The Impact of Ocean Therapy on Veterans with Posttraumatic Stress Disorder

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Final Technical Report and Summary

<div align="center">**Data Analysis and Results**</div>

Introduction

  Posttraumatic stress disorder (PTSD) often prevents individuals from re-assimilating to civilian life due to a disconnect between their own experiences with war and the experiences of others, often leading individuals with PTSD to have difficulties with relationships and increased risk seeking or illegal behaviors (Hauffa et al., 2011; Myrseth et al., 2012). With the increase in PTSD cases in the United States in the last 15 years (Rogers et al., 2014), there is a constant motivation for mental health agencies in the United States to seek therapeutic activities for individuals with PTSD that do not involve pharmaceuticals, alcohol, or illegal drugs (Rogers et al. 2014), particularly for combat veterans.

  The purpose of this quantitative study was to determine the effect of nature-based therapy, an alternative form of treatment that focuses on the interaction of the individual and the environment, on combat veterans with PTSD. The focus was to determine if the therapy reduced PTSD symptoms, decreased depression and increased self-efficacy among veterans. This was done by expanding on the work of Rogers et al. (2014) examining the effect of ocean therapy, a type of nature-based therapy that primarily uses surfing as the treatment modality (Nichols, 2014; Rogers et al., 2014). Combat veteran subjects were sought who were about to begin an ocean therapy program, and their PTSD, depression and self-efficacy were measured using online surveys prior to the commencement of the therapy. The same veterans were surveyed using the same surveys at the end of the program and also 30 days after the program. This chapter firsts presents summary statistics of the collected data at each time point and then repeated-measures ANOVAs to answer the research questions and hypotheses. The chapter is concluded with a summary.

Descriptive Data

   Data were first entered into excel to generate the PTSD Checklist for DSM-5 (PCL-5), Beck Depression Inventory II (BDI-II) and General Self-Efficacy Scale (GSE) scores for each subject. All participants in Amazing Surf Adventure's Operation Surf program were eligible to participate. Both men and women between the ages of 20 and 55 participated in this study. All participants were military combat veterans. A total of 113 subjects were contacted for participation, and 95 subjects responded to the survey. All 95 subjects completed all parts of each survey at three time periods. No demographic data were collected. Data were then entered into SPSS for summary statistic generation and assumption testing. Assumption tests for repeated measures ANOVA include that the dependent variable is a continuous variable, that the independent variable is a marker which denotes how subjects have been measured on two or more occasions on the same dependent variable (i.e., a marker for time), that there are no significant outliers in the data, that the dependent variable is approximately normally distributed, and that sphericity is present within the data, i.e., there is homogeneity of variance (Green & Salkind, 2014). These assumptions were tested for each research question; violations of the assumptions resulted in further testing and/or corrective action.

   Mean and standard deviations of scores for each of the variables at each time point is presented in Table 1 and Table 2. Both PCL-5 and BDI-II have the highest mean values at the first time point before the commencement of therapy (52.18 and 45.05 respectively). Immediately after finishing the therapy program both scores are almost half their previous values (22.99 and 26.44 respectively), although at the third time point 30 days after therapy both scores have risen although not as high as their initial values (42.72 for PCL-5 and 34.87 for BDI-II). This is presented graphically in Figures 2 and 3. Self-efficacy shows the opposite pattern, as the

mean score is the lowest prior to the commencement of the program (17.33) and increases

immediately after the program (35.61). There is a drop in GSE score after the 30-day period

(31.93), but it is not as large as the change between time points two and three for PTSD and

depression. In order to determine whether or not these differences between time points are

statistically significant, repeated measures ANOVA tests were run on the data. Results of the

ANOVA checks are discussed later in this chapter.

Table 1

Summary Statistics of PTSD Checklist for DSM-5 (PCL-5), Beck Depression Inventory II (BDI-II) and General Self-Efficacy Scale (GSE) Scores at Each Time Point

Variable	Time 1 M (SD)	Time 2 M (SD)	Time 3 M (SD)
PCL-5 Score	52.18 (2.90)	22.99 (3.34)	42.72 (4.20)
BDI-II Score	45.05 (5.39)	26.44 (6.01)	34.87 (6.81)
GSE Score	17.33 (3.22)	35.61 (3.40)	31.93 (4.40)

Table 2

Means, Standard Deviations, and Study Variables

Variable	M	SD	Min.	Max.
General Self-Efficacy, Time 1	17.33	3.22	12	25
General Self-Efficacy, Time 2	35.61	3.40	28	40
General Self-Efficacy, Time 3	31.93	4.40	25	40

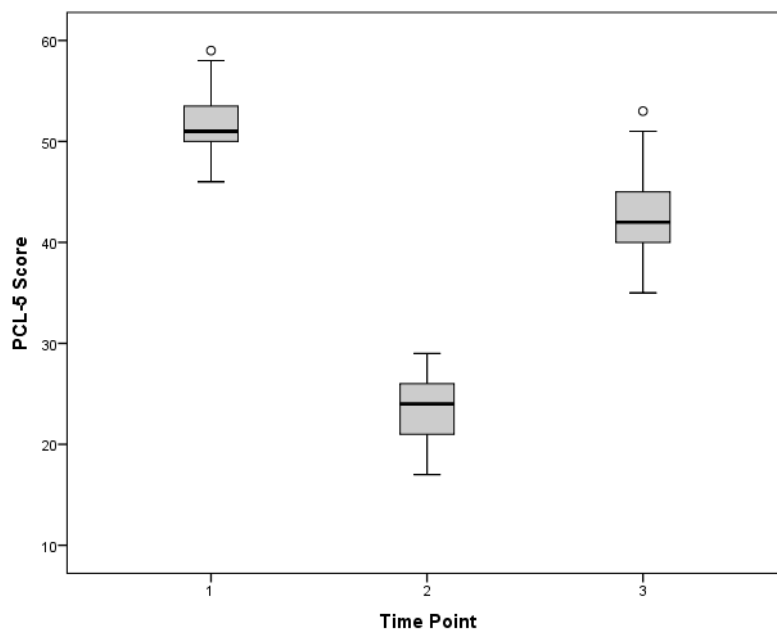|				
Beck Depression Inventory, Time 1	45.05	5.39	31	58
Beck Depression Inventory, Time 2	26.44	6.01	11	40
Beck Depression Inventory, Time 3	34.87	6.81	5	53
PTSD Checklist for DSM-5, Time 1	52.18	2.90	46	59
PTSD Checklist for DSM-5, Time 2	22.99	3.34	17	29
PTSD Checklist for DSM-5, Time 3	42.72	4.20	35	53

Note. n = 95.

