



**VIRTUAL REALITY IN  
SERVICE OF HEALTHCARE**







Since 2015, we have been driven by the desire to develop virtual reality therapeutic software to meet today's health needs.

Virtual reality is a scientific field in its own right. C2Care's vocation is to exploit its benefits through the prism of mental health. To do so, we have created virtual environments in which patients will live experience under the therapist's total control. The immersions will allow patients' gradual exposure to their anxiety-provoking stimuli to correct dysfunctional activations and reduce and extinguish the distress inherent to their problem.

According to our scientific committee's specifications, these environments have been developed composed of Doctors, Psychologists, and Academics.

Our e-health solutions are based on the need to maximize therapeutic benefits and overcome current management difficulties. Thus, Virtual Reality Exposure Therapies offer definite benefits: more delicate graduation of exposures, accessibility of environments, time-saving, confidentiality, controllability.

We are able to offer you a global accompaniment to allow you to acquire and learn this new complementary tool to your current practice.

Thanks to our network of partners and clients (22 university hospitals, more than 300 institutions, and more than 1,700 health professionals), we are part of permanent research and development dynamic always to be able to offer practical solutions and contribute to medical progress.

- Romain STREICHEMBERGER  
C2Care President





## Treating phobias with virtual reality

A new wave in the cognitive-behavioral approach, virtual reality exposure therapies, offers patients the opportunity to safely and confidentially expose themselves to anxiety-provoking stimuli within your practice.

Numerous studies recognize virtual reality exposure therapies as being significantly more satisfying for patients. They facilitate therapeutic engagement and compliance with care.

**The benefits of virtual reality are numerous: accessibility, confidentiality, and ease of care, patient safety, financial gain.**

Virtual reality exposure therapies are defined as more accessible to healthcare professionals due to the controlled scalability of virtual environments and the accessibility of the developed environments.

**C2Phobia is the comprehensive therapeutic software for the management of phobias using VRET. It is also an efficient adjunct to conventional therapies.**



*C2Phobia - Agoraphobia*

## C2Phobia: Advanced technology for a total sense of realism

Recognized CE medical device, C2Phobia's virtual environments have been thought and designed to generate total immersion and maximize learning transfer.

**Easy to use for the practitioner and the patient, C2Phobia allows an optimal sensory stimulation immersing the user in a reality similar to his daily life's anxiety-provoking situations.**

From your MyC2Care interface, you can access multiple features and environments to manage agoraphobia, social

phobia, and specific phobias such as arachnophobia or acrophobia.

You will be able to increase or decrease the crowd's intensity and control the frequency of the avatars' glances towards the user and their emotions.

You will also be able to interact live in virtuo with your patients in the guise of an avatar who will simulate a conversation.

## Case study: How to treat vertigo by in virtuo exposure ?

Thanks to C2Phobia, you will be able to perform gradual exposures. The scenes were designed to respect the hierarchy of anxiety-producing situations. In the case of acrophobia treatment, phobic contexts are under the control of the health professional. **The realism of the stimuli will increase the cognitive and emotional activation allowing optimal exposure.**

From a building, the patient will be progressively exposed to different heights: immersion at the building's foot, from the 1st to the 15th floor up to the roof of a skyscraper. The control

of the gradient of stimuli will allow for the development of the anxiety necessary for the anxious response's extinction.

To complete the treatment, he/she will be able to expose him/herself to his/her fear from a balcony or an outside elevator. The therapist will control the environment through features such as walkway configuration (increasing the phobic context by adding or removing affordances: walls, ropes, or lack of protection).



C2Phobia - Acrophobia

## Phobias and VRET: what does scientific research say ?

Therapies by exposure to virtual reality were observed through the prism of research.

Thus, many studies have evaluated its effectiveness and have obtained significant results giving VRETs a definite clinical relevance.

Concerning social phobia, Malbos (2016) has not only demonstrated the effectiveness of virtual reality on this disorder but has also shown long-term maintenance of therapeutic gains.

**The authors also agree on the safety that this method will allow, thus facilitating patient engagement in the exposure.**

From the activation of the anxiety response to its extinction, Virtual Reality Therapy proves, according to the literature,

its efficiency in maximizing therapeutic benefits for the management of specific phobias, agoraphobia, and social phobia.



