

RESEARCH

Reducing Veterans' Symptoms of Depression, Anxiety, Stress, and Posttraumatic Stress, and Enhancing Engagement in Occupations with SCUBA Diving and Occupational Therapy

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Veterans face significant occupational and mental health challenges. This article explores whether an occupational therapy program in combination with SCUBA diving can enhance occupational performance and mental health outcomes for veterans more than SCUBA diving alone. A two-group random assignment pretest–posttest design was implemented to compare outcomes across two groups. Veterans in Group 1 ($n = 7$) completed SCUBA diving while those in Group 2 ($n = 8$) completed SCUBA diving in combination with occupational therapy. Outcomes were measured using the Canadian Occupational Performance Measure, PTSD Checklist for DSM-5, and the Depression, Anxiety and Stress Scale. Both groups participated in a semi-structured focus group post-participation. Additionally, those in Group 2 engaged in follow-up phone interviews. Trial registration number: NCT03928392. All participants significantly improved their occupational performance and satisfaction with performance, and reduced symptoms of PTSD, depression and stress. Those in Group 2 also experienced significant reductions in anxiety levels and reported applying learned interventions to daily life. Participating in SCUBA diving may contribute to reduced symptoms of PTSD, depression and stress among veterans. Engaging in occupational therapy may additionally contribute to reduced symptoms of anxiety and aid in therapeutic application of interventions to daily life.

Keywords: Veterans; SCUBA diving; occupational therapy; depression; anxiety; stress; posttraumatic stress disorder; occupational performance

Introduction

The United States Department of Veterans Affairs estimates that the incidence of mental health disorders among veterans receiving services from the Veterans Health Administration increased from 27 percent in 2001 to 41 percent in 2014 (USDVA, 2017). Veterans are at risk of developing mental health conditions, such as posttraumatic stress disorder (PTSD), depression, and anxiety disorders due to encounters with traumatic events during combat (U.S. Department of Health and Human Services, n.d.). In addition, experiencing mental health problems may negatively impact the transition from combat to civilian life and interrupt participation in the occupations of sleep, health management, leisure, social participation, community mobility, work, and education (Plach & Sells, 2013; Hwang et al., 2013). Through the use of occupation-based interventions, occupational therapists aim to enhance participation in meaningful occupations by

addressing underlying factors such as depression, anxiety, and posttraumatic stress. One promising occupation-based intervention that has received little attention in the occupational therapy literature includes Self-Contained Underwater Breathing Apparatus (SCUBA) diving.

Morgan and colleagues (2017) conducted a study with 15 veterans in which they investigated the therapeutic benefits of participating in SCUBA diving for veterans who had experienced combat. Their findings suggested that SCUBA diving contributed to reduced symptoms of anxiety, depression, and insomnia, and improved social functioning (Morgan et al., 2017). The researchers proposed that SCUBA diving was beneficial as it demanded veterans' complete focus and provided a feeling of weightlessness (Morgan et al., 2017). Similarly, in a study with individuals with physical disabilities, Carin-Levy and Jones (2007) reported that the sensation of weightlessness enabled individuals to feel

free from their impairments. They further noted that SCUBA diving may enhance individuals' quality of life through meaningful social experiences and improved self-concept.

The therapeutic benefits of SCUBA diving may potentially be enhanced with occupational therapy interventions. For instance, much like SCUBA diving, surfing is a high-intensity sport that offers the opportunity for veterans to engage in risk-seeking behavior in a healthy environment (Rogers, Mallinson & Peppers, 2014). In 2014, Rogers and colleagues designed a program in which veterans engaged in five weekly sessions comprising surfing in the ocean and follow-up group discussion led by an occupational therapist. The group discussions focused on resilience building and highlighted a different theme each week: role identity, leadership and trust, community building, problem solving, and transition. Veterans experienced significant decreases in their symptoms of PTSD and depression after participation in the program (Rogers, Mallinson & Peppers, 2014). In a broader meta-analysis, including 11 randomized controlled trials, researchers reported that occupational therapy interventions improved engagement in occupations and well-being of individuals diagnosed with mental health conditions (Ikiugu et al., 2017).