Figure 2. Boxplots showing PTSD Symptoms as Measured using the PCL-5 score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.
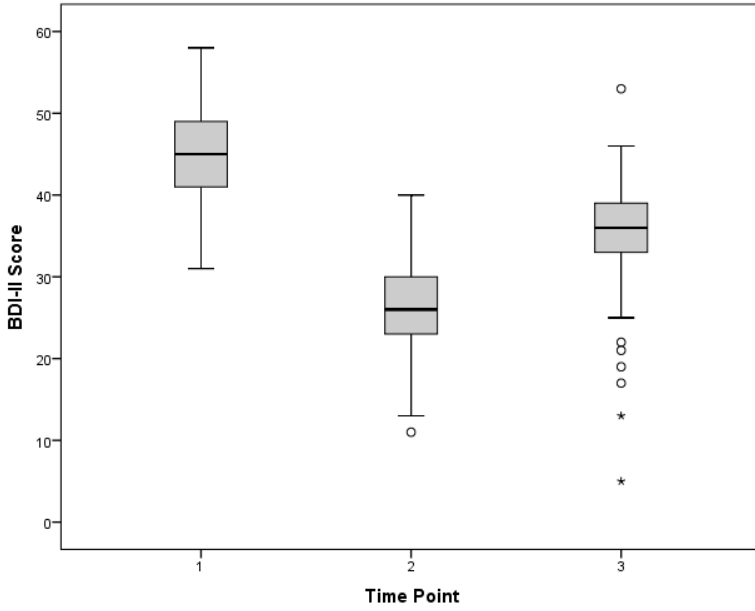
Figure 3. Boxplots showing Depression Symptoms as Measured using the BDI-II score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.
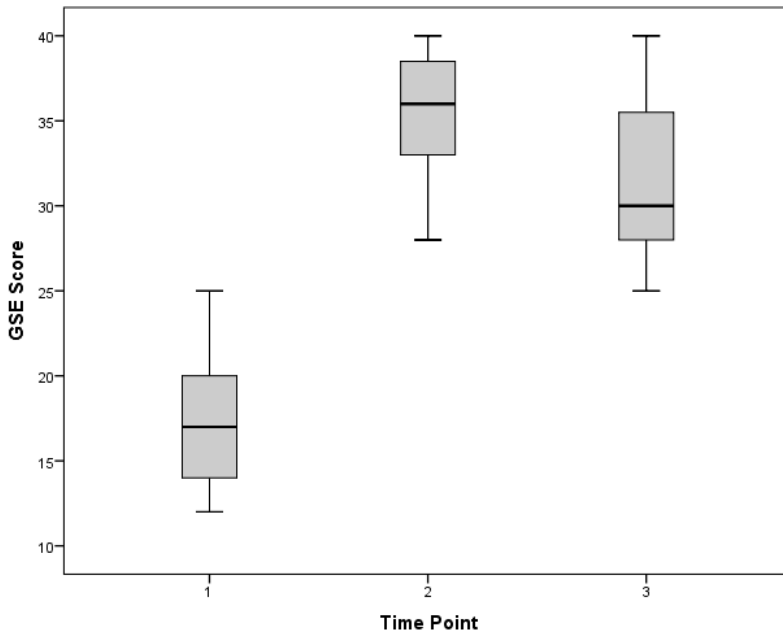

Figure 4. Boxplots showing Self Efficacy as Measured using the GSE score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.

Data Analysis Procedures

All data analysis was conducted in SPSS 23. Repeated measures ANOVA for each of PCL-5 scores, BDI-II scores and GSE scores were done using the time point of the survey as the independent variable. Analysis was completed by first testing the assumptions of repeated measures ANOVA mentioned previously. Specifically, the first assumption requires that the dependent variable be continuous in nature. This assumption was met for all dependent variables (i.e., PCL-5 score, BDI-II score and GSE score), as all dependent variables were measured as aggregated scales. The second assumption requires that the independent variable in a repeated measures ANOVA be a marker which denotes how subjects have been measured in two or more time points on the same dependent variable. This assumption was met, as subjects were measured before therapy, immediately after therapy and 30 days after therapy. The third assumption is that there are no significant outliers in the data. This assumption was checked for each repeated measures ANOVA via a visual inspection of the box and whiskers plot. The fourth assumption is the dependent variable is approximately normally distributed. This assumption was checked for each repeated measures ANOVA via the Shapiro-Wilk test. Finally, the fifth assumption is that sphericity is present within the data, i.e., there is homogeneity of variance. This assumption was checked for each repeated measures ANOVA via Mauchly's test of sphericity. Any violations of the final three assumptions (i.e., outliers, normality and sphericity) resulted in further testing and/or corrective action for each repeated measures ANOVA that was computed for each of the three research questions.

Results of the repeated measures ANOVA tests were then subjected to post-hoc testing using pairwise comparisons with Bonferroni corrections as a way to determine the exact relationships between variable levels if the ANOVA was significant. This analysis was done in

the event of a statistically significant ANOVA result to determine what time points were statistically different from each other. Repeated measures ANOVA was the most appropriate statistical test as it allows for one to determine if there was a significant relationship between the time a survey was taken and the score of that survey, while taking into account repeated measurements from each subject. Post hoc-testing allowed one to identify which time points had significantly different scores in surveys.

Prior to all statistical analyses, several steps were taken to prepare the data. Several variables were constructed from original data so as to effectively model each variable in question; namely, self-efficacy, depression, post-traumatic stress levels, and sports motivation. The scales that measured self-efficacy at time 1, time 2 and time 3 were created as the sum of the ten scale items for the General Self-Efficacy Scale. For example, self-efficacy at time 1 was created as the sum of the ten scale items measured at time 1. The same logic was used at time 2 and time 3. The scales that measured depression at time 1, time 2 and time 3 were created as the sum of the twenty-one scale items for the Beck Depression Inventory Scale. For example, depression at time 1 was created as the sum of the twenty-one scale items measured at time 1. The same logic was used at time 2 and time 3. The scales that measured PTSD at time 1, time 2 and time 3 were created as the sum of the twenty scale items for the PCL-5 Scale. For example, PTSD at time 1 was created as the sum of the twenty scale items measured at time 1. The same logic was used at time 2 and time 3. If the variable of time taken of the survey was found to be significant, post-hoc testing was used to identify which pairwise comparisons of time were significantly different using Bonferroni corrections for multiple comparisons.

Results

Results are presented in order of research question. All 95 subjects were used for each analysis.

RQ1: Is there an increase in self-efficacy among veterans who participate in ocean therapy as measured by the GSE at Time 1, Time 2, and Time 3?

H_{01}: There is no increase in self-efficacy among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

H_1: There is an increase in self-efficacy among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

As previously noted, the first and second assumptions of a repeated measures ANOVA (that the dependent variable is continuous and that the independent variable denotes how subjects have been measured in two or more time points on the same dependent variable) have been met for the first research question. Testing for the third assumption of normality was accomplished by using the Shapiro-Wilk test. Results showed that the self-efficacy data was significantly non-normal at time point 1 (0.934 (95), $p < 0.001$), time point 2 (0.926 (95), $p < 0.001$) and time point 3 (0.932 (95), $p < 0.001$). Even though this test was statistically significant, the violation of this assumption is not considered to be an issue for the current statistical analysis, as ANOVA is known to be robust against deviations from normality, provided that sample size is more than 30 (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010).