C2Phobia - Elevator

“ The results show that virtual reality effectively reduces anxiety and depressive symptoms and improves the quality of life <sup>1</sup>

- Rus-Calafell et al. (2016)

### Virtual environments available for the treatment of phobias

- |                |                   |                   |
|----------------|-------------------|-------------------|
| • Acrophobia   | • Claustrophobia  | • Fear of animals |
| • Agoraphobia  | • Hospital        | • Fear of insects |
| • PTSD         | • Emetophobia     | • Mysophobia      |
| • Aviophobia   | • Glossophobia    | • Ochlophobia     |
| • Belenophobia | • Fear of driving | • School Phobia   |

### Medical Sources

<sup>1</sup> Rus-Calafell et al. (2013)  
Geraets et al. (2019)  
Parrish et al. (2016)

Gutierrez et al. (2009)  
Mapples-Keller et al. (2017)  
Susó-Ribera et al. (2019)

Bouchard et al. (2016)



Take advantage of the free demo version  
by creating a MyC2Care account.





## Treating Eating Disorders by Virtual Reality

The C2Nutri software has been developed to allow you an efficient treatment of eating disorders. The available applications have been designed by our scientific team and our medical and paramedical partners.

The available functionalities will allow you to target the major substrates of these disorders.

**The different scenes developed will assist you in treating anorexia nervosa, bulimia, hyperphagia, and obesity.**



*C2Nutri - Composition meal trays*



*C2Nutri - Exposure*

## From awareness of your disorder to treatment in virtual reality

**C2Nutri is a software program designed to treat the factors underlying eating disorders.**

The silhouette test will allow you to assess the severity of body dysmorphic disorder and promote awareness of your patients' condition. Thanks to the fitting room environment, you will correct the cognitive and emotional correlations of the body image disorder: patients will be able to directly perceive the gap existing between their self-perceived silhouette and the real one (calculated according to BMI).

**Expose your patients to food craving via ecological environments:** supermarket, apartment, exhaustiveness of

appetitive stimuli..

**Work on food rehabilitation by immersing your patients in an environment where they will compose their meal trays:** this module will help you improve your patients' nutritional knowledge and facilitate the reintroduction of forbidden foods for anorexics.

C2Nutri is the additional solution for the management of eating disorders in a collaborative and multidisciplinary work perspective, maximizing therapeutic benefits.



C2Nutri - Body Dysmorphic Disorder

## VRET and Eating Behaviour Disorders: What does scientific research say ?

Research on the use of virtual reality for the treatment of eating disorders are increasing in number.

Evidence-based results offer new insights for both researchers and clinicians. For example, Marco (2013) has demonstrated the relevance of using virtual reality to treat body dysmorphic disorder in anorexic patients. Exposure-based virtual reality therapies, coupled with CBT, significantly improved clinical outcomes substantially more than CBT alone.

The impact of virtual reality was also evaluated in the processes underlying obesity.

Studies have shown that in virtual exposure, reduced hyperphagic attacks also maximized weight loss and long-term gains.

**The current literature also highlights the interest of virtual reality for cognitive and emotional activation concerning problematic eating behavior.**



C2Nutri - Supermarket

“ The results show the interest of using virtual reality as a new method to reduce body image distortions<sup>1</sup>

- Keizer et al. (2019) ”

### Virtual environments available for the treatment of eating disorders

Confrontation with several food groups (sodas, chocolate bars, fast food, candies, appetizers, etc.)

Composition of meal trays and the development of personalized food programs

Comparison with a body avatar with the possibility to choose a precise BMI (perceived silhouette / real silhouette).

### Medical sources

<sup>1</sup>Keizer et al. (2019)  
Marco et al. (2013)  
Cesa et al. (2013)

Ferrer-Garcia et al. (2012)  
Manzoni et al. (2016)  
Keizer et al. (2016)



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## Treating addictions in virtual reality

Virtual reality has allowed us to create virtual ecological environments **to manage tobacco, alcohol, gambling, and drug addiction.**

We have developed optimal contexts to treat addictions in virtuo and allow the transfer of therapeutic benefits into your patients' daily lives.

The environments have been designed **to create an intense craving in the patient. They will trigger cognitive, emotional,**

**and behavioral responses identical to those experienced by the addict in their daily life.**

C2Addict will allow you to safely and confidentially expose your patient within your practice.



*C2Addict - Alcohol*

## C2Addict: Complete addiction management

Thanks to the environments' realism, the emergence of problematic cognitions, emotions, and behaviors underlying addiction will be achievable in the office. The stimuli related to substance use will offer the possibility of assessing the severity of the craving.

