference to the PFC “both acute and chronic stress impair performance in behavioural flexibility and set shifting paradigms, which require the ability to inhibit a previously learned response.” The authors go on to explain that “acute stress may funnel energetic resources toward a ‘salience network’ (comprised of the amygdala and striatum) at the expense of energetic resources in the ‘executive network” (McKlveen et al., 2015, p. 452).

Moore et al. (2020) determine “martial arts training as an efficacious sports-based mental health intervention for improving wellbeing and reducing symptoms associated with internalizing mental health.” Similar findings reported that “practitioners of martial arts had significantly higher scores for mindfulness and subjective well-being and lower scores for depression (Miyata et al., 2020). Mindfulness developed within these sports provides cross-disciplinary psychological tools to address stress in all aspects of life. Bing and Kim (2021) describe the manner in which martial arts provide cathartic release

to relieve mental stress which would certainly help provide a beneficial response to acute and chronic anxiety attacks.

Harwood-Gross et al. (2021) find that martial arts provided at-risk youths with “significant improvements in participants’ self-reported experiences of self-control” resulting from disciplined training of inhibition while developing higher cognitive functioning. MRI findings help establish health benefits of participation in martial arts through increased brain activity related to exercise (Fujiwara et al., 2019; Kim et al., 2015; Srinivas et al, 2021; Mayer et al., 2017; Yu et al, 2018). Social bonding increases through oxytocin production and “prosocial interaction” within the martial arts community which helps to combat stress and depression (Rassovsky et al., 2019).

Zaccaro et al. (2018) report that “Slow breathing techniques act enhancing autonomic, cerebral and psychological flexibility in a scenario of mutual interaction” as related to the activation of the “prefrontal, motor, and parietal cortices” while modulating activity in the amygdala to create calm, deeply meditative states. Breath techniques are able to accelerate or decelerate our nervous systems by directly impacting the neurobiological properties of the brain. Biofeedback loops within the human body induce stimulation of anxiety through fast breathing which stimulates a cascade of hormonal and neurological changes throughout the body. Similarly, slow diaphragmatic breath helps to down regulate this response and calm the entire body down. Teaching such breath techniques is key to helping individuals who struggle with psychological and emotion distress.

Martial arts possess the ability to provide explicit training on breath control which diminish pain and distress levels in

participants. In one specific case, martial arts therapists teach a breathing technique “consisting of breathing in, holding the breath and breathing out at 3 to 4 second intervals each and an introspective body-scan” to help children manage their levels of “anxiety, depression, and posttraumatic stress symptoms” (Marusak et al., 2020). Jiu-Jitsu heavily relies upon breath control as a vital element to successfully engage in sparring matches. Renden et al. (2015) find that police officers who regularly train in combative sports “performed better under high anxiety than officers with no additional experience.”

Although this sport may be thought of as a combative, intense practice there is reason to believe that it operates as powerful agent of growth with regards to self-regulation through a form of exposure therapy. Fernandez et al. (2020) find that “practical applications of these psychological instruments in combat sports are important to incorporate self-regulation strategies.” Souza et al. (2019) find that Jiu-Jitsu practitioners “showed higher somatic and cognitive anxiety” than other athletes within the same study which speaks to their heightened ability for psychological monitoring and interoception as a means of successfully operating through anxious states. When training with calm and patience there is an opportunity to help participants slowly expose themselves to gradually increasing levels of intensity while managing their breath. In time, even combative engagement in the sport will remain within the bounds of calm control as studies have shown training over longer periods of time is “associated with lower levels of aggression” (Vertonghen and Theeboom, 2010).

Combative sports in this study are defined as any competitive sport requiring

the use of hands-on grappling or sparring within one-on-one engagements. Examples of such sports include: Jiu-Jitsu, Judo, wrestling, boxing, Sambo, Krav Magas, Muay Thai, Karate, Taekwondo, or martial arts of any kind. Mickelsson (2020) found that various combative sports promote an increase in “self-control and pro-social behaviour” though differences exist between various forms of combative sports as some require high levels of aggression and or violence than others. Careful consideration is necessary to determine if specific individuals are more prone to emotional overwhelm or flooding if overexposed to high adrenaline events brought up by the sport itself (Schumacher et al. 2015). Ensuring appropriate training partners and instructors are provided will help mitigate the risk of inducing a negative effect when stimulating the nervous system of clients seeking therapeutic exposure to anxiety.