Table 3

Tests of Normality for GSE

	Shapiro-Wilk	
Statistic	*df*	Sig.

GSEScaleT1: General Self- Efficacy Scale, Time 1	.934	95	.000
GSEScaleT2: General Self- Efficacy Scale, Time 2	.926	95	.000
GSEScaleT3: General Self- Efficacy Scale, Time 3	.932	95	.000

The assumption check for statistical outliers was accomplished via a visual inspection of the box and whisker plots for the self-efficacy scores at time 1, time 2, and time 3. Figure 5 below shows no outliers within the data for self-efficacy.
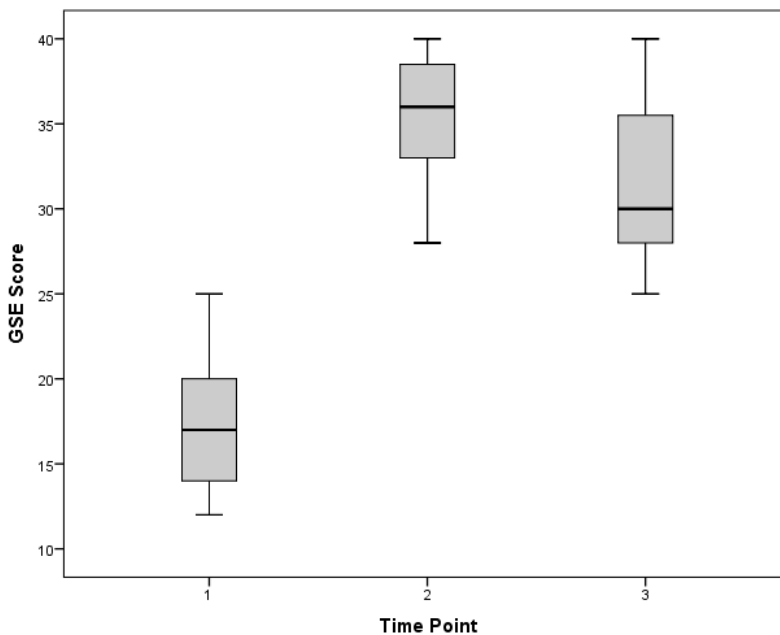

Figure 5. Boxplots showing Self Efficacy as Measured using the GSE score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.

As a repeated measures ANOVA was used, the assumption of homogeneity of variances was tested with Mauchly's test of sphericity instead of Levene's test. For self-efficacy,

Mauchly's test of sphericity was found to be non-significant (Mauchly's $W = 0.983$ (2), $p = 0.445$), thus meeting the requirements of this assumption.

The results of the repeated measures ANOVA for the main effect of time indicated a statistically significant change in self-efficacy over time (F (2,188) = 644.25, $p < 0.001$) and are presented in Table 4. As there was a significant ANOVA result, pairwise comparisons with Bonferroni corrections were undertaken. Pairwise results are presented in Table 5. Before therapy self-efficacy, as measured by the GSE, was found to be significantly lower than both time points after therapy (mean marginal difference after therapy = 18.28, mean marginal difference 30 days after therapy = 14.60). However, there was also a significant increase in self-efficacy from the immediately after therapy score and the score at 30 days after therapy (mean marginal difference = 3.68). Based on these findings and the ANOVA presented above, we concluded that there is a significant increase in self-efficacy following Ocean therapy for combat veterans. However, it should be noted that this increase in self-efficacy is less 30 days after the therapy.

Table 4

ANOVA Table for Self-Efficacy (GSE)

Variable	Sum of Squares	df	Mean Squares	F	Significance
Time of Survey	17766.45	2	8883.22	644.25	< 0.001
Error	2592.21	188	13.78		

Table 5

Pairwise Comparisons of GSE Score at Each Time Point Using a Bonferroni Correction

Variable	Comparison	Mean Difference	Std Error	Significance

Before Therapy	After Therapy	-18.28	0.49	< 0.001
	30 Days After	-14.60	0.53	< 0.001
After Therapy	30 Days After	3.68	0.56	< 0.001

RQ2: Is there a decrease in depression in veterans who participate in ocean therapy as measured by the BDI-II at Time 1, Time 2, and Time 3?

H_{02}: There is no decrease in depression in veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

H_2: There is a decrease in depression in veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

As previously noted, the first and second assumptions of a repeated measures ANOVA (that the dependent variable is continuous and that the independent variable denotes how subjects have been measured in two or more time points on the same dependent variable) have been met for the second research question. Testing for the third assumption of normality was accomplished by using the Shapiro-Wilk test. Results showed that the BDI-II score data were not significantly non-normal at time point 1 (0.992 (95), $p = 0.84$), or time point 2 (0.991 (95), $p = 0.75$), but was significantly non-normal at time point 3 (0.882 (95), $p < 0.001$), as presented in Table 6. Even though this test was statistically significant at the third time point, the violation of this assumption is not considered to be an issue for the current statistical analysis, as ANOVA is known to be robust against deviations from normality, provided that sample size is more than 30 (Schmider et al., 2010).

Table 6

Tests of Normality for BDI-II

	Shapiro-Wilk		
	Statistic	*df*	Sig.
BECKSCaleT1: Beck Depression Scale, Time 1	.992	95	.845
BECKSCaleT2: Beck Depression Scale, Time 2	.991	95	.749
BECKSCaleT3: Beck Depression Scale, Time 3	.882	95	.000

The assumption check for statistical outliers was accomplished via a visual inspection of the box and whisker plots for depression scores at time 1, time 2, and time 3. Figure 6 below shows some outliers within the data for depression at time 3, the most concerning being the very high value and the very low value. For ANOVA the effect of outliers is that they lower the chance of rejecting the null hypothesis, in other words they lower the chance of finding a significant result due to the increase in variance of the mean. No changes were made, but interpretation of the results should be made with these outliers in mind.
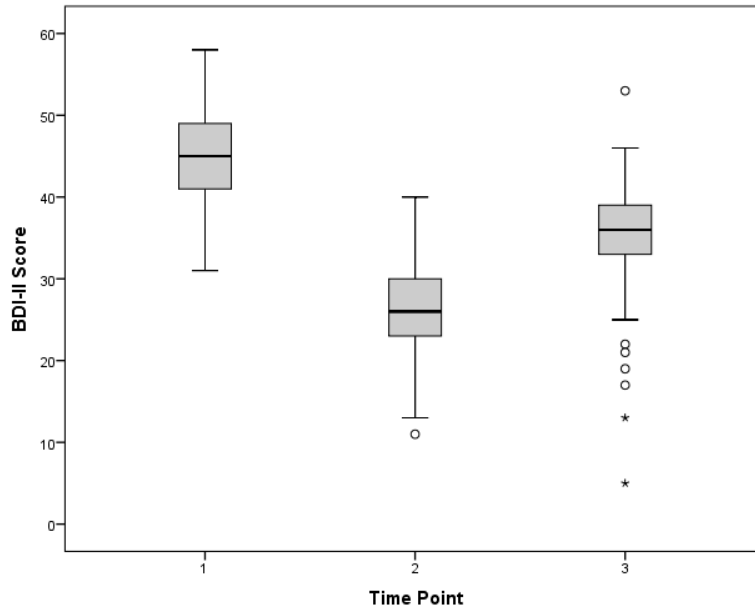
Figure 6. Boxplots showing Depression Symptoms as Measured using the BDI-II score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.

