Can ocean therapy treatment be effective in promoting relaxation, reducing stress, and in relieving symptoms of mood disorders by utilizing multifactorial approaches such as neuroscience and evolutionary biology, ocean-based occupational therapy, and active and passive proximity to the ocean?

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Mental illnesses are increasing at dangerous rates world wide. As time goes on, more children and adults are diagnosed every year. Access to affordable and accessible mental health care treatment is limited. New programs and therapeutic techniques that are low cost and easily implemented are needed in order to provide effective treatment to those with mental illnesses. This paper discusses ocean therapy techniques and how they are being used to treat the depressive symptomatology of mental health patients. Research is highly influenced by studies and reports with quantitative and qualitative evidence. Overall, I found that ocean therapy has scientific, anecdotal, and statistical evidence that suggests that this type of therapy is highly successful in reducing stress and symptoms of mental illness. These conclusions indicate that forms of ocean therapy should be used to treat the symptoms of mental health patients. Further research could show if additional forms of ocean therapy are successful in reducing the depressive symptomology of patients with mental illnesses.

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Part I: Introduction

The number of people suffering from mental health conditions in the US is increasing at an alarming rate. Between the years 2012 and 2015, the rates of children suffering from severe depression went from 5.9% to 8.2% (Mental Health by the Numbers). One in every five adults suffers from a mental health condition and mental health and behavioral problems are the leading cause of disability worldwide (Mental Health Statistics: UK and Worldwide.). As the prevalence of mental health issues increases, possible treatments for these disorders are also also increasing. Alternative therapies are being successfully used to treat mood disorders. One promising form of alternative therapy that reduces depressive symptomology in patients with mood disorders and stress in general is ocean therapy. The therapeutic effects of the ocean are being harnessed in different ways in order to promote relaxation.

Technological advances in the way that we understand the process of relaxation and meditation, neuroscience, evolutionary biology and medical research illustrate how water entices relaxation and provides therapeutic effects. Brain scans illustrate how minds are at peace when exposed to the natural environment. Ocean-based forms of occupational therapy such as: sailing, kayaking, fishing and swimming are shown to have a beneficial impact on participants with mental health problems and those looking to reduce stress in general. Surf Therapy, the most studied and understood form of ocean therapy, has been proven to decrease symptoms of PTSD

(post traumatic stress disorder) among war veterans. Ocean therapy offers an alternative to pharmaceutical and traditional therapies for mental illness. Ocean therapy treatment is effective in promoting relaxation, reducing stress, and relieving symptoms of mood disorders by utilizing multifactorial approaches such as neuroscience and evolutionary biology, ocean based occupational therapy, and active and passive proximity to the ocean.

Part II: Historical Context

Historically, the ocean was considered to be vast and frightening. The darkness and depth of the sea has evoked fear in many humans. And yet over the course of history thousands of vessels were used to transport explorers, merchants, migrants, and slaves across oceans. Ships have been used to import and export goods and valuables like gold, sugar, tobacco, and rice. Because of frequent shipwrecks, people associated the ocean with death and drowning. Strong currents and fluctuating tides were seen as uncontrollable and therefore dangerous. Early mapmakers, particularly in the 1600's, included detailed illustrations of sea monsters. During the renaissance, more and more monsters began to appear on maps (Swanson).

Fear of the vast oceans did not stop humans from experiencing the benefits of being near the ocean. "Ocean therapy" is an umbrella term for the usage of the ocean in a way that will benefit the mental health of the individual. The earliest use of ocean therapy occurred in the late 1700's. After years of frightening human experiences on the ocean, new attitudes were beginning to emerge. Paintings illustrating the beauty of the ocean, encouraged tourists to visit

the oceanside and appreciate the beautiful landscape. During the late 1800's and early 1900's, doctors began to prescribe trips to the beach. Doctors believed that time in or near the ocean could treat what they referred to at the time as "melancholy" or "spleen"- which was associated with depression and moodiness. Robert Burton, an English scholar who wrote the book *The Anatomy of Melancholy,* describes the term melancholy as an illness of the soul and body associated with the spleen. Burton suggested that changing one's environment by traveling and looking at the horizon was the best way to treat melancholy. Because of Burton's suggestions and other societal changes, vacations to the beach grew increasingly popular. During the next two centuries, doctors prescribed time in the cold waters of the ocean with increasing frequency. Physicians noted how long, how often, and under what conditions patients should spend time in the sea. They even suggested different beaches for different ailments. Antoine Lavoisier discovered oxygen in 1778 and because people believed that the sea breeze was rich in oxygen, many theories about the health benefits of ocean air began to emerge. By the early 1900's, seaside resorts sprouted in France, Germany, and Scandinavia. By the late 1900's many other resorts designed for seaside vacations, opened worldwide (Swanson).