#### *The present study*

The primary aim of this study is to investigate the differences in self-reported anxiety levels when comparing black belt level Jiu-Jitsu practitioners against non-practitioners of the sport. This is a quasi-experimental correlational study between two sample groups as related to their self-reported levels of anxiety before, during, and after high stress events. The two groups are differentiated as either having long term experience in Jiu-Jitsu or not having any experience in the sport. High stress events were defined as any life experience of their choosing that the participant premeditatedly prepared for with the understanding that they would face a competitive opponent or challenging difficulty.

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## Method

### *Participants*

64 participants voluntarily participated in the study. Ages range from 18 to 65 years). 32 subjects were black belt level practitioners in Jiu-Jitsu having more than a decade of experience in the sport. 32 subjects were non-practitioners of combative sports entirely. Of the black belt group all 32 were male. Non-practitioners were comprised of 16 male and 16 female subjects. Only 9 participants had any military combat experience, and 8 of these belonged to the black belt participant group with 1 belonging to the non-participant group.

Diversity was a key aspect to sample population design. Participants were racially diverse individuals from across the United States with a broad variety in education level and income. Professional backgrounds of the participants include university students, graduate school students, Board Certified Surgeon, practicing Psychologist, Physician, former Special Forces military service member, Police Officer, Cafe Barista, Yoga instructor, Entrepreneurs, and Real Estate Agent.

Of the non-practitioner participant group all subjects possessed a history of participation in competitive team sports at some point in their lives. They were able to draw upon these experiences to answer questions related to anxiety and breath control management.

### *Experimental design and procedure:*

The research took place in the summer and fall seasons of 2021, between 01 June and 30 November. The primary method of research was multifaceted, custom questionnaire that was used for assessing anxiety levels of the participate before, during, and after high stress events. Before receiving the survey, all participants were briefed as to the process

and duration of the questionnaire while the purpose of the research was explained to ensure comprehension and clarity.

Ethical considerations involved providing every participant a consent form which explained the risks and benefits of their participation along with their rights to object from being included in the study at any point. Data collected has been anonymized for their identity protection and no deceptive techniques were involved in the study.

The survey was administered as a questionnaire in an interview style whereby the subjects self-reported their responses. This survey was conducted mostly in person with a small subset being done telephonically. The questionnaire contains 42 questions with a variety of parameters. 9 questions relate to anxiety at varying time points using a 1 to 10 Likert scale for quantifiable analysis. 13 questions ask yes/no questions related to experiences with stress and anxiety. 11 questions are open-ended to provide qualifying context to the subjects' experiences. 4 questions ask for the subject's age during various life events related to stress and anxiety. 5 questions offer multiple choice responses regarding anxiety, life experiences, and personality.

### *Data Analysis:*

Non-parametric testing via Mann-Whitney U Tests were conducted in SPSS Statistics v27 on the results for self-reported anxiety measures using 1 to 10 Likert scale. Level of significance was defined as  $p < .05$ . Mann-Whitney U Test was used to compare means between the groups at all three time points (before, during, and after) and establish statistical significance in differences considering the z-score and a statistical significance at  $p < .05$

**Results**

Black belt Jiu-Jitsu practitioners self-report lower anxiety levels than non-practitioners for all three time points related to high stress events. Means reported for black belts before, during, and after engagement were 4.94, 2.31, and 1.31 (standard deviation= 2.49, 1.31, 1.42) compared with non-practitioners reporting means of 7.31, 5.28,

and 5.47 (standard deviation= 2.43, 2.22, 2.18).

Mann-Whitney U test results confirmed statistical significance between both independent test groups for all three time points at  $p < 0.05$ . The following values were calculated for the 2-tailed test at time points before (u-value 241, z-score -3.63, p-value .00028), during (u-value 134, z-score -5.07, p-value <.00001), and after (u-value 57, z-score -6.10, p-value <.00001).

Table I: Test for self-reported levels of anxiety among subjects.

