

## Short Communication

## Open Access

## Application of the Diving Response in Treating Anxiety Disorders and Depression

Peter Kyriakoulis

Positive Psychology, VIC Melbourne, Australia

**\*Corresponding author**

Peter Kyriakoulis, Positive Psychology, Oakleigh, VIC Melbourne, Australia.

**Received:** January 07, 2025; **Accepted:** January 08, 2025; **Published:** January 21, 2025

The diving response (DR) is an innate adaptation that we share with aquatic and land mammals as well as birds and reptiles. According to the aquatic ape theory we once spent a considerable amount of time in the water, hence this adaptation has evolved over time to enhance our survival chances by conserving oxygen when submerged in water [1].

The DR is activated when our face encounters cold water or moisture, and it is usually exaggerated when simultaneously holding our breath (apnea).

This allows us to stay in the water for longer as our heart rate decreases, and all the blood is redistributed to the chest cavity, heart, and brain given that these are vital organs for survival [2]. Cold water facial immersion is superior in reducing heart rate when compared to immersions of other body parts and that the water temperature is a significant stimulus for driving the DR.

Training effects have been noted in elite breath-hold divers, such as freedivers and synchronized swimmers. Kyriakoulis et al. in their study found that activating the DR via cold facial immersion (CFI) can reduce panic cognitions and physiological symptoms of anxiety in clients suffering from anxiety [3]. Historically, the DR has been activated in emergency departments at hospitals to treat paroxysmal atrial tachycardia [4]. My interest in this area began once I learnt about the DR whilst completing a freediving course to improve my performance in underwater activities such as spear fishing. Following many years of clinical practice and research in which I have been able to apply the CFI task in the treatment and management of anxiety disorders, and with depression, this short paper aims to enlighten colleagues and clients of a number of proposed treatment protocols that involve activating the DR that I have been using in clinical practice for several years with excellent outcomes.

In clinical practice, I use it in the management and treatment of anxiety symptoms and as a behavioral experiment to psycho-educate clients and provide them with biofeedback which may include respiration rate and heart rate. The application of the DR is consistent with a bottom-up treatment approach, focusing on stabilizing the nervous system, building therapeutic trust, and a sense of psychological safety and control whilst focusing on increasing confidence by making it a positive experience and approaching feared situations that have been habitually avoided. In this short

commentary opinion, I aim to explain how the DR activation can be used in the treatment of anxiety disorders such as Panic Disorder (PD), Post Traumatic Stress Disorder, (PTSD), Obsessive Compulsive Disorder (OCD), Generalized Anxiety Disorder (GAD) and Social Anxiety Disorder (SAD), and Specific Phobia (SP). Moreover, how it can also be used in the treatment of depression and in managing stress.

**Panic Disorder (PD)**

I often educate clients on how the DR elicits a bradycardiac effect and that during a panic attack, it can reverse their anxiety symptoms via cold facial immersion (CFI). Practicing the CFI task between psychology sessions can assist with developing training effects and over time facilitate the prevention of panic attacks. The application of regular practice of the CFI task, and breath holding over time can help decrease one's carbon dioxide sensitivity, a factor that has been linked with PD [5].

A behavioral experiment can be used where the therapist can model how to hyperventilate with a client in order to expose them to their feared bodily symptoms, so they learn to habituate over time to their feared symptoms. Applying the CFI task once a client has hyperventilated and providing them with biofeedback can teach the client that the hyperventilation can mimic panic symptoms and cognitions, and they can be reversed when one immerses their face in cold water for approximately 30 seconds. Breathing techniques are usually taught to slow down breathing and maximize breath hold ability prior to the CFI task. Biofeedback can be provided by simply having a client insert their finger into a pulse oximeter which will display one's heart rate on a second-to-second basis, and oxygen saturation levels whilst their face is immersed in cold water. Given this pronounced response of the bradycardiac effect of the DR, clients are usually surprised at the reduction of their heart rate and the oxygen saturation levels at times increasing given that it is an oxygen conserving mechanism. The hyperventilation challenge would usually increase one's respiration and heart rate as well as cause vestibular symptoms such as dizziness, and lightheadedness in some clients, as well as numbness and tingling sensations in others. The reversal of these symptoms is usually achieved by the activation of the DR via the CFI task, which not only leads to an exaggerated bradycardiac effect but also induces parasympathetic nervous system responses. The CFI task can generally be administered multiple times; however, 2-minute surface time is required between administrations to ensure safety with water and breath-holds.