Part III: Research and Analysis

Ocean and The Brain

Electroencephalography also known as EEG, was the first test to be able to determine what parts of our brain are activated at a given time. A more recent invention of brain scanning techniques, the fMRI (functional magnetic resonance imaging) machine, uses magnetic fields to align protons in the hydrogen atoms of blood and use radio waves to disaligne them. As protons

realign, they send signals for oxygenated and deoxygenated blood which the fMRI machine can detect. The machine uses different colors to indicate the concentration of energy in a given location of the brain (Nichols 29).

Discoveries found by the use of various brain scanning machines help us understand how the brain reacts to different stimuli. A study by Sands Research examined 45 women who were viewing videos with commercials. They were given *Saturday Night Live* skits and three videos of ocean environments: a swimming turtle, an undersea kelp forest, and a clip from the point of view of a diver underwater. Brain scans from an EEG machine and eye movements were used to assess what Steve Sands referred to as *emotional valence* which is the positive/negative and approach/withdrawal reaction to each video. The reading indicated that exposure to ocean environments evoke positive emotions and sustained attention among participants and showed that cognitive engagement was lower when participants viewed the ocean videos. This inferred that the underwater clips were supporting a mental rest period among participants (Nichols 142).

This may be explained because focused time in nature can distract or 'turn off' the frontal lobe which is the part of our brain associated with cognitive control and attention. Energy is then concentrated in the emotional parts of the brain, indicating security and providing a calming effect. These results become evident with the use of various brain scans. Natural environments, like the ocean, are predictable to the human brain in the sense that if one visits a beach or park over and over, the likelyhood of the scenery being the same is high compared to urban

environments. This eases the brain and limits the amount of information that the brain needs to process (Ravassard).

The primary purpose of the brain is to solve problems based on a natural environment to promote survival (Medina 31-32.) Throughout the evolution of the human brain, neural networks evolved and were able to gain the skills of sight, hearing, smell, touch and taste. Over time, these skills led to the ability to read, write, and make art and music (Changazi 27). Neuroplasticity is our brain's ability to strengthen parts of the brain that we need and use the most, and weakening the parts that we use the least. Because of this, our brains are shaping themselves throughout our lives based on the environments around us. This is our species way of evolving over time in order to best adapt to our environment (Nichols 36).

Everyone's brain is ultimately shaped differently based on the experiences and the environments that we have been exposed to. A 2011 study done by researchers at the Princeton University Neuroscience Institute measured the brain's response to unorganized environments. They discovered that exposure to cluttered environments distracts the brain and can overload the senses, which makes it more difficult for the brain to process information (Mcmains).

Other studies show that areas of our brain associated with empathy become more active when exposed to natural scenes and urban scenes promote more activity in the amygdala which is the part of our brain that gives us response to danger and is significantly related to chronic stress (Gwang-Won.) Our natural instincts are heightened in natural environments which allows

our minds to decompress and stop processing every aspect of man-made environments. This implies that time near the ocean allows our brain to function as they're biologically intended to, reducing stress and promoting wellness.

Occupational Therapy and the Sea

Water is loved and cherished globally and most of us utilize water for recreation in some form. Over 500 million people around the world use water as a form of recreation in order to exercise, relax, and play. Millions of people across the United States participate in water based activities like motorboating, snorkeling, kayaking, fishing, water skiing, jet skiing, sailing, scuba diving, and swimming. In fact, swimming is the fourth most popular recreational activity in the United States (Healthy Swimming). The most studied form of ocean therapy is the use of surfing to promote wellness and in some cases, treat symptoms of PTSD.

Post traumatic stress disorder (PTSD) is a psychological condition that can develop among people who have been exposed to traumatic events. Symptoms of PTSD include extremely disturbing feelings and thoughts. Often times, people with PTSD relive their trauma by experiencing vivid flashbacks of traumatic memories. They often avoid situations that would remind them of unpleasant memories and sometimes have extreme reactions to simple things like loud noises or unexpected touches. Symptoms of PTSD are sometimes not detected until months or years after the the traumatic event/s that precipitated the disorder. PTSD is very common

among veterans returning from combat. Some veterans with PTSD develop intense and debilitating depression, anxiety, hyperarousal and hypervigilance (Parekh).