BLACK BELT	BEFORE	DURING	AFTER	NON-PRACTITIONER	BEFORE	DURING	AFTER
Subject 1	2	4	8	Subject 1	7	5	7
Subject 2	9	1	1	Subject 2	10	5	7
Subject 3	8	4	2	Subject 3	8	5	6
Subject 4	3	5	1	Subject 4	6	6	2
Subject 5	5	3	1	Subject 5	10	6	2
Subject 6	4	1	1	Subject 6	8	5	7
Subject 7	8	1	1	Subject 7	8	2	3
Subject 8	3	4	3	Subject 8	1	5	8
Subject 9	5	2	1	Subject 9	9	5	7
Subject 10	8	4	1	Subject 10	8	5	8
Subject 11	8	1	3	Subject 11	8	6	5
Subject 12	9	3	1	Subject 12	8	4	1
Subject 13	6	3	2	Subject 13	9	5	3
Subject 14	1	1	1	Subject 14	9	7	5
Subject 15	5	1	2	Subject 15	9	7	3
Subject 16	8	5	1	Subject 16	9	7	5
Subject 17	6	4	1	Subject 17	7	4	9
Subject 18	6	3	1	Subject 18	6	8	3
Subject 19	6	2	1	Subject 19	3	3	4
Subject 20	3	2	0	Subject 20	6	9	8
Subject 21	4	1	1	Subject 21	10	3	4
Subject 22	8	2	0	Subject 22	9	9	7
Subject 23	3	1	0	Subject 23	4	1	6
Subject 24	3	1	1	Subject 24	8	5	4
Subject 25	4	1	1	Subject 25	7	8	8
Subject 26	5	3	1	Subject 26	9	9	8
Subject 27	5	3	1	Subject 27	9	2	7
Subject 28	1	1	1	Subject 28	1	1	6
Subject 29	7	2	0	Subject 29	10	8	8
Subject 30	2	2	2	Subject 30	4	6	3
Subject 31	2	2	0	Subject 31	8	3	5
Subject 32	1	1	1	Subject 32	6	5	6
Average	4.94	2.31	1.31	Average	7.31	5.28	5.47
Standard Deviation	2.49	1.31	1.42	Standard Deviation	2.43	2.22	2.18
Standard Error	0.44	0.23	0.25	Standard Error	0.43	0.39	0.39
Min	1	1	0	Min	1	1	1
Max	9	5	8	Max	10	9	9
Median	5	2	1	Median	8	5	6

Table II. Descriptive statistics of self-reported anxiety levels related to high-stress events.

	Before		During		After	
	M	SD	M	SD	M	SD
Black-Belts	4.94	2.49	2.31	1.31	1.31	1.42
Non-Practitioners	7.31	2.43	5.28	2.22	5.47	2.18

Notes. M = Mean, SD = Standard deviation.