Although SCUBA diving and occupational therapy have both been found to benefit veterans with mental health conditions, there is limited research on whether the combination of both interventions would enhance benefits more than SCUBA diving alone. Therefore, the research question for this study was: Does an occupational therapy program in combination with SCUBA diving enhance occupational performance and mental health outcomes for veterans more than SCUBA diving alone?

Methods

Design

A two-group random assignment pretest–posttest design was implemented along with focus group discussion, and

follow-up phone interviews one month after program completion. Participants were randomly assigned into two groups using simple random allocation. *Group 1* engaged in SCUBA diving alone. *Group 2* received occupational therapy interventions and SCUBA diving. The occupational therapy interventions spanned three sessions and consisted of deep breathing, stretching, mindfulness strategies, group discussion, and journaling activities. Both groups completed two SCUBA dives in the ocean, spaced three weeks apart, during the months of February and March 2019.

Both groups completed pre-assessments approximately one week prior to the intervention. Session one took place in a classroom at a local school. Occupational therapy interventions for sessions two and three were provided before and after the SCUBA dives, while on the boat or back on shore. Session four took place in a private room at a local restaurant. Post-assessments were given approximately two weeks after the intervention (see **Figure 1**). Additionally, participants in *Group 2* engaged in follow up phone calls one-month post program completion. Ethical clearance for the study was obtained by Loma Linda University's Institutional Review Board. The study was registered as a clinical trial on clinicaltrials.gov (NCT03928392).

Participants

Participants were recruited from the Wounded American Veterans Experience SCUBA (WAVES) Project, an organization providing SCUBA diving experiences for veterans. Veterans who were members of the WAVES Project for at least three months and had previously completed at least three ocean SCUBA dives were invited by the director of the WAVES Project via an email flyer or in person to sign up for participation in the study. Additionally, participants were required to be between 18 and 95 years of age and proficient in English. Those who expressed interest in participating in the study were randomly placed into one of two groups using simple random

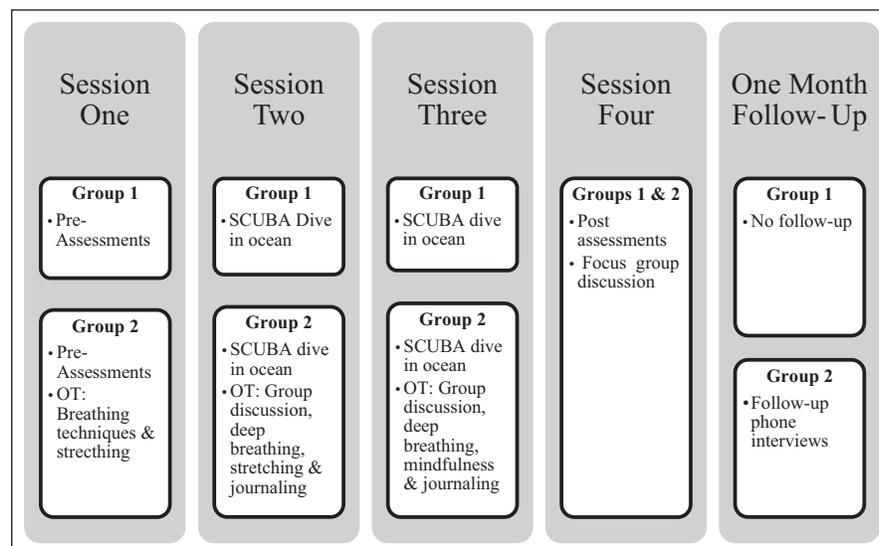


Figure 1: Outline of the research process for participants in Group 1 and Group 2.

allocation. Prospective participants attended “session one,” which included an overview of information related to the study and those agreeing to participate signed an informed consent form. Upon consent, participants were informed of their group allocation and completed pre-assessments.