Surf therapy has been shown to be an effective form of treating symptoms of PTSD among veterans. Surf therapy is the combination of traditional therapy techniques and surfing to reduce depressive symptomology and promote wellness. Participants engage in group therapy as well to reflect on lessons and process emotions. The results of a study published in the The American Journal of Occupational Therapy show that surfing is effective in introducing soldiers back into society, boosting their self efficiency, and relieving symptoms of post traumatic stress disorder. Participant reports showed that PTSD symptom severity was significantly lower after a five week study and median PTSD symptom scores (PCL-M) dropped by 21 points. The study reads, "A potential explanation for the improvement in PTSD and depression symptoms reported by the participants in this study may be that programs like Ocean Therapy provide opportunities for successful performance in goal-directed activities and in doing so create a renewed sense of self-efficacy in a non-combat environment." The results of this study are demonstrated around the world among non-profit organizations and charities that use Surf Therapy to decrease depressive symptomology and promote wellness (Rodgers).

Sergeant Andrew Manzi served in Iraq and returned to the United States with post traumatic stress disorder. After discovering how much surfing was able to help him get his life back together, he opened a nonprofit organization called Warrior Surf, which provides free surfing lessons and therapy for veterans and their families. In the last two years, Manzi was able

to help over 300 people with Surf Therapy (Dunn). Another program called Operation Surf, that offers surf therapy to veterans, published a quantitative study on the results of their participants showed a decrease in PTSD symptoms by 36%, a decrease in depression by 47%, and an increase in self-efficacy by 68% (Crawford).

Surf Therapy is not just used for veterans struggling with mental health, it is also used as therapy for people with mental and physical disabilities. A charity called Healing Waves debuted their first session in September of 2017. They aim to use surfing and the ocean as a therapy for anyone with any condition, at any age. Charity owners Dominic Booth, Seán Burke and Max Wiltshire have helped the anxiety of 17 year old, Adam. He shares, " I have autism and find the water very therapeutic. I always feel a bit uncomfortable on land but when I surf I feel very comfortable" (Surfers Hope to Make Waves with Ocean Therapy Charity).

Adam isn't the only one gaining relief from anxiety from surf therapy, A program called The Wave Project, started by the National Service in Cornwall, United Kingdom, aims to help the mental health and improve the wellbeing of young people by providing surfing lessons and mentorship (Taylor). The Wave Project has published an evaluation report of a six week project done about the benefits of surfing for the wellbeing and mental health of the youth. Results from both qualitative and quantitative evidence shows that the project had a genuine, positive impact on clients especially in building confidence and self esteem ('Surf Therapy' Evaluation Report).

Surf therapy has a high success rate among mental health patients with various symptoms and diagnoses. Various studies and charities provide both statistical and anecdotal evidence that portrays surf therapy as highly beneficial for people from all backgrounds. This form of Ocean Therapy is successful yet poorly recognized. If the idea of surf therapy was publicized more, many patients near the coast could benefit from it. Given the high rates of suicide in PTSD this therapy could possibly even save lives.

While Surf Therapy is certainly the most established form of ocean therapy, other forms of Ocean Therapy are also effective. Various programs offer the use of ocean-centered activities as a form of therapy and stress reduction. Some programs use sailing as way to cope with stress or mental health problems. A man named Rorke Miller from Michigan, a recipient of the Old Pulteney Maritime Hero Award, gives troubled teens sailing lessons in hopes to regain their sense of purpose. Miller explains that "kids leave their problems, bad behavior and habits at the dock." Rorke Miller combines therapy from sailing with traditional therapy with a therapist. Miller has also started a program that combines traditional therapy with small boat building and paddle boarding (Harding).

Rorke Miller isn't the only person to use sailing lessons as therapy for people with mental health problems. A charity called Sea Sanctuary in Cornwall, United Kingdom, uses sail training and health education to support participants at any age or ability. Sea Sanctuary aims to improve self-awareness of participants in the stimulating environment of the ocean. The program teaches participants coping strategies in hopes to improve mental wellbeing, anxiety management, and

identifying bad habits in behavior. One client referred to her time on the boat as “the most soul-searching and fulfilling days of my life!” (Quentin).