As a repeated measures ANOVA was used, the assumption of homogeneity of variances was tested with Mauchly's test of sphericity instead of Levene's test. For depression, Mauchly's test of sphericity was found to be statistically significant (Mauchly's $W = 0.861$, $df = 2$, $p < 0.001$), thus suggesting heterogeneity of variance. In this situation, it is recommended that either the Greenhouse-Geisser correction or the Huynh-Feldt correction be applied to the data analysis (Girden, 1992). Of the two choices, the Huynh-Felt correction is the preferred technique when epsilon is greater than 0.75. For depression scores, epsilon for the Greenhouse-Geisser was 0.884, and for the Huynh-Feldt correction, epsilon was 0.910. As such, the Huynh-Felt correction was applied to the repeated measures ANOVA results. ANOVA analysis determined there was a significant effect of the time point that the BDI-II was taken at on BDI-II (F (2, 188) = 188.99, $p < 0.001$) and is presented in Table 7.

Table 7

ANOVA Table for Depression (BDI-II)

Variable	Sum of Squares	df	Mean Squares	F	Significance
Time of Survey	16500.04	1.78	9237.19	188.99	< 0.001
Error	8206.61	167.90	48.87		

As there was a significant effect of time of survey on BDI-II score, post hoc testing was conducted to determine which comparisons were significantly different using a Bonferroni correction. All pairwise comparisons were found to be significantly different even with the outliers, as presented in Table 8. The before therapy BDI-II score was found to be significantly higher than both time points after therapy (mean difference with after therapy = 18.61, mean difference with 30 days after therapy = 10.17). The mean BDI-II score 30 days after therapy was also found to be significantly lower than the mean BDI-II score immediately after therapy (mean difference = 8.43). Based on these findings and the ANOVA, we reject the null hypothesis and accept that there is a significant reduction in depression symptoms, as measured by the BDI-II score, for combat veteran's immediately after Ocean therapy and at the 30-day time point. However, the reduction in depression symptoms is significantly less 30 days after therapy than the reduction experience immediately after therapy.

Table 8

Pairwise Comparisons of BDI-II Score at Each Time Point Using a Bonferroni Correction

Variable	Comparison	Mean Difference	Std Error	Significance
Before Therapy	After Therapy	18.61	0.87	< 0.001
	30 Days After	10.17	0.85	< 0.001
After Therapy	30 Days After	-8.43	1.12	< 0.001

RQ3: Is there a decrease in PTSD symptoms among veterans who participate in ocean therapy as measured by the PCL-5 at Time 1, Time 2, and Time 3?

H_{03}: There is no decrease in PTSD symptoms among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

H_3: There is a decrease in PTSD symptoms among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

As previously noted, the first and second assumptions of a repeated measures ANOVA (that the dependent variable is continuous and that the independent variable denotes how subjects have been measured in two or more time points on the same dependent variable) have been met for the third research question. Testing for the third assumption of normality was accomplished by using the Shapiro-Wilk test.

Results showed that the PCL-5 score data were significantly non-normal at time point 1 (0.911 (95), $p < 0.001$), time point 2 (0.875 (95), $p < 0.001$), and time point 3 (0.969 (95), $p = 0.022$). Even though this test was statistically significant at all three time points, the violation of this assumption is not considered to be an issue for the current statistical analysis, as ANOVA is known to be robust against deviations from normality, provided that sample size is more than 30 (Schmider et al., 2010).

Table 9

Tests of Normality for PCL-5

	Shapiro-Wilk		
	Statistic	*Df*	Sig.
PCLScaleT1: PCL-5 PTSD Scale, Time 1	.911	95	.000
PCLScaleT2: PCL-5 PTSD Scale, Time 2	.875	95	.000
PCLScaleT3: PCL-5 PTSD Scale, Time 3	.969	95	.022

The assumption check for statistical outliers was accomplished via a visual inspection of the box and whisker plots for PTSD scores at time 1, time 2, and time 3. Figure 7 below shows only a single potential outlier within the data for PTSD at time 1 and time 3, but based on how close this outlier is to the other data it was not considered of statistical concern.
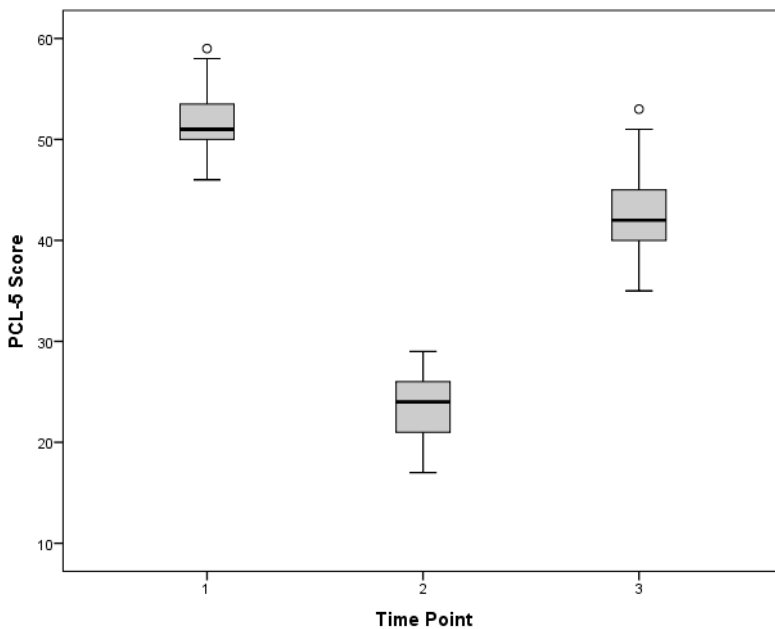

Figure 7. Boxplots showing PTSD Symptoms as Measured using the PCL-5 score at each time point. Time point 1 = before therapy, time point 2 = immediately after therapy and time point 3 = 30 days after therapy.