Instruments

A demographic questionnaire along with three standardized assessments [Canadian Occupational Performance Measure (COPM), PTSD Checklist for DSM-5 (PCL-5), and Depression, Anxiety and Stress Scale (DASS-21)] were administered during session one. The demographic questionnaire included six questions regarding age, gender, ethnicity, educational level, marital status, and employment status. The standardized assessments were re-administered in session four along with a focus group discussion.

The COPM was used to assess veterans' perception of, and satisfaction with, their occupational performance (Law et al., 2014). The veterans identified personal goals using the COPM. The assessment was scored by averaging ratings for “performance” and “satisfaction with performance” for the five most important goals (ranging from 1 to 10). The COPM has been used in research studies to measure perceived performance and satisfaction with performance (Plach & Sells, 2013).

The PCL-5 is a 20-item self-report measure used to assess symptoms of PTSD (Blevins et al., 2015). Items are presented as a list of problems people may have as a result of a stressful situation. Respondents are required to indicate how much they have been bothered by this problem in the past month. An example problem is, “Repeated, disturbing, and unwanted memories of stressful experience?” Problems are rated on a four-point Likert scale where 0 = “not at all”, 1 = “a little bit”, 2 = “moderately”, and 3 = “quite a bit, or extremely.” A total score was generated by summing all responses. The PCL-5 has demonstrated sound psychometric properties (Wortmann et al., 2016).

The DASS-21 is a screening tool used to assess symptoms of depression, anxiety, and stress in community settings (Lovibond & Lovibond, 1995). The DASS-21 consists of 21 questions and is comprised of three subscales: The Depression scale which measures hopelessness, low self-esteem, and low positive affect; the Anxiety scale which assesses autonomic arousal, musculoskeletal symptoms, situational anxiety and subjective experience of anxious arousal; and the Stress scale which assesses tension, agitation, and negative affect (Tran, Tran & Fisher, 2013). Each item is presented as a statement and respondents are asked to indicate how much the statement applied to them over the past week. An example statement is: “I found it hard to wind down.” Items are recorded on a four-point Likert scale where 0 = “did not apply to me at all”, 1 = “applied to me some degree, or some of the time”, 2 = “applied to me to a considerable degree or a good part of time”, and 3 = “applied to me very much or most of the time.” Subscales were calculated by summing corresponding responses. The DASS-21

has demonstrated excellent reliability, internal consistency, and temporal stability (Nieuwenhuisen et al., 2003).

During session four, all participants engaged in a focus group discussion. The focus group was guided by 16 semi-structured questions related to veterans' overall experiences in the program, aspects of the program enjoyed or requiring improvement, development of coping strategies, and experiences with occupational therapy interventions. Example questions included: “How was your overall experience with the program?” and “How was your experience with occupational therapy different in addition to SCUBA?” Additionally, follow-up phone calls were held individually with seven out of eight participants in *Group 2*. The phone interview comprised of six semi-structured questions related to the effects of occupational therapy in combination with SCUBA diving and its impact on participants' mental health and daily life. An example question was: “With your participation in both SCUBA diving and occupational therapy, have you noticed any changes in stress, gloominess, and overall uneasiness?”

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics for Windows Version 25.0 (IBM, 2017). Participants' characteristics were summarized using counts and percentages for categorical variables and mean \pm standard deviation (*SD*) for quantitative variables. Distribution of gender, ethnicity, marital status, educational, and employment status by study group was assessed using a chi-square test of independence. Additionally, an independent t-test was used to compare mean scores at baseline between the two groups. Changes from pre-test to post-test scores by study group for COPM, PCL-5, and DASS-21 were examined using 2×2 factorial design. The primary analysis included a comparison between groups using the group \times time interaction effect. If the interaction was statistically significant, pre-test versus post-test score changes were examined using paired t-test for each group separately. If the results of the interaction were not statistically significant, the between-groups comparisons were considered not statistically significant. The level of significance was set at $p \leq 0.05$.

Qualitative data obtained from the focus group and follow-up phone interviews were transcribed verbatim and coded by applying descriptive coding. The primary author and last author, together with six student researchers coded each transcript separately and then came together as a group to cross-check, discuss, and confirm codes to be recorded in the codebook. Upon completion of the codebook, they met to condense codes by grouping related codes and engaging in concept mapping. Codes were condensed sequentially into categories and then themes (Miles, Huberman & Saldana, 2014).