Kayaking is similar form of Ocean Therapy that is currently being used to help patients of mental illness. Heros on the Water is an organization that takes veterans kayak fishing. Founder Jim Dolan describes kayak therapy as being quick and inexpensive. A study done of Dolan’s program done in 2013 showed that his program resulted in 78 percent reduction in overall stress, 77 percent reduction in hypervigilance, and 63 percent reduction in avoidance behavior. All are common symptoms of PTSD. Kayaking and paddling requires cross body coordination which stimulates both sides of your brain and has been shown to be effective at treating symptoms of PTSD (Schuff).

Active and Passive Proximity

Proximity to the ocean, either active or passive (observing the ocean or being immersed in it) is the most common way of benefiting from the ocean. One Japanese study shows a strong difference in mood and mental health issues between patients who regularly visit the beach and those who do not. The study found that the beach environment has a positive influence on mood and mental health (Peng). Certain scientists suggest that high concentrations of negative ions, which can be found near any beach, are beneficial in decreasing symptomatology of mental health patients. Negative ions are molecules that have gained or lost an electrical charge and are created in nature as molecules break up due to sunlight, radiation, moving air and water. They are invisible molecules that can be found in higher concentrations near bodies of moving water.

Negative ions are thought to induce a biochemical reaction that can boost serotonin levels which can relieve depression and stress, as well as boost energy (Mann). One study done by Columbia University shows that exposure to a negative ionizer can be effective in treating depression, possibly as much as antidepressants (Terman). Another study found a correlation with negative air ionization and reduction of depression, however, the study concluded that no consistent influence was found with reducing anxiety and improving mood, relaxation, sleep, and personal comfort (Perez). More research should be done in order to confirm or quantify the positive effects of negative air ionization and mental health. However, there is evidence suggesting that negative ions could be beneficial in decreasing depressive symptomatology of mental health patients.

Exposure to negative ions is not the only way to benefit from visiting the ocean. Watching water and aquatic life in aquariums, another form of passive proximity, is also linked to stress reduction and promotion of a better mood. The National Marine Aquarium in Plymouth, England conducted a study that monitored the heart rate, blood pressure, relaxation levels and moods of 112 participants who spent time observing an aquarium tank with various levels of biodiversity. The study found that all levels of biodiversity were shown to drop participant's blood pressure levels in just the first five minutes of observation. The most significant changes in heart rate, relaxation, and mood occurred when the participants observed the highest level of biodiversity (Cracknell). Another study completed in 1984 by researchers from the Schools of Dental Medicine and Veterinary Medicine at the University of Pennsylvania researched different treatments for to reduce anxiety among dental patients before surgery. Researchers asked if

viewing a poster or aquarium with or without hypnotic induction was effective in reducing the stress of patients. The study showed that viewing the aquarium, with or without hypnosis was significantly more relaxing. The study actually showed that hypnosis did not offer additional relaxation to those observing the fish tank (Katcher). Passive proximity to the ocean is a promising way of gaining from the ocean. This is likely due to a combination of factors such as negative air ionization and the brains reaction to a natural environment, specifically one with a high level of biodiversity.

Active proximity to the ocean is to be physically interacting with it. The use of Thalassotherapy, a concept that was introduced in France in 1800 and gained popularity by the 1820's, is defined by the use of seawater in cosmetic and health treatment. Thalassotherapy is now popularly used worldwide by various spas that offer seawater and seaweed treatments. Seaweed wraps areis a popular form of thalassotherapy because its composition is essentially concentrated seawater, which is rich in an abundance of minerals such as iodine and trace elements and is believed to treat tuberculosis, arthritis, infections colds and influenza, worm infestations, and increase libido. Some species of seaweed have been used to treat cancer and induce child labor in China (Tyrrell).

The benefits of actively immersing yourself in ocean water can be explained by the absorption of minerals and trace elements and the resistance and pressure of water, that combined, aids in making swimming and soaking a form of ocean therapy. The director of the National Aquatics and Sports Medicine Institute at Washington State University, Bruce E Becker, explains that the pressure of water outside of the body is greater than the pressure inside of the body which forces blood away from the extremities and toward the heart and lungs. The

heart then begins to work harder, pushing a higher volume of blood more efficiently and and circulating more than 30 percent more blood volume throughout the body. In order to keep up with the extra blood, the arterial blood vessels relax and create less resistance to blood flow. One hormone that regulates how our arteries function is catecholamine, which is part of the body's response to stress. As Becker explains it, "During immersion, the body sends out a signal to alter the balance of catecholamines in a manner that is similar to the balance found during relaxation or meditation" (Becker). This means that immersion in water by swimming, soaking, playing or exercising can entice a state of relaxation. Passive and active proximity to the ocean is a key part of Ocean Therapy because it is scientifically proven to promote relaxation and could be used to treat mental illness. Many of the world's population already uses the ocean in someway to relax and have fun. These positive attributes to visiting the ocean can be used to benefit the lives of millions of mental health patients worldwide.