As a repeated measures ANOVA was used, the assumption of homogeneity of variances was tested with Mauchly's test of sphericity. For PCL-5, Mauchly's test of sphericity was found to be statistically significant (Mauchly's $W = 0.776$, $df = 2$, $p < 0.001$), thus suggesting heterogeneity of variance. In this situation, it is recommended that either the Greenhouse-Geisser correction or the Huynh-Feldt correction be applied to the data analysis (Girden, 1992). Of the two choices, the Huynh-Felt correction is the preferred technique when epsilon is greater than 0.75. For PCL-5 scores, epsilon for the Greenhouse-Geisser was 0.783, and for the Huynh-Feldt correction, epsilon was 0.802. As such, the Huynh-Felt correction was applied to the repeated measures ANOVA results.

The results of the ANOVA for the effect of time indicated a statistically significant change in PTSD symptoms over time ($F(2, 188) = 2040.7$, $p < 0.001$). As there was a significant effect of time of survey on PCL-5 score, post hoc testing was conducted to determine which comparisons were significantly different using a Bonferroni correction. All pairwise comparisons were found to be significantly different, as presented in Table 11. The before therapy PCL-5 score was found to be significantly higher than both time points after therapy (mean difference with after therapy = 29.18, mean difference with 30 days after therapy = 9.46). The mean PCL-5 score 30 days after therapy was also found to be significantly lower than the mean PCL-5 score immediately after therapy (mean difference = 19.72). Based on these findings and the ANOVA, we reject the null hypothesis and accept that there is a significant reduction in PTSD symptoms, as measured by the PCL-5 score, for combat veteran's immediately after Ocean therapy and at the 30-day time point. However, the reduction in PTSD symptoms is significantly less 30 days after therapy than the reduction experience immediately after therapy.

Table 10

ANOVA Table for PTSD (PCL-5)

Variable	Sum of Squares	df	Mean Squares	F	Significance
Time of Survey	42138.96	1.65	25393.77	2040.7	< 0.001
Error	1941.032	155.98	12.44		

Table 11

Pairwise Comparisons of PCL-5 Score at Each Time Point Using a Bonferroni Correction

Variable	Comparison	Mean Difference	Std Error	Significance
Before Therapy	After Therapy	29.18	0.46	< 0.001
	30 Days After	9.46	0.36	< 0.001
After Therapy	30 Days After	-19.72	0.56	< 0.001

Summary

The purpose of this quantitative study was to determine the effect of nature-based therapy on combat veterans with PTSD by measuring PTSD symptoms, depression symptoms and self-efficacy before commencement of Ocean therapy, after finishing the therapy and also 30 days after finishing the therapy. There were no outliers in the data or subjects that failed to complete all rounds of surveys that may have had an impact on quality of statistical analysis. Differences were assessed qualitatively using repeated measures ANOVA analysis. There was found to be a

significant effect of time point of survey on GSE score ($F_{(2,188)} = 644.25$, $p < 0.001$), BDI-II

score ($F_{(2, 188)} = 188.99$, $p < 0.001$) and PCL-5 score ($F_{(2, 188)} = 2040.7$, $p < 0.001$). BDI-II

and PCL-5 were both found to decrease significantly after the initial time point, and GSE score

was found to increase significantly after the initial time point. As such, the null hypothesis for all

research questions was rejected. The significance of these results will be discussed in detail in

Chapter 5.

Summary, Conclusions, and Recommendations

Introduction and Summary of the Findings

There are an estimated 2.6 million Armed Forces Americans that have participated in various wars since 2001, with many of them returning home with injuries associated with traumatic brain issues, and musculoskeletal malfunctions, along with amputations, as well as stress (Radomski & Brininger, 2014). Even without a physical injury, a veteran could develop mild to severe cases of PTSD and PTSD symptoms, which could create daily dysfunction and the need for treatment to improve quality of life and well-being (Radomski & Brininger, 2014). Ocean therapy is a recently developed therapy used to treat veterans with PTSD in the US due to the ability to improve and enhance self-efficacy, as well as reduce PTSD symptoms and depression (Nichols, 2014; Rogers et al., 2014). It is a type of nature-based therapy that primarily uses surfing as the treatment modality, along with group programs to support the therapy using surfing and the camaraderie that comes along with these group activities (Nichols, 2014: Rogers et al., 2014).

In this particular study, a surf program developed by Van Curaza was used. This program is titled Operation Surf and is executed through Amazing Surf Adventures. This program is unique in that it is a curriculum based program that focuses on the veteran learning to surf and connecting with other veterans with PTSD. Operation Surf is a six-day program in which veterans are paired with current and former professional surfers who bond with the participants and keep them safe while going out in the water together, primarily to ride the waves and enable the veterans to successfully experience surfing with all the thrills, confidence and exuberance.

More specifically, Operation Surf begins with the arrival of veterans at the designated hotel where participants will stay six nights and live amongst each other, the volunteers, and the

surf instructors.   The first evening, participants meet at a hotel meeting room for a welcoming and introductions. This meeting is a dinner tin which members of Operation Surf are introduced to the veterans and the veterans introduce themselves to everyone. After dinner, wetsuits and other materials are handed out and dry-land surf instruction takes place. In this instruction participants are introduced to the basics of surfing and how to paddle and stand up on the board. Following the instruction, participants check into their rooms for the evening.

The next morning the participants meet to eat breakfast together and begin the first surfing lesson at 8:00AM. Each participant is paired with experienced surf instructors as well as volunteers to ensure a positive experience as surfing is a challenging sport to learn. Surfing continues through the morning hours until lunch. Lunch is served on the beach where the veterans are able to discuss what they experienced while in the Ocean and begin to socialize with each other. After lunch, surfing resumes with instructors and volunteers aiding all participants. Surfing for the day ends at 2:00PM at which time participants and instructors socialize. After a short rest, participants meet in the hotel lobby and are bused to dinner at local restaurants. The participants continue this schedule for the next four days. Upon completion of day five, the participants and all volunteers and instructors attend a closing ceremony to celebrate their accomplishments over the past week. Ocean therapy, specifically Operation Surf uses the environment as a tool to allow interaction in a new event, encouraging self-empowerment, adventure, and happiness.

The purpose of the study was to determine if this ocean therapy is related to increased self-efficacy, reduced PTSD symptoms and lower depression levels in veterans with PTSD in the United States, as well as motivation. The quantitative study used repeated-measures to determine specific outcomes related to these issues using a sample population of veterans from Santa Cruz,

California, Pismo Beach, California, and Coco Beach, Florida. The study expanded on a Rogers et al. (2014) study that evaluated the impact of ocean therapy on veterans who were experiencing PTSD symptomology, but was limited by the small sample size of 14 participants, along with only investigating PTSD and depression. This study offered further understanding and filled the gap by broadening the sample and by including the relationship between ocean therapy programs and the self-efficacy of the veterans who could to undergo this ocean therapy.