Results

A total of 15 male veterans participated in this study, with seven participants in *Group 1* and eight participants in *Group 2*. Veterans were between 28 and 57 years of age,

with an average age of 42.3 ± 7.8 years. Seven veterans were Caucasian, seven were Hispanic/Latino, and one was African American. The majority of the veterans were married ($n = 13$, 86.7%). Seven veterans were employed (46.7%), six were retired or unable to work (40%), one veteran was looking for work (6.7%), and one veteran was a student (6.7%). Veterans' education level varied from high school level education ($n = 3$, 20%), vocational training ($n = 1$, 7.7%), associate's degree ($n = 3$, 20%), Bachelor's degree ($n = 5$, 33.3%), Master's degree ($n = 2$, 13.3%), to professional degree ($n = 1$, 7.7%). There was no significant difference in participants' characteristics by study group (Table 1).

Changes in Occupational Performance

Results of the factorial ANOVA are displayed in Table 2. There was no significant group by time interaction effect for veterans' COPM perceived performance and satisfaction with their occupational performance ($p = 0.99$ and $p = 0.96$, respectively); however, there was a significant improvement in mean \pm standard error (SE) over time (pre versus post) for the combined groups (4.8 ± 0.5 versus 5.7 ± 0.5 , $p = 0.036$, partial $\eta^2 = 0.30$; and 3.0 ± 0.3 versus 4.1 ± 0.3 , $p = 0.009$, partial $\eta^2 = 0.42$, respectively).

Changes in PTSD, Depression, Anxiety, and Stress

Overall, results revealed significant changes across both groups indicating improved mean \pm SE mental health symptoms' scores for PTSD, depression, and stress over time (pre versus post) for the total sample (44.4 ± 5.4 versus 25.9 ± 5.0 , $p = 0.001$, partial $\eta^2 = 0.59$; 17.0 ± 2.9 versus 9.8 ± 2.8 , $p = 0.001$, partial $\eta^2 = 0.59$, and 22.6 ± 3.2 versus 13.6 ± 2.8 , $p = 0.007$, partial $\eta^2 = 0.44$, respectively). However, there was no significant group by time interaction effect for veterans' PTSD, depression, and stress ($p = 0.88$, $p = 0.59$ and $p = 0.95$, respectively), Table 2 indicates that the improvement did not differ significantly between the two groups.

In terms of anxiety, there was a significant group by time interaction effect ($p = 0.03$, partial $\eta^2 = 0.20$). Thus, we ran a paired t-test to examine changes in anxiety for each group separately. Participants in Group 2

(SCUBA + OT) had a significant decrease in mean \pm SD anxiety (18.3 ± 8.4 versus 7.1 ± 9.2 , $p = 0.03$), but the change in Group 1 was not significant (8.6 ± 11.4 versus 8.3 ± 9.6 , $p = 0.30$).

Table 1: Baseline characteristics by study group ($N = 15$).

	Group 1 Scuba ($n_1 = 7$)	Group 2 OT and Scuba ($n_2 = 8$)
Male, n (%)	7 (46.7)	8 (53.3)
Age, Mean \pm SD	44.3 ± 8.0	40.6 ± 7.7
Ethnicity, n (%)		
Caucasian	3 (42.9)	4 (50.0)
Hispanic	4 (57.1)	3 (37.5)
African American	0 (0.0)	1 (12.5)
Marital status, n (%)		
Single	2 (28.6)	0 (0.0)
Married	5 (71.4)	8 (100.0)
Education, n (%)		
High school	1 (14.3)	2 (25.0)
Trade/Technical	0 (0.0)	1 (12.5)
Associate	2 (28.6)	1 (12.5)
Bachelor	3 (42.9)	2 (25.0)
Master	1 (14.3)	1 (12.5)
Professional	0 (0.0)	1 (12.5)
Employment status, n (%)		
Employed for wages	2 (28.6)	2 (25.0)
Self-employed	2 (28.6)	1 (12.5)
Looking for work	0 (0.0)	1 (12.5)
Student	1 (14.3)	0 (0.0)
Retired	1 (14.3)	2 (25.0)
Unable to work	1 (14.3)	2 (25.0)

Abbreviations: SD, Standard Deviation; OT, Occupational Therapy.