Ecological contexts will allow for efficient exposure. Indeed, **the in virtuo exhibition will enable one to free oneself from the ethical and environmental limits of exposure by imagination and in vivo in addictology.**



## Target the craving !

Our environments are the result of the cooperation between our scientific team and academics specialized in addictology. Thus, they have been designed and created to allow the evaluation, treatment, and prevention of relapse risks by putting craving at the forefront.

Different contexts are accessible according to the targeted pathology: bar, home, casino. Situations conducive to the emergence of permissive thoughts are proposed (waiting, home, social contexts), among which the patient can choose the stimuli that generate the most craving.



C2Addict - Consumption

## Addictology and VRET: what does scientific research say ?

In virtuo therapies have been the subject of numerous studies on their effectiveness in the treatment of addiction. Some authors have recently underlined virtual reality's interest compared to exposure by imagination: **virtual reality enables the production of significantly more dysfunctional automatic thoughts**. This tool presents a real clinical relevance in the work of cognitive restructuring.

These researches also show **an efficiency equal to the intensity of craving felt during in virtuo exposures compared to in vivo exposures with a superior therapeutic engagement through Virtual Reality Exposure Therapies**.

Validated for exposure to tobacco addiction, drugs, alcohol, and gambling, in virtuo therapies have shown significant results, giving them a strong clinical interest.



C2Addict - Casino

“ Simple to use and inexpensive, virtual reality demonstrates its clinical effectiveness and confirms the value of its use <sup>1</sup>

- Giovancarli et al. (2016)

”

### Virtual environments available for the treatment of addictions

- Tobacconist's shop
- The terrace of a café
- Bus stop
- Supermarket aisle
- Cooking (alcohol/drug/smoking exposure)
- Casino

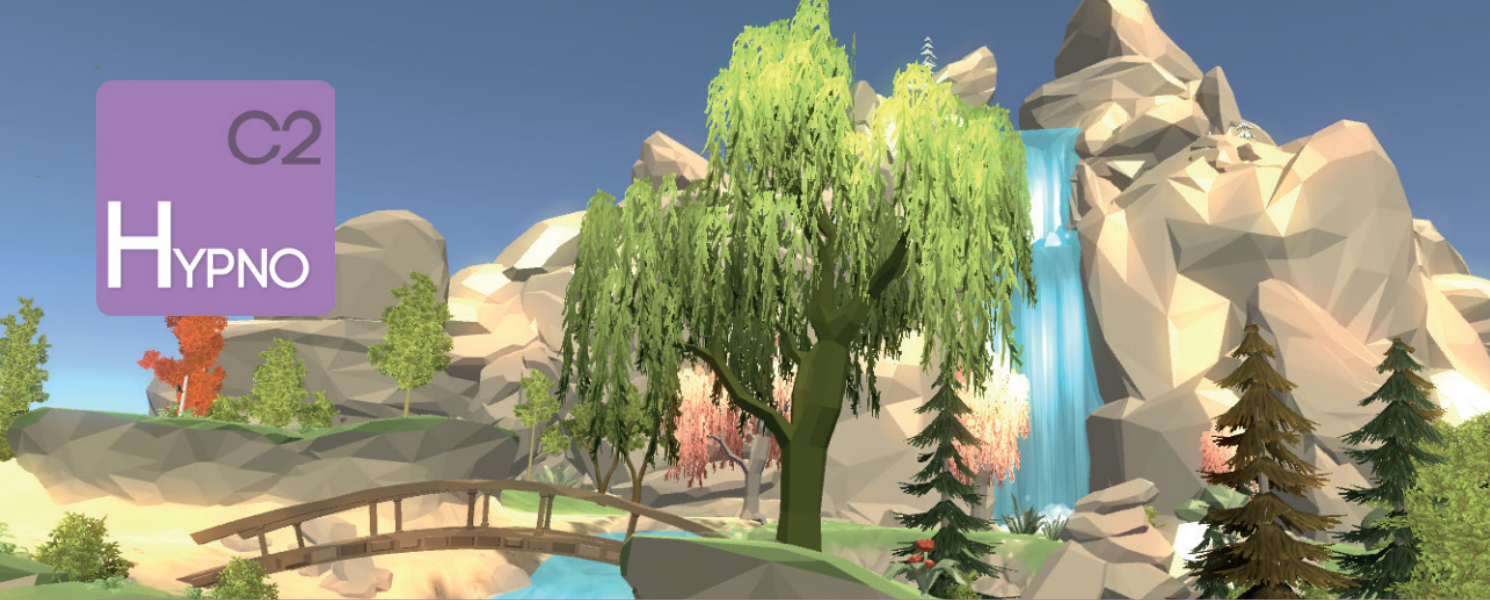
### Medical Sources

<sup>1</sup> Giovancarli et al.(2016)  
Chrétien et al.(2018)  
Ghiță et al.(2018)