From an original sample of 113 veterans who participated in an ocean therapy program presented by the organization Amazing Surf Adventures, 95 clients responded to the survey and completed all parts of the survey at each collection time, before, immediately after, and 30 days after ocean therapy. Data were collected on three occurrences using SurveyMonkey. The three collection points included: first, prior to participation in the therapy program, second, after participation in the program, and third, at 30 days after participation in the ocean therapy program. The collected data were analyzed using repeated-measures ANOVA for three separate repeated measures. After collection, the data were first entered into excel to generate the PTSD Checklist for DSM-5 (PCL-5), Beck Depression Inventory II (BDI-II) and General Self-Efficacy Scale (GSE) scores for each subject. No demographic data were collected. Data were then entered into SPSS for summary statistic generation and assumption testing.

Study results identified that both PCL-5 and BDI-II had the highest mean values at the first collection point before the therapy began (52.18 and 45.05 respectively). Immediately after finishing the therapy program, both scores were almost half their previous values (22.99 and 26.44 respectively), although at the third data collection point 30 days after therapy, both scores had increased, close to the initial values (42.72 for PCL-5 and 34.87 for BDI-II). These values and changes demonstrated that both PTSD symptoms and depression were improved

immediately after the therapy program, and slightly improved 30 days after the program. Improvement was evident by expressed feelings of less stress, reduced anger, and a sense of calm. Self-efficacy, the belief of the veteran to complete the therapy goals and tasks, showed the opposite pattern which is what was desired, as the mean score was the lowest prior to the beginning of the therapy program (17.33) and increased immediately after 30 days of the program (35.61). There was a drop in GSE score after the 30-day period (31.93), but it is not as large as the change between Time 2 and 3 for PTSD and depression. This demonstrated that self-efficacy increased from before participation in the program to after participation in the program, and there was limited change 30 days after the program when compared to participation immediately after the program.

Summary of Findings and Conclusions

The quantitative study addressed the following research questions, using the General Self-Efficacy Scale or GSE (Schwarzer & Jerusalem, 1995); the BDI or Beck Depression Inventory II (Beck et al., 1996); and the PTSD Checklist for DSM-5 to measure PTSD symptom severity (Weathers et al., 2014), along with the hypothesis reflected beneath to determine the if ocean therapy impacts PTSD, depression, and self-efficacy.

Research Question One. R_1: Is there an increase in self-efficacy among veterans who participate in ocean therapy as measured by the GSE at Time 1, Time 2, and Time 3? The two hypotheses were:

H_{01}:   There is no increase in self-efficacy among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

H_1:   There is an increase in self-efficacy among veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

Outcome. After ANOVA analysis, it was determined that there was a significant effect of the time point that the GSE was taken on (F (2,188) = 644.25, $p < 0.001$). The significance of the ANOVA analysis required that pairwise comparisons with Bonferroni corrections were undertaken to account for the number of comparisons taken. Self-efficacy before ocean therapy as measured by the GSE, was found to be significantly lower than both time points after therapy (mean marginal difference after therapy = 18.28, mean marginal difference 30 days after therapy = 14.60). However, there was also a significant increase in self-efficacy from the immediately after therapy score and the score at 30 days after therapy (mean marginal difference = 3.68). After a review of these findings and the ANOVA results, it was concluded that there was a significant increase in self-efficacy following ocean therapy for combat veterans. However, this increase in self-efficacy is less 30 days after the therapy, but still significantly higher than before the program

Research Question Two. R_2: Is there a decrease in depression in veterans who participate in ocean therapy as measured by the BDI-II at Time 1, Time 2, and Time 3?

H_2: There is a decrease in depression in veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

H_{02}: There is no decrease in depression in veterans who participate in ocean therapy at Time 1, Time 2, and Time 3.

Outcome. ANOVA analysis determined there was a significant effect of the time point that the BDI-II was taken at on BDI-II (F (2, 188) = 188.99, $p < 0.001$). Since there was a significant effect of time of survey on BDI-II score, post hoc testing was conducted to determine which comparisons were significantly different using a Bonferroni correction. Given that, all

pairwise comparisons were found to be significantly different, with the before ocean therapy

BDI-II score found to be significantly higher than both time points after therapy (mean

difference with after therapy = 18.61, mean difference with 30 days after therapy = 10.17). The

mean BDI-II score 30 days after therapy was also found to be significantly lower than the mean

BDI-II score immediately after therapy (mean difference = 8.43).

Due to these findings and the ANOVA results, the null hypothesis was rejected and we

accepted that there was a significant reduction in depression symptoms, as measured by the BDI-

II score, for combat veteran's immediately after ocean therapy and at the 30-day time point.

However, the reduction in depression symptoms is significantly less 30 days after therapy than

the reduction experience immediately after therapy.

Research Question Three. R_3: Is there a decrease in PTSD symptoms among veterans

who participate in ocean therapy as measured by the GSE at Time 1, Time 2, and Time 3.

H_1:   There is a decrease in PTSD symptoms among veterans who participate in ocean

        therapy at Time 1, Time 2, and Time 3.

H_{01}:   There is no decrease in PTSD symptoms among veterans who participate in ocean

        therapy at Time 1, Time 2, and Time 3.

Outcome. The results of the PCL-5 score (F (2, 188) = 2040.7, p < 0.001), were greatly

influenced by the time of the survey. Since there was a significant effect of time of survey on

PCL-5 score, post hoc testing was conducted to determine which comparisons were significantly

different using a Bonferroni correction. All pairwise comparisons were found as significantly

different. The before therapy PCL-5 score was found as significantly higher compared to both

time points after therapy (mean difference with after therapy = 29.18, mean difference with 30

days after therapy = 9.46). The mean PCL-5 score 30 days after therapy was also found to be significantly lower compared to the mean PCL-5 score immediately after therapy (mean difference = -19.72).

Due to these factors and the ANOVA analysis, the null hypothesis was rejected and this researcher accepted that there was a significant reduction in PTSD symptoms, based on the PCL-5 score measurement, for combat veteran's immediately after ocean therapy and at the 30-day data collection point. However, the reduction in PTSD symptoms was significantly less 30 days after therapy compared to the reduction experience immediately after therapy.

Interpretation of the Findings

Self-efficacy. Research question one asked if there was an increase in self-efficacy among veterans who participated in ocean therapy as measured by GSE and the three different data collection times. Research revealed that self-efficacy is based on not only belief, but the development of necessary skills and influences a person's life in every area (Bandura,1995). Self-efficacy before ocean therapy as measured by the GSE, was found to be significantly lower than both time intervals after therapy. However, there was also a significant increase in self-efficacy immediately after therapy and at 30 days after therapy, concluding that there was a significant increase in self-efficacy following ocean therapy for military veterans. However, the increase in self-efficacy is less 30 days after the therapy. These results identify the effectiveness of ocean therapy as a short-term solution for self-efficacy and veterans. The study contributes to the knowledge of self-efficacy and PTSD since there are limited studies on the topic. Similar short-term results were determined by Oman and Bormann's (2015) study about the management of PTSD and self-efficacy of 132 veterans with weekly review for a period of six weeks.