Table 2: Changes of Mean (SE) of outcomes by study group over time ($N = 15$).

	Scuba ($n_1 = 7$)		OT and Scuba ($n_2 = 8$)		P-value over time (η^2)	P-value for interaction effect (η^2)
	Pre	Post	Pre	Post		
COPM Performance	5.4 (0.7)	6.3 (0.7)	4.2 (0.6)	5.1 (0.6)	0.036 (0.30)	0.99 (0.00)
COPM Satisfaction	3.1 (0.50)	4.2 (0.4)	3.0 (0.5)	4.1 (0.4)	0.009 (0.42)	0.96 (0.00)
PTSD	39.4 (7.9)	21.6 (7.3)	49.4 (7.3)	30.3 (6.8)	0.001 (0.59)	0.88 (0.00)
Depression	16.3 (4.2)	10.0 (4.2)	17.6 (3.9)	9.5 (3.9)	0.001 (0.59)	0.59 (0.02)
Anxiety	8.6 (3.9)	7.1 (3.3)	18.3 (3.7)	10.3 (3.1)	0.04 (0.28)	0.03 (0.20)
Stress	20.0 (4.7)	10.9 (4.1)	25.1 (4.4)	16.4 (3.9)	0.007 (0.44)	0.95 (0.00)

Abbreviations: SE, Standard Error; OT, Occupational Therapy, COPM, Canadian Occupational Performance Measure; PTSD, Post Traumatic Stress Disorder.

Emerging Themes from Qualitative Data

Results from focus groups and phone interviews indicated that the participants felt they experienced benefits from occupational therapy and SCUBA diving, and these benefits were sustained one-month post participation. Analysis of qualitative data revealed three themes: Benefits of occupational therapy, SCUBA benefits, and Universality in daily life.

Benefits of Occupational Therapy

Overall, participants expressed satisfaction and gratification with the occupational therapy interventions alongside SCUBA diving. Randy stated, "It was a great experience...I hope and wish a lot of other veterans get to experience it because it definitely is mind blowing." Participants reported positive effects from occupational therapy interventions including increased self-awareness, increased regulation, decreased anxiety, and improved mood. For example, George explained, "I was about to like flip out that I just tried to remember, all right, I'm getting to that point. Let me try to use these breathing techniques and everything like that to try to calm down." Participants further noted that including occupational therapy with SCUBA diving helped them to further establish trust and develop camaraderie. For instance, Owen shared "...they really opened up a lot um, a lot more than, uh, than what we usually have for some reason."

Occupational therapy interventions that were described as beneficial included journaling, breathing exercises, and stretching. In describing the benefits of deep breathing, Kevin shared, "when you feel angry or agitated, you know, after doing those breathing techniques for a while, you don't, you're doing them and you don't even realize that you feel like it just calms you down." Similarly, George stated: "...so I think the breathing helped me out a lot." Nick found the following techniques to be most impactful: "I think the second week's journaling with the mindfulness and trying to find time for yourself and free your mind and just by yourself and reflect." Most participants shared that journaling was difficult but beneficial. For instance, Cooper reflected that journaling had the most significant impact on him: "journaling was the most the toughest part." He went on to say: "At one point you can't lie to yourself...you and yourself and it actually brings out like...I kind of jacked my life...and then how to reflect on that and how do you change that?" Even though most participants found the journaling activity to be meaningful, they recommended that the journaling prompt questions should be simplified to be more easily understood.

At the one-month follow-up phone interviews, participants shared that they were applying the breathing exercises learned in the OT sessions. Nick described: "...I think that the breathing does help me. It helps me relax, and it, and it helps me with the whole experience." Likewise, George said, "...I did try to take away the breathing techniques you've got to be able to help, try to calm me down and I built that." Further, at the follow up interview, a number of participants shared that the journaling activities during the program caused them to "open up" and supported the increase in self-awareness.