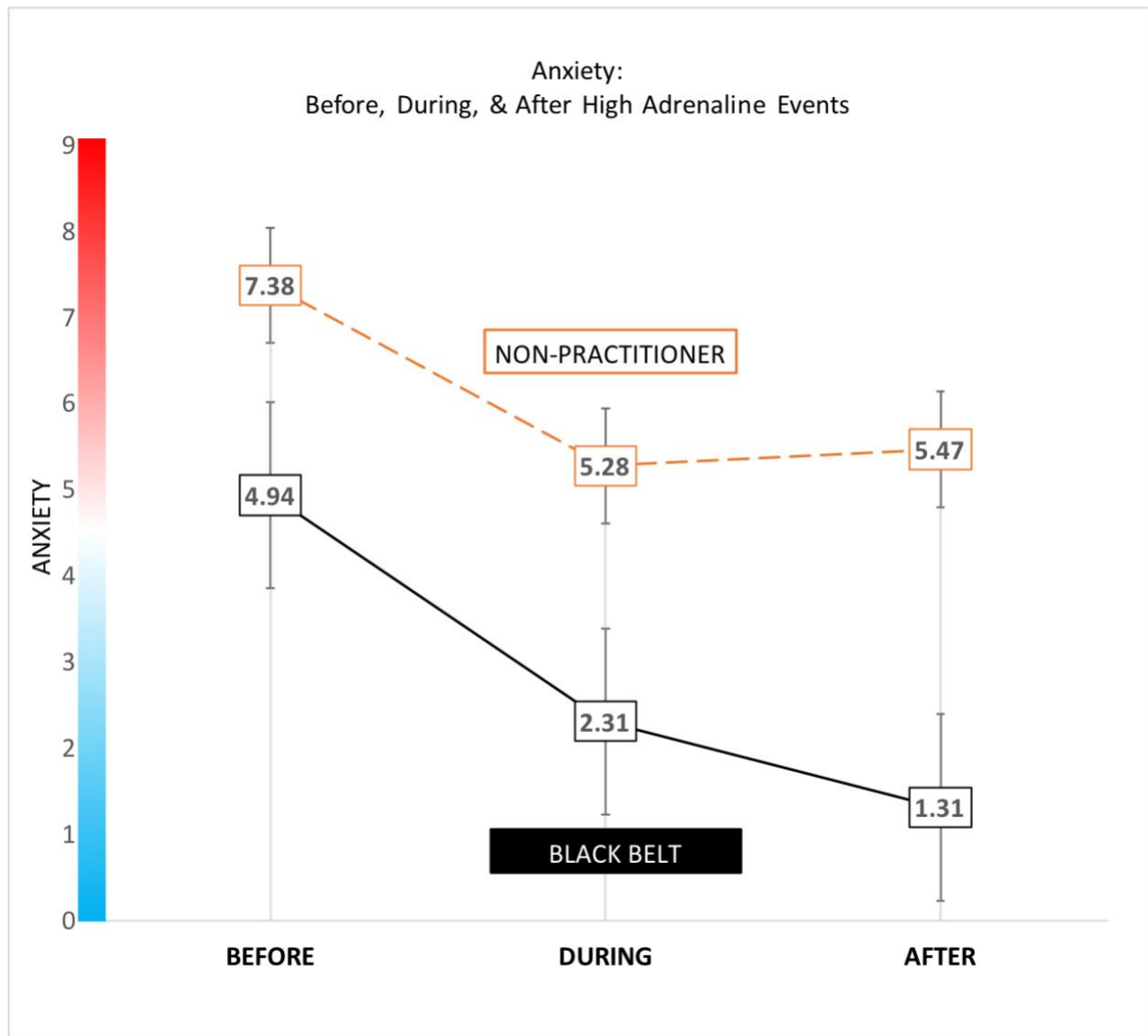


Figure 1. Graphical depiction of anxiety regulation with Standard Error bars

		Experienced a Panic Attack		Experience Daily General Anxiety		Experience Social Anxiety	
		Black Belt	Non-Practitioner	Black Belt	Non-Practitioner	Black Belt	Non-Practitioner
Yes		19	21	16	23	17	9
No		13	11	16	9	15	23
Total		32	32	32	32	32	32
		59%	65%	50%	72%	53%	28%

Table III. Data on self-reporting experience with a panic attack, general anxiety, and social anxiety