### **Post Traumatic Stress Disorder (PTSD)**

When delving into trauma work with clients, educating them about trauma and its effects on memory and the body are key. It is important to psycho-educate clients about their trauma symptoms and teach them coping skills, so they know how to stabilize their nervous system when emotionally triggered and dysregulated. When one is dissociating, the cold facial immersion task can bring someone back to the present moment, given that the cold water activates the parasympathetic nervous system, triggering a relaxed response and a mindful state of awareness due to the cold temperature. Once a client has developed coping skills also known as resourcing, a therapist can delve into trauma memories and use a hierarchy list of traumatic memories from moderate to severe to commence exposure therapy. It is advised to expose clients to traumatic memories that elicit moderate intensity trauma symptomology and distress and work the way up to more severe distressing events. A commonly-used method for gathering anxiety ratings within exposure sessions is the Subjective Units of Distress Scale (SUDS). SUDS ratings require both child and adult clients to indicate their level of anxiety on a scale ranging from “no distress” to “extreme distress”. SUDS are discussed with the therapist and used to measure one’s distress when recollecting trauma memories and to monitor one’s hyperarousal, with an aim to reduce those with the clinical application of activating the DR. The client is instructed to immerse their face in cold water once the SUDS are at moderate or severe intensity whilst exposing someone to their trauma narrative. During the CFI task clients immerse their face in a tub with cold water and added ice for 30 seconds or less if feeling distressed whilst breath holding. It is always recommended that the breath hold needs to feel comfortable and hence clients are encouraged to complete the CFI before any signs of breath hold distress. This is important because when the client achieves a positive experience with the CFI task it can maximize therapeutic effects. The client’s physiology changing can assist with the down regulation of the fear response and help reprocess the memory and that is the aim in this treatment protocol. Two alternatives in using this method include changing the memory of the traumatic memory and connecting a positive thought to the memory of the trauma whilst doing the CFI task.

### **Obsessive Compulsive Disorder (OCD)**

OCD is a psychological disorder in which one is bothered by obsessive thoughts and compulsions. The application of the DR in treating and managing OCD symptoms can be used in exposure therapy. A common example may be when a client has an intrusive thought i.e., that they touched something dirty, and they feel compelled to want to wash their hands. Once the client has been psycho-educated about the DR they can be introduced to the CFI task. This would mean that the client can bring up an intrusive thought that is distressing and then they can abstain from washing their hands but rather complete the CFI task which helps reverse anxiety symptoms and reduce obsessive thoughts. Another treatment protocol alternative is to have the client touch something dirty in the therapy office under supervision of a therapist or in their home environment on their own following exposure practice with the clinician. They would then be instructed to sit with their anxiety in order to habituate to their symptoms, as well as complete the CFI task in order to reduce anxiety and obsessive cognitions.

One way to understand habituation and its relationship with anxiety is to comprehend that most of our anxiety is anticipatory and short-lived. For example it is a bit like jumping in the cold water at the beach, within minutes you habituate to the water temperature so it is more tolerable. That exact process almost always happens with anxiety, however it may take that little bit longer. The idea is to sit

with the anxiety long enough for it to be able to dissipate, hence this is what we are trying to achieve with sitting with the discomfort of the intrusive obsessive thoughts and withholding back from the urge to engage in the compulsion.

### **Specific Phobia (SP) and Social Anxiety Disorder (SAD)**

With SP and SAD a similar protocol can be used when applying the CFI task. This involves exposing oneself to a feared specific situation in imagination and in-vivo. For example, with the fear of spiders, the client and the therapist monitor during the exposure therapy the SUDS and when they are of moderate intensity, the client would be instructed to do the CFI task to reduce the fear response and anxiety. This can be practiced with the aid of a trained therapist and can also be practiced at home after the CFI task and its applications are taught. This may also be used when being exposed to real life situations such as approaching a social situation that elicits anxiety or discomfort, whilst practicing self-talk and by immersing their face in cold water. This can be practiced either at home or in a public place by the anxiety sufferer who is exposing themselves to a feared social situation by splashing cold water in their face and breatholding whilst using positive self-talk to tackle the feared situation.