Depression. Research question two inquired if there was a decrease in depression in veterans who participated in ocean therapy as measured by the BDI-II at each time interval. Research spotlighted no significant decrease in depression after participation in ocean therapy, however earlier studies have identified a link between PTSD and depression disorders. The link between PTSD and major depressive disorder (MDD)was an underlying theme in multiple studies. Pukay-Martin et al. (2012) identified that the link between these issues was a concern in their study of Afghanistan, Iraq, and Vietnam veterans. The self-reported assessment highlighted that the development of both of these conditions was associated with higher rates of suicidal ideation, particularly when depression was significant (Pukay-Martin et al., 2012). The same connection was identified in Debeer et al. (2014). Maguen et al. (2012) also highlighted a strong correlation between killing and suicide of military veterans with the suggestion that the combination of PTSD, depression, and substance abuse resulted in suicidal ideation. PTSD and depression were closely tied to Runnals' et al. (2013) study that evaluated the connection between PTSD, MDD, and musculoskeletal pain with a review of almost 2,000 veterans from 2005 to 2010. Study results determined that there was a strong connection between veterans with PTSD and MDD that reported higher pain levels. Ramsawh et al. (2014) was another study that evaluated the tie between depression and PTSD, both separately and jointly of using the PTSD checklist or PCL for assessment. The evaluation of over 5,000 patients resulted in the veterans experiencing feelings of suicide between 25 percent and 29 percent, respectively for each condition independently, but when the veteran has both conditions, the percentage of suicidal likeliness increased to 45% (Ramsawh et al., 2014). In this study, it was anticipated that depression would be reduced at the same rate as the PTSD symptoms due to the comorbidity of

the two, but results show a greater relief of PTSD symptoms than depression. This appears to be an area for further inquiry.

Decreased PTSD symptoms. The goal of research question three was to determine if there was a decrease in PTSD symptoms among veterans who participated in ocean therapy as measured by the GSE at Time 1, Time 2, and Time 3. The study highlighted a significant reduction in depression symptoms, as measured by the BDI-II score, for combat veteran's immediately after ocean therapy and at the 30-day time point. However, the reduction in depression symptoms was significantly less 30 days after therapy than the reduction experience immediately after ocean therapy. Also based on the PCL-5 score measurement, for combat veteran's immediately after ocean therapy and at the 30-day data collection point there was a significant reduction in PTSD symptoms. However, the reduction in PTSD symptoms is significantly less 30 days after ocean therapy than the reduction experienced immediately after therapy. This suggested that ocean therapy is successful at various intervals and due to the finding, it should be used on a more regular basis for sustained and ongoing results. The Rogers et al. (2014) suggested that PTSD symptoms were improved in a small group of veterans using ocean therapy, but warranted a larger sample size and better program evaluation. Caddick and Smith (2014) investigated the use of ocean therapy and outdoor physical activities and military veterans in the United Kingdom. Their study highlighted the feelings of suffering release that occurred from the therapy and the nature environment using various forms of physical water activities (Caddick & Smith, 2014).

PTSD has a variety of symptoms leading to comorbidity conditions of alcohol and drug abuse, despair, feelings of hopelessness and shame, and job problems, as well as relationship issues, along with physical violence towards friends and family (Javidi & Yadollahie, 2012).

Historically, veterans with PTSD symptoms were believed to have avoided social settings due to increased feelings of arousal and amplified responses when startled (Hauffa et al., 2011; Myrseth et al., 2012). Symptoms such as relationship conflicts with a spouse are believed to be associated with PTSD, evidenced by greater aggression towards a partner and the dissolution of marriage (Monson et al., 2009). The sharing of military experiences in discussion was found to relieve the PTSD symptoms associated with relationship stress in Balderrama-Durbinet al. (2013). Reduction of PTSD symptoms was also associated with other alternative treatment approaches. Hollifield (2011) identified a reduction in PTSD symptoms with the use of acupuncture, along with Strauss et al. (2011), which conducted a twelve-week study of acupuncture administration biweekly for roughly 60 minutes. Reduced symptoms were sustained when a follow-up was conducted 24 months after the initial treatment (Strauss et al., 2011).

Mindfulness-based stress reduction or MBSR is another alternative therapy that has been tried with PTSD diagnosed veterans. Kearney et al. (2012) investigated the approach with veterans with results that indicated there was a moderate impact for PTSD depression, when meditation was used with mantras, evidenced by greater calm and peacefulness. Nature-based therapies use programs with activities conducted in nature settings, such as gardening (Stigsdotter et al., 2010). Stigsdotter's et al. (2010) research showcased the healing effects associated with stress related mental disorders and nature-based therapies, but the effects were not sustained long-term like in this ocean therapy study, thus suggesting future sessions are needed to sustain reduced PTSD symptoms.

Implications

The current study sheds light on the use of ocean therapy to treat veterans with PTSD and PTSD symptoms, particularly in the immediate and short-term capacity. Benefits of ocean

therapy provided a reduction in aggression and stress, which reduces incidences of this type of behavior on family and friends, and provides a sense of well-being for the veteran. Healthcare providers and organizations that deal with veterans and PTSD are encouraged to add ocean therapy as a program practice, alongside other alternative approaches. Harnessing the power of the need for adrenaline exhibited by many veterans, without the use of medications, has huge appeal to sustaining the quality of life for the veteran and their family. Ocean therapy is a great approach to addressing PTSD relief in the short-term, as well as the potential of long-term with repeated event outings of ocean therapy. The current literature review did not reveal any traditional approaches that were used in conjunction with ocean therapy. However, Nicholas (2014) and Rogers et al. (2014) suggested that the therapy could be used as a practice addition.

Theoretical implications. Theoretically the study advanced on the research of Rogers et al. (2014) by identifying the use of ocean therapy as an immediate and short-term use to address PTSD, PTSD symptoms, depression, and self-efficacy. This was evident by the improvement in scores, both immediately and temporarily. With increased ad hoc testing, the null-hypotheses were rejected and resulted in increased identification of ocean therapy benefits. Study results suggested that the use of a sports-oriented therapy intervention with traditional treatments has the promise to treat veterans with PTSD, if the veteran has an interest in radical sports or can develop an interest in these types of sports activities. The transition from combat to everyday life can be challenging and complex for veterans and establishes the need for creative and effective interventions. Ocean therapy offers the connection and merger of surfing and the veterans' past experiences to develop greater social connections, alongside the need for an adrenaline rush, ultimately resulting in an alternative experience that can be life changing (Adler et al., 2009; Hoge, 2011). The study utilized the theoretical framework in the literature of self-efficacy. The

study added to the body of research with an increased sample size and demonstrated short-term results, which can improve the outlook of veterans suffering from issues associated with PTSD.