Kevin noted, "...getting a veteran to open up and talk about things are not always easy." Further, Randy shared the following experience: "I go and talk to my psychiatrist every week and she noticed, uh, I was smiling a little bit more, um, being more engaged to our conversations." Although participants noted the value of reflection and openness, they did not continue journaling after the program was completed. Cooper explained, "...it does help out a lot to tell you the truth, but it just, it's just taking the time to do it." Building journaling into their daily routines without the accountability of the OT group was difficult.

SCUBA Benefit

Participants' descriptions of the effects of SCUBA diving on their mental health was profound across both groups. They noted improved concentration, increased focus, decreased stress, and decreased anxiety. Nick said, "My mind doesn't wander at all...I can kind of concentrate on myself and think about me when I'm down there." Upon completing a SCUBA dive, participants were calmer and more relaxed. For example, commenting on something another diver did, Luke shared, "...normally that would just drive me nuts. But after a dive it didn't bother me at all." The impact of SCUBA diving was so strong that even thinking back to the dive was calming as Connor explained: "...even remembering back to the dive, you know, if you're feeling a little agitated or whatever, you know, that can bring you back to just calm and happy, you know." Participants described that being able to SCUBA dive helps them to regulate their mood, and that agitation may occur if too much time has lapsed between dives. For example, Nick shared, "I can see that just the difference that it's made in my life... few weeks that I haven't been able to dive much. My irritability has gone way up." Further, Cooper commented: "...it does lower my anxiety dramatically, especially when I dive more often." Veterans emphasized the need to SCUBA dive regularly to be able to stay emotionally regulated and connected in their daily lives.

Further benefits of SCUBA diving included camaraderie and improved relationships. Robert described the camaraderie he experienced as: "...diving with these people, with the group we all speak a certain language, we all understand, you know, one another." Some participants noted improved relationships with their spouses as a result of SCUBA diving. George explained, "It helped, I feel a lot for me and, uh, brought my wife and I a little bit closer as well." Physical benefits were also noted in the area of pain relief. Luke described, "...underwater all that pain, cause you're weightless. So, all my joints and everything spread and relax and it's relaxing that way too for me. So, it's a lot of pain relief."

Other common benefits of SCUBA diving were continued learning and a sense of meaning. Luke described how learning was naturally intertwined with SCUBA diving: "...like every time you go out and dive, I've learned something from it." Jose further commented, "...it's learning from our mistakes is one thing when it happens to us, but trying to learn from somebody else's mistakes." Being part of SCUBA diving

gave veterans something to be proud of. When reflecting on a previous dive, Jackson stated, "...we were up right on line right where we needed to be. And I was like kind of proud of that." In addition, Arnold shared, "I think right after SCUBA diving it helps your daily life... cool stories to tell or an experience you just had with your friends and family." Arnold clearly felt that the positive effects of SCUBA continued to impact him the rest of the day.

Universality in daily life

This theme captures how participants were able to apply the experiences and interventions learned from the program to their everyday life. Everyday life included overall health, everyday stressors and relationships. Toby said, "I guess you can say it [SCUBA diving] helped my, my daily life and made me take care of my health better." When considering the impact on his daily life, Jose shared, "Uh, it [SCUBA diving] just calms me down whenever I'm doing. So no matter what happens, I'm like uhh okay, let's do it, let's take care of it. You know then I know how to look at it in a different way versus attacking it." Similarly, Nick stated, "...when I go SCUBA diving for at least a couple of days after I dove...I'm a lot less irritable. I don't snap as quick...the more I dive, the better it is for not only me but for the people around me."

The ability to apply occupational therapy techniques in daily life was strongly emphasized at the one-month follow-up. Cooper stated, "it was a definitely a big improvement in my day to day activities and so it was great." He went on to describe,

... breathing exercises throughout the course of the day or during the drive or you know, when you're stuck in traffic and you want to just lose it, but, uh, you know, slow down, do a little bit of breathing and, you know, uh, you'll realize that it's not all that bad. You can calm yourself down...