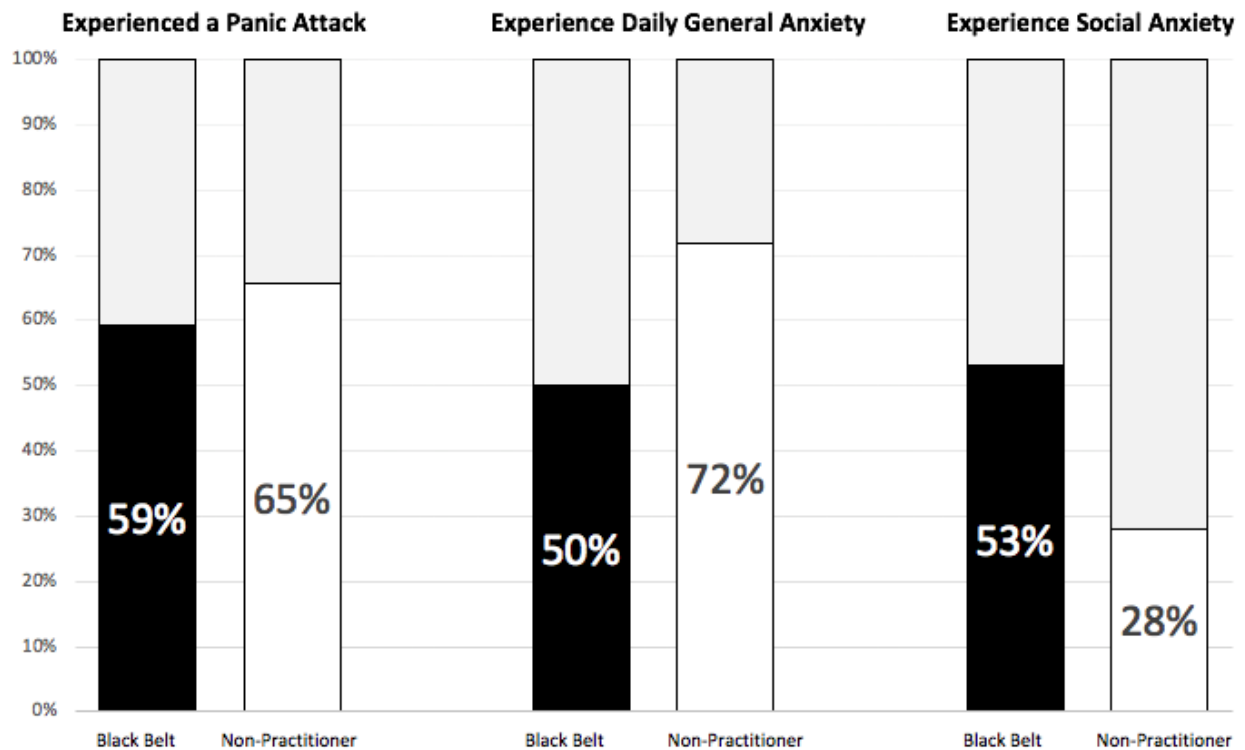


Figure 2. Graphical depiction of experience with a panic attack, general anxiety, and social anxiety



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## Discussion

The main goal this study was to examine psychophysiological control learned within the sport of Jiu-Jitsu as a means of therapizing patients who struggle with self-regulation related to anxiety and breath control. The research results showed the averages for self-reported anxiety levels at all measured time points are significantly lower for black belt Jiu-Jitsu practitioners compared to non-practitioners (*Figure 1*).

Anticipatory anxiety is highest for both groups preceding a high-stress event and both groups demonstrate diminished anxiety once they initiate the engagement or event. However, only black belts are able to maintain downregulation of their sympathetic response indefinitely as non-practitioners experience a spike of anxiety after the engagement ends.

Deeper insight into the minds of these black belts was enabled through open-ended questions within the survey of this study. Many have shared their stories of ceasing to self-medicate their anxiety through drugs and alcohol after being introduced to the sport of Jiu-Jitsu. Several have overcome trauma from child-abuse and bullying through combative sport which has helped them minimize aggression levels.

One intriguing and unexpected piece of data was that both groups reported having experienced panic attacks at nearly the same ratio (*Figure 2*); 19 of 32 (59%) black belt participants and 21 of 32 (65%) non-participants reported experiencing a panic attack at some point in their life. This helps establish a baseline of similarity among all participants regardless of their experience with combative training. Subjectivity is a serious concern when asking participants to report anxiety levels as there is a risk for unfamiliarity with how to quantify emotional experience. However,

being that both groups report the same number of panic attack experiences there is increased confidence that subjects rank their anxiety levels with similar criteria in mind.

When asked if they struggle with daily general anxiety 50% of black belts and 72% of non-practitioners answered in the affirmative (*Figure 2*). Conversely, when asked if social anxiety specifically was a reoccurring struggle here we find that black belts reported almost twice as high in the affirmative at 53% compared to 28% for non-practitioners (*Figure 2*). More research is required to investigate this dynamic but it is intriguing to see that black belts struggle more than non-practitioners in this facet of anxiety.