Practical implications. Practical implications include short-term benefits of reducing issues associated with PTSD. Increased practice use of ocean therapy with existing traditional and alternative treatments can potentially create long-term sustainability of well-being for veterans with PTSD. Incorporating a sports-oriented treatment program as part of a practice is an option to treat PTSD veterans who have symptoms, depression, and who have issues coping with life after the military, as well as have needs to engage in behaviors with risk. High intensity sports such as surfing are socially acceptable activities that veterans can learn to reduce PTSD. Programs of this nature can provide transition support after military life. Further studies are required to support the use of these types of high intensity programs as a stand-alone treatment or paired with medication and / or talk therapy

Future implications. Ocean therapy provides goal oriented activities that establish feelings of self-efficacy in a noncombat setting. The findings from this quantitative study suggest that sports-oriented therapy interventions show promise and merit further investigation, specifically programs associated with high intensity sports such as surfing. Future examination of the effectiveness of multiple types of sports interventions such as kayaking and rock climbing may be valuable. Adapting programs of this type to enable veterans with cognitive and physical disabilities to participate should also be evaluated as an alternative to existing programs, as well as to be used in conjunction with existing approaches.

Limitations of the Study

The study used data collected before ocean therapy, immediately after therapy, and 30 days after therapy. While these intervals have substantial value for improved outcomes in the

short term, greater follow-up is needed to understand the sustaining ability beyond the 30-day window. Additional review is required after 30 days to gain a better understanding of the benefits of ocean therapy at six months, one year, and up to five years. The study size was small although larger than previous studies such as Rogers et al. (2014), 95 participants was still a small group versus the estimated 84% of individuals diagnosed as suffering from PTSD and PTSD symptoms (Javidi & Yadollahie, 2012). The execution of the study was purposeful and methodical with data collection and management, as well as analysis and instruments used. The survey tool used yielded more than a 50% return of participants, while adequate and greater than existing studies, needs to be further evaluated to gain greater participation. The implementation of the study used standard tools for a study of this nature.

Recommendations for Future Research

Ocean therapy could be studied at a greater length to fully gauge the success of the approach for long-term use. Although successful in the immediate and short-term, it may not sustain the veteran for the amount of time needed to reduce or eliminate PTSD and PTSD symptoms. Group and individual sessions need to be conducted both in the short-term and long-term to increase self-efficacy and balance the need for adrenaline seeking activities. Perhaps the inclusion of family and friends in the sessions needs to be studied, as this increases communications about the veteran's military and ocean therapy experiences. Larger sample sizes need to be used, as well as studies of longer durations need to be considered and performed. The incorporation of ocean therapy to be used in conjunction with traditional and other alternative therapies could be further studied to identify potential benefits. There may also be value in collecting and analyzing demographic date to determine if there are any significant factors with age, physical condition, years in service, experiences in combat, gender, family structure and

more that determine how a participant respond to ocean therapy. Another area of focus could be how the number of participants within each Operation Surf program could influence the data collected. Would smaller groups provide a more intimate bonding experience that would have longer lasting results? A qualitative study of the participant's experience would be useful to understand why the changes occur and to better understand what would be more beneficial for a longer lasting result.

Recommendations for Future Practice

The purpose of this quantitative study was to determine the effect of nature-based therapy on combat veterans with PTSD by measuring PTSD symptoms, depression symptoms and self-efficacy before commencement of ocean therapy, after finishing the therapy and also 30 days after finishing the therapy. Differences were assessed quantitatively using repeated measures ANOVA analysis. Significant effects were discovered at the time point of survey on GSE score ($F(2,188) = 644.25$, $p < 0.001$), BDI-II score ($F(2, 188) = 188.99$, $p < 0.001$) and PCL-5 score ($F(2, 188) = 2040.7$, $p < 0.001$). BDI-II and PCL-5 scores were both found to decrease significantly after the initial time point, and GSE scores were found to increase significantly after the initial time point. As such, the null hypothesis for all research questions was rejected.

Researchers have demonstrated that PTSD is comorbid with major depressive disorder and substance abuse disorders which have been linked to high rates of suicide attempts and suicide (Javidi & Yadollahie, 2012). Evidence-based treatments are available, but only a few veterans who are diagnosed with PTSD or PTSD symptoms, get treatment due to existing military culture, stigma, and lack of access to mental health care. Evidence-based treatments for veterans with PTSD have included medication and cognitive-behavioral therapy, prolonged exposure therapy, and cognitive processing therapy, which is particularly effective for treating

female victims of traumatic sexual events, and veterans and active duty members with trauma related to war activities, as well as survivors of significant car accidents (Holliday et al., 2014). Stress inoculation therapy and eye movement desensitization and reprocessing are considered successful PTSD treatment methods (Gates et al., 2012). Providing more treatment options for veterans could increase the number of veterans who seek treatment.

Veterans with PTSD frequently seek experiences and activities that provide an adrenaline rush (Rogers et al., 2014). Research and this study support that ocean therapy can be a substitute for illegal adrenaline oriented behaviors, as well as extreme aggressive and physical behaviors at various intervals in the life of these patients. Surfing like other extreme sports, produces an adrenaline rush and suggests that programs designed with this type of group activity can be highly affective and can be introduced when needed to relieve PTSD symptoms and increase self-efficacy, as well as reduce depression.

The findings of this study combine all of these elements and demonstrate and explain the benefits of ocean therapy for veterans with PTSD, both immediately and short-term, as well as potential long-term benefits if participation is ongoing. The study was guided by Bandura's (1977; 1986; 1997) self-efficacy theory, and ocean therapy enhanced self-esteem, and had a positive impact on PTSD veterans. The increase in self-efficacy in veterans upon completion of ocean therapy is significant in that high self-efficacy allows the veteran to feel as they are in charge of the direction of their life whereas most entered the program with low self-efficacy. Veterans with low self-efficacy feel the victim of circumstances and are more likely to withdrawal from society and engage in self-destructive behaviors. With the increase in self-efficacy the veteran looks at life with possibilities instead of dread.

The benefit of ocean therapy for PTSD-diagnosed veterans had a calming and meditative impact, which has ramifications for better quality of life, improved relationships, and decreased depression and PTSD symptoms. It is recommended that ocean therapy be incorporated into future practices as an alternative or in conjunction with other approaches. High intensity sports such as surfing are socially acceptable activities that veterans can learn to reduce PTSD. Programs of this nature can provide transition support after military life. Further studies are required to support the use of these types of high intensity programs in practices.