Part IV: Conclusion

Many forms of therapy involving the ocean and water are effective in promoting relaxation and can be used in the treatment of various mood disorders. These therapeutic modalities have been explored throughout history when doctors would prescribe time spent at the beach for patients with depression. Statistical, scientific, and anecdotal evidence suggests that the beach environment can be effective in treating mood disorders, boosting mood, and promoting relaxation. With this being said, brain scans and the use of new medical technology show that water and natural environments are effective in slowing the brain process and inducing feelings

of calmness and wellness. Evolutionary biology suggests that exposure to natural environments, such as the ocean, is important in order to connect to our natural instincts and to stimulate the emotional sections of one's brain. This is known to be true because multiple programs are already successfully improving the lives of participants by introducing them to ocean therapy.

Most existing programs combine the use of ocean therapy and traditional therapy but there are few programs that combine the use of passive and active proximity to the sea, ocean based occupational therapy, and traditional therapy techniques. Further research is needed to identify the most effective method of ocean therapy and what types of ocean therapies can be combined in order to maximize results .A program that combines elements of ocean therapy would likely be very effective in treating symptomology of patients and promote wellness and relaxation.

Additionally, implementation of these therapies has the potential to increase job satisfaction, improve productivity, boost creativity, and improve overall quality of life. Research in these areas may help quantify the potential benefits of ocean therapy and provide a revenue stream for further research. Ocean based therapy should be an accepted form of therapy and included in consideration of possible treatment modalities. Cost benefit studies have not been done but are unlikely to result in a negative recommendation.

Ocean based therapies do not necessarily require proximity to the ocean. The effects on mood by water or natural landscape are not specific to the ocean and be achieved by exposure to

any natural landscape or water source. Additionally, water-based occupational therapies such as kayaking, fishing, swimming, motorboating, and soaking can and should be added to any comprehensive therapeutic approach.

In conclusion, ocean therapy is a promising form of therapy that has been shown to be effective and should be further researched and implemented. This type of therapy offers an affordable, accessible way to treat symptoms of mood disorders, reduce stress, and promote relaxation. The lives of many struggling people world wide could be positively influenced if introduced to ocean therapy. Ocean therapy treatment is an effective, and accessible way to promote relaxation, reduce stress, and relieve symptoms of mood disorders by utilizing multifactorial approaches such as neuroscience and evolutionary biology, ocean based occupational therapy, and active and passive proximity to the ocean.

Works Cited

Becker, Bruce. “Healing Waters .” *Aquatics International* , June 2007, pp. 27–32.

Changizi, Mark A. *Harnessed: How Language and Music Mimicked Nature and Transformed Ape to Man*. Benbella Books, Inc., 2011.

Cracknell, Deborah, et al. “Marine Biota and Psychological Well-Being.” *Environment and Behavior*, vol. 48, no. 10, 2016, pp. 1242–1269., doi:10.1177/0013916515597512.

Crawford, Russell. The Impact of Ocean Therapy on Veterans with Posttraumatic Stress Disorder. The Impact of Ocean Therapy on Veterans with Posttraumatic Stress Disorder.

Dunn, Meghan. “Vets Use Unconventional Therapy to Treat PTSD.” *CNN*, Cable News Network, 17 Dec. 2017, www.cnn.com/2017/08/31/health/cnn-hero-andrew-manzi-warrior-surf/index.html.

Harding, Daniel. “Rorke Miller: The Helping Hero.” *Yachting Magazine*, 6 Mar. 2014, www.yachtingmagazine.com/rorke-miller-helping-hero.

“Healthy Swimming.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 15 Sept. 2016, www.cdc.gov/healthywater/swimming/fast-facts.html.

Katcher, Aaron, et al. “Comparison of Contemplation and Hypnosis for the Reduction of Anxiety and Discomfort during Dental Surgery.” *American Journal of Clinical Hypnosis*, vol. 27, no. 1, 1984, pp. 14–21., doi:10.1080/00029157.1984.10402583.