Further to this, at the follow-up interview Kevin described applying breathing exercises, "...my ability to apply that [breathing techniques] on a regular basis definitely helps." He went on to explain "...if I'm frustrated or, or angry or just irritable, I tried to apply those, the breathing techniques...allows me to kinda direct my, my attention on, on the situation and try to deal with it in a more productive manner." Additionally, Owen shared how he applies mindfulness techniques, "...I started getting frustrated or stressed out with something that's going on. I'll kind of step back and just kind of step back and breathe for a little bit, calm myself down."

At the one-month follow-up participants in *Group 2* were also able to describe how the occupational therapy techniques aid them in their relationships and completing everyday simple activities. For instance, George described how he uses the breathing techniques to help with his family relationships: "...I get like angry with my wife or daughter or something like that...then I'm able to

use those breathing techniques, uh, help me control it a little bit better." Similarly, at the follow-up Kyle reflected how deep breathing gives him a sense of control and confidence in coping: "...the whole breathing and a lot of OT type techniques is controlling what you have control over so that you know, anything you don't have control over is a little bit softer of a blow." In addition, Randy explained, "...it definitely helped out with, uh. Other activities besides SCUBA diving, uh, you know waiting in line or having my wife drive, um. Using those breathing techniques that really helps." Veterans continued to apply the occupational therapy interventions to cope with a range of daily life situations one month after the intervention.

Discussion

Veterans are faced with a range of mental health challenges and engaging in SCUBA diving and occupational therapy may significantly reduce negative symptoms and improve occupational engagement and participation in life roles. Participating in SCUBA diving alone, or SCUBA diving in combination with occupational therapy appears to result in similar mental health outcomes with improved occupational performance and satisfaction with performance, and reduced symptoms of PTSD, depression, and stress. However, there are a few differences that should be highlighted. Firstly, veterans who received occupational therapy interventions in addition to engaging in SCUBA diving had significantly reduced symptoms of anxiety. A possible explanation for this is that veterans learned strategies such as mindfulness and breathing exercises as part of the occupational therapy intervention, which could be applied to daily life, resulting in reduced anxiety. Similar results have been reported by Shepardson, Tapio and Funderbunk (2017) who surveyed 182 veterans and found that they employed a range of self-management strategies including deep breathing techniques and relaxation to manage daily stressors, and that 91% of veterans identified these strategies as effective for reducing anxiety. Veterans in the present study further noted that they naturally apply deep breathing while SCUBA diving, and that intentionally extending this to daily life helped them to self-regulate when outside of the water. Therefore, it appears that it is beneficial to combine occupational therapy with SCUBA diving to aid veterans in recognizing the therapeutic value of SCUBA diving and its application to daily life; occupational therapy seems to serve as a bridge connecting the occupation of SCUBA to engaging in real life situations. Secondly, while veterans across both groups expressed comradery as a significant benefit to SCUBA diving, veterans who participated in SCUBA diving and had occupational therapy noted that the connection between participants was "deeper" and that they opened up more than usual.

Participants in the present study expressed that the comradery experienced while SCUBA diving with peer veterans was meaningful as they had shared experiences and spoke the "same language." Previous studies have shown that

post-deployment social support can significantly buffer traumatic stress and reduce negative emotions (Pietrzak et al., 2009). Further, Price, Pallito, and Legrand (2017) studied the influence of perceived social support among individuals who experienced potentially traumatic events and reported that increased social support reduced symptoms of depression, anxiety, and PTSD. Similarly, upon investigating the impact of different sources of social support among marine recruits, Smith and colleagues (2013) reported that having support from one's military unit was more important than support from family and friends for buffering posttraumatic stress symptoms, and this was particularly true among males. Although measures of perceived social support were not incorporated in the present study, participants described comradery as a significant component of the SCUBA diving experience and this may have accounted for some of the variance in mental health results. Future investigations should focus on the impact of social support on mental health outcomes among veterans who SCUBA dive.