The correlational relationship between lower reported anxiety levels and Jiu-Jitsu deserves further investigation to determine what dynamics of causality exist. Training in the sport may have provided black belt practitioners the ability to override a primal survivalist sympathetic biological processes tied to the fight/flight response. However, there is the possibility that the lifestyle required to acquire a black belt may select for individuals predisposed to control their anxiety. An attempt at increasing objectivity within this study involved asking participants if they experienced panic attacks as this offered the opportunity to see if both parties understood what it meant to be overwhelmed by the sympathetic response.

Breath control specifically must be analyzed further as a tool for psychophysiological control as it is heavily emphasized within the sport. Much research demonstrates the use of intentional deep breath as a means of cognitive control over physiological stress (Laborde et al., 2022; Zaccaro et al., 2018; Ma et al., 2017; Jerath et al., 2015; Valenza et al., 2014; Cea Ugarte

et al., 2010; Conrad et al., 2007; Forbes and Pekala, 1993). The therapeutic implication of using Jiu-Jitsu for anxiety management by way of breath control offers an exciting method for providing innovative psychological services for select populations such as veterans with PTSD and at-risk youth. (Harwood-Gross et al., 2021; Mickelsson & Stylin, 2021; Turelli et al., 2020; Bird et al., 2019; Kotarska et al., 2019; Woodward, 2009). There is much more work to be done within upcoming studies.

### **Limitations**

Several limitations in this study must be mentioned as they may influence the results and should be addressed in future research. First, the sample population of Jiu-Jitsu black belts is disproportionately male with no female black belt practitioners being included. This is expected to influence accuracy of the findings and must be investigated further. More effort on follow up studies will be required to engage the smaller female subset of this already rare community of elite level practitioners.

Second, subjectivity looms large as psychometric relevance of the self-reporting requires further assessment as to the confidence in accuracy and objectivity. Fernández et al. (2020) state “one of the major difficulties confronting the researcher of combat sports in anxiety studies is the assessment of situational anxiety response or state anxiety.” Self-reporting measures include variance related to the “multidimensional measures of sport performance anxiety” which could affect precision (Sattar & Hussain, 2019). This study design is quasi-experimental and is limited in the capacity for truly objective quantification. Further experimental studies with carefully designed controls are necessary to elucidate objective data from

subjective cognitive or physiological manifestations of anxiety.

Third, there is no clear differentiation provided between cognitive and psychological anxiety as participants were directed to report their own interpretation as to how they experienced the activation of their nervous systems’ sympathetic response.

Future studies designed to increase objectivity are planned to include quantifiable biomarkers such as salivary cortisol levels, heart rate variability, blood oxygen saturation, fMRI, and PET scans. This will help decrease subjectivity while elucidating the psychophysiological and neurobiological implications of anxiety control related to combative sport.

### **Conclusions**

Self-regulation and anxiety management learned through sports may have therapeutic implications that operate beyond the gym environment. Combative sports offer a unique opportunity to activate powerful primal responses in the brain related to anxiety and threat detection as a means of teaching self-regulation. With careful consideration for monitoring the safety and emotional activation of clients who suffer with anxiety disorders there is the possibility to use Jiu-Jitsu as a tool to help these individuals process past trauma. The conclusions of this study highlight that anxiety may be cognitively recontextualized by mindfulness techniques learned through sport to the extent that the body responds by minimizing the physiological impact. This opens the door for an exciting possibility of uncovering neurobiological dynamics related to biomarkers within the body linked to maintaining calm and control amidst heightened alarm from past or present stimuli.

**Acknowledgements**

This research was supported and made possible by VictoryMMA in San Diego, California with a special thank you to Jocko Willink for providing access to a community of elite level coaches, athletes, and champions of Jiu-Jitsu from around the world. Also, thank you to We Defy Foundation and TJ Kreutzer for spreading the word on this research and for enabling combat veterans to seek their own paths in recovery from PTSD through the sport of Jiu-

Jitsu. Thank you as well to Tim Bywater and Joshua Whiteside of Ultimate Athlete Jiu-Jitsu for introducing me to this entire journey. To all the coaches who show up to the mats every day and live out the reality of never quitting I want to thank you for giving us all the courage to pursue healing through Jiu-Jitsu. I hope this research opens the door for more work in understanding how our community can save lives by pushing us to the edge of our fears in order to conquer invisible threats.

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