Kim, Gwang-Won, et al. “Functional Neuroanatomy Associated with Natural and Urban Scenic Views in the Human Brain: 3.0T Functional MR Imaging.” *Korean Journal of Radiology*, vol. 11, no. 5, 2010, p. 507., doi:10.3348/kjr.2010.11.5.507.

Mann, Denise. “Negative Ions Create Positive Vibes.” *WebMD*, WebMD, www.webmd.com/balance/features/negative-ions-create-positive-vibes#1.

Medina, John. *Brain Rules: 12 Principles for Surviving and Thriving at Work, Home and School*. Pear Press, 2014.

"Mental Health Statistics: UK and Worldwide." *Mental Health Foundation*, 9 Mar. 2017, www.mentalhealth.org.uk/statistics/mental-health-statistics-uk-and-worldwide.

"NAMI." *NAMI: National Alliance on Mental Illness*, https://www.nami.org/Learn-More/Mental-Health-By-the-Numbers

Nichols, Wallace J. *Blue Mind*. Back Bay Books; Reprint Edition, 2015.

"On the Water." *On the Water - Living in the Atlantic World*, Smithsonian Natural Museum or American History , americanhistory.si.edu/onthewater/exhibition/1_2.html.

Parekh, Ranna. "What Is Posttraumatic Stress Disorder?" *American Psychiatric Association*, Jan. 2017, www.psychiatry.org/patients-families/ptsd/what-is-ptsd.

Peng C, Yamashita K, Kobayashi E (2015) An Empirical Study on the Effects of the Beach on Mood and Mental Health in Japan. J Coast Zone Manag 18:412. doi: 10.4172/2473-3350.1000412

Perez, Vanessa, et al. "Air Ions and Mood Outcomes: a Review and Meta-Analysis." *BMC Psychiatry*, vol. 13, no. 1, 2013, doi:10.1186/1471-244x-13-29.

Quentin, Caroline. "What Is Sea Sanctuary?" *Sea Sanctuary* , www.seasanctuary.org.uk/about-us.

Ravassard, Pascal, et al. "Multisensory Control of Hippocampal Spatiotemporal Selectivity."*Science*, American Association for the Advancement of Science, 2 May 2013, science.sciencemag.org/content/early/2013/05/01/science.1232655.

Rogers, Carly M., et al. "High-Intensity Sports f/or Posttraumatic Stress Disorder and Depression: Feasibility Study of Ocean Therapy With Veterans of Operation Enduring Freedom and Operation Iraqi Freedom ." The American Journal of Occupational Therapy, vol. 68, July 2014, pp. 395–404., doi:10.5014/ajot.2014.011221.

Shuff, Tim. "Healing Waters: Kayaking as Therapy." *Rapid Media*, 1 May 2014, www.rapidmedia.com/adventurekayak/categories/departments/5864-healing-waters-kayaking-as-therapy.

"Surfers Hope to Make Waves with Ocean Therapy Charity." *Baliwick Express* , 9 Aug. 2017, www.bailiwickexpress.com/jsy/news/surfers-hope-make-waves-ocean-therapy-charity/.

"'Surf Therapy' Evaluation Report ." *The Wave Project*, Oct. 2010, www.waveproject.co.uk/wp-content/uploads/2011/08/Wave-pilot-report-vs2.pdf.'

Swanson, Ana. "The Weird Origins of Going to the Beach." *The Washington Post*, WP Company, 3 July 2016, www.washingtonpost.com/news/wonk/wp/2016/07/03/the-weird-origins-of-going-to-the-beach/?utm_term=.a4c3e10e66c3

Taylor, Joe. "Giving Kids a Break: How Surfing Has Helped Young People in Cornwall Overcome Mental Health and Social Difficulties." *Mental Health and Social Inclusion*, vol. 17, no. 2, 2013, pp. 82–86., doi:10.1108/20428301311330135.

Terman, Michael, and Jiuan Su Terman. "Treatment of Seasonal Affective Disorder with a High-Output Negative Ionizer." *The Journal of Alternative and Complementary Medicine*, vol. 1, no. 1, 1995, pp. 87–92., doi:10.1089/acm.1995.1.87.

Tyrrell, Fiona. "Is There Any Science behind Benefits of Seawater Therapy?" *The Irish Times*, The Irish Times, 23 Feb. 2013, www.irishtimes.com/news/health/is-there-any-science-behind-benefits-of-seawater-therapy-1.472923.