### **Generalised Anxiety Disorder (GAD)**

This psychological condition is characterised by persistent worry, about several different areas of life that is hard to switch off. The CFI task can be used as a way to induce a mindfulness state which will distract someone from their persistent worries and anxieties. It can also be used as a way to expose a client to a particular worry that they may be ruminating about whilst immersing their face in cold water and breath-holding. This can also act as a defusion technique of a circuit breaker, in which a client is able to let go of the worrying, ruminative thinking and catastrophising which is typical of GAD.

### **Depression and Stress Responses**

With depressive symptoms, particularly low motivation, flat mood and cognitive and physiological symptoms of depression one can activate the DR via cold facial immersion, splashing water on the face, having a cold shower, or a swim at the beach whilst submerging oneself in the sea. One can breath hold under water for what is comfortable which gives the brain a dopamine and serotonin neurochemical release. The DR is activated via the baroreceptors and chemoreflexes in the facial and cranial area which signal to the trigeminal nerve to reduce the heart rate via the vagus nerve which connects the brain, heart, lungs and gut with all other viscera. The afferent nerves that connect the viscera including bodily organs and limbs to the vagus nerve are abundant making up the majority of the nerve fibres and meaning they move in one direction from the body to the central nervous system [6]. When a client that is immobilized due to trauma, heightened anxiety, distress or resistant depression, activating the DR can lead to greater motivation. Qualitative research investigating one’s experience of the CFI task, yielded responses such as it was calming, relaxed state that it induced as well as a mindfulness state, and a sense of achievement and accomplishment, and clearing negative thoughts [7].

Similarly in stress responses the CFI task can act as a reset button, to defuse and distract self from stress symptoms. For example if someone is experiencing tension, in the body, the CFI task can assist with down regulating the stress response. One can immediately move on to participating in an activity that is meaningful and which obtains their full mindful attention in order to reduce stress.

### **Conclusion and Opinion**

This commentary opinion in summary only shares a handful of treatment strategies and applications used which all share in

common the activation of the DR. Although there are likely to be more strategies and applications of the DR for the abovementioned psychological conditions, the focus of this commentary opinion has been to share some valuable insights of how the activation of the DR can be applied to manage anxiety, stress and depressive symptoms. Moreover, other clinical disorders and fields are likely to benefit from the activation of the diving response and its oxygen conserving mechanism which we have adapted to to enhance our chances of survival. The DR can be easily be activated with cold moisture (i.e., ice packs), and cold water making it an easily administered treatment [3]. Further research is needed to provide greater insights into the application of the DR in assisting with the development of evidence-based interventions and to explore the anxiolytic effects induced by the activation of the DR [8].

## References

1. Verhaegen MJ (1985) The Aquatic Ape Theory: evidence and a possible scenario. *Med Hypotheses* 16: 17-32.
2. Alboni P, Alboni M, Gianfranchi L (2011) Diving bradycardia: a mechanism of defence against hypoxic damage. *J Cardiovasc Med* 12: 422-427.
3. Kyriakoulis P, Kyrios M, Nardi AE, Freire RC, Schier M (2021) The implications of the diving response in reducing panic symptoms. *Frontiers in Psychiatry* 12: 784884.
4. Wildenthal K, Leshin SJ, Atkins JM, Skelton CL (1975) The diving reflex used to treat paroxysmal atrial tachycardia. *Lancet* 305: 12-14.
5. Klein DF (1993) False suffocation alarms, spontaneous panics, and related conditions: an integrative hypothesis. *Archives of General Psychiatry* 50: 306-317.
6. Utley A (2019) *Motor Control, Learning and Development Instant Notes*, 2nd Edition. Routledge.
7. Kyriakoulis P, Caballero CL (2024) A Qualitative Exploration of Panic and Cold Facial Immersion. *Rep GlobHealth Res* 7: 204.
8. Peter Kyriakoulis (2024) The Cardio-Respiratory Mechanisms Involved in the Diving Response Adaptation and Breath-Hold Training Effects in Freedivers. *Journal of Cardiology Research Reviews & Reports* 5: 1-12.

**Copyright:** ©2025 Peter Kyriakoulis. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.