Further benefits of SCUBA diving described by veterans included experiencing increased focus and concentration when in the water and reduced pain. Of particular importance was the finding that participating in SCUBA diving had a profound impact on veterans' mental health. Supporting qualitative data revealed renewed mental health benefits upon each SCUBA dive. Participants described a decreased ability to regulate emotions and manage daily stressors when time had extended beyond a few weeks between dives. Previous studies have demonstrated the significance of participating in meaningful occupations among veterans, such as participating in surfing (Rogers, Mallinson & Peppers, 2014), sensory-enhanced hatha yoga (Stoller et al., 2012), and competitive sports (Spornier et al., 2009) for improving mental health and quality of life. The findings of the present study add to this body of literature suggesting the need to develop occupation-based interventions, such as engaging in SCUBA diving, for veterans experiencing mental health symptoms on a regular basis and provide opportunities for continued long-term participation in the occupation.

In 2013, Plach and Sells used the COPM to identify the five highest declines in occupational performance for veterans returning from service and these were described as: engagement in relationships, school, physical health, sleeping, and driving. In contrast to these findings, the results of the present study demonstrate significant improvements in occupational performance and satisfaction with performance. Additionally, at the one-month follow-up, veterans who received occupational therapy together with SCUBA diving described application of learned strategies to daily life including managing family relationships, self-regulation, and completing daily tasks. Improved relationship functioning is of particular value in light of previous reports indicating that rates of interpersonal violence range from 13.5% to 58%, with the highest rates among veterans with psychosocial disorders as well as increased combat exposure (Marshall, Panuzio & Taft, 2005). Further,

research suggests that veterans may experience interpersonal impairment due to emotional numbing (Ruscio et al., 2002). Consistent with this, participants in the present study described difficulty with completing journaling tasks as they had to confront their thoughts and emotions. However, the veterans recognized the therapeutic value of completing journaling activities and appreciated the opportunity for self-reflection, which allowed them to position themselves at a stance from their emotions and respond in a calculated manner, rather than relying upon automatic responses. Based on these findings, building opportunities for self-reflection and emotional awareness as part of an occupational therapy intervention alongside SCUBA diving appears warranted.

Limitations of this study include a small sample size and failure to blind participants to the intervention. Further, we did not obtain information about participants' past deployments that may have offered further insights for our results. Additionally, we did control for SCUBA diving that may have occurred alongside the intervention during the study period. We recommend that future studies implement a "supplementary intervention" for *Group 1* as a control to ensure that participants across both groups are blinded to the intervention. Additionally, another focus for future studies is to compare the outcomes between engaging in SCUBA diving and occupational therapy to engaging in an existing evidence-based intervention such as cognitive processing therapy or prolonged exposure therapy. Further, it is important that a longitudinal study be implemented to track the long-term impact of engaging in SCUBA diving among veterans.

Conclusion

Overall, findings suggest that SCUBA diving provides a range of therapeutic benefits for veterans including improved occupational performance, and reduced symptoms of PTSD, depression, and stress. Key therapeutic features of SCUBA diving include the use of deep breathing techniques, experiencing comradery, and immersion underwater which evokes a state of relaxation to help manage daily stressors. Occupational therapy appears to be beneficial alongside SCUBA diving, providing opportunities for self-reflection and highlighting the therapeutic value of SCUBA diving. Supplementing SCUBA diving with occupational therapy interventions may reduce symptoms of anxiety and help veterans to apply therapeutic interventions to improve occupational performance and manage daily life stressors.

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Competing Interests

The authors have no competing interests to declare.

Author Contributions

- The first author helped in designing the study, obtaining approval from the Institutional Review Board, implementing study procedures, analyzing study results, and writing up study findings for publication.
- The second author collaborated with the SCUBA diving organization, helped to design and implement the intervention of the study, and reviewed the write up of the study.
- The third author performed statistical analysis for the study, helped to interpret study findings, write up, and edit the study findings.
- The fourth author provided support with designing the study, writing the application for the Institutional Review Board, and editing the write up of the study.

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