Hone-Blanchet et al.(2014)  
Pericot-Valverde et al.(2015)  
Lee et al.(2009)



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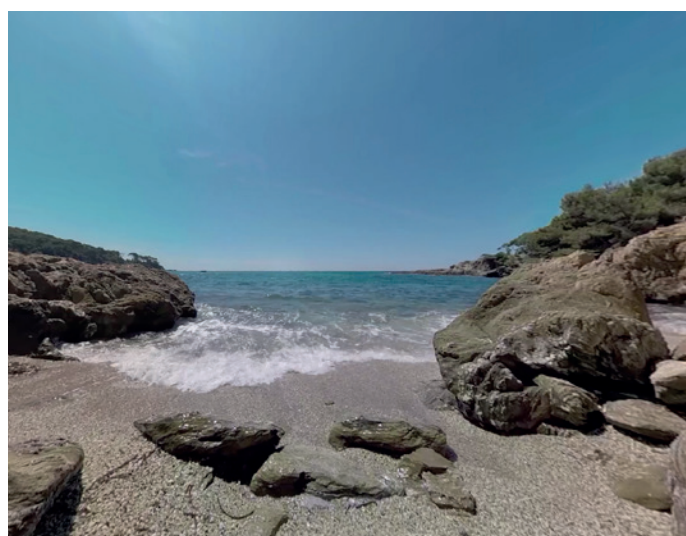


## Emotional management and relaxation through virtual reality

Stress and anxiety are very present in the origin of the physiological and psychological disorders. Whether they adopt a pathological character or are simply a shadow in your patients' daily lives, C2Hypno will accompany you in their treatment.

The numerous environments offered will allow you to trigger positive emotions and to establish a state of tranquility.

**Optimize your mindfulness, sophrology, hypnosis, and relaxation sessions with environments resulting from the collaboration between our scientific team and specialists in relaxation and hypnosis (psychologists, hypnotherapists, sophrologists).**



*C2Hypno - A cove*

## C2Hypno: The software with multiple virtues

C2Hypno is an efficient adjunct to conventional therapies. The proposed environments and functionalities will act in interoperability with your treatment methods and other C2Care software.

The reduction of anxiety and stress markers maximizes therapeutic success: **immerse your patients in virtual worlds that will be a support of choice for learning to breathe, letting go, and meditation techniques.**

Thanks to multisensory stimuli, **the initiation of positive emotions will be easy and help reduce pain perception**

**during medical interventions and relieve the stress inherent to them.**

Prepare your patients for quiet nights by stimulating their mental imagery capacity coupled with calm breathing.

In addition to other C2Care software, perform systematic desensitizations. Relaxing environments will be ideal for familiarizing your patients with virtual reality or ending your consultations positively.



*C2Hypno - Scuba Diving*



## Multisensoriality through virtual reality

To facilitate the patient's adherence and meet his needs, C2Hypno has multiple environments (mountains, sea, forests, parks, etc.) The virtual places visited are enriched by auditory stimuli consistent with the environment (bird songs, wave noise, etc.) and will facilitate immersion and the feeling of

presence. **You can customize the Hypno option applications:** activate a soft and soothing speech or enhance your session with classical music.



*C2Hypno - Hot air balloon trip*

## Cardiac coherence in virtuo

To facilitate the learning of cardiac coherence exercises, you will be able to provide your patients with assistance in the virtual environment: a phantom bust on which a bar will oscillate, personalizing the inhalation and exhalation, will

stimulate the breathing anchoring exercises.

To visualize the letting go, bubbles will complete the relaxation work.

## VRET and relaxation: the prism of research

**The scientific literature highlights the interest of the use of virtual reality in protocols, including relaxation.** Navarro-Harro (2017) has shown that immersing patients in a relaxing virtual environment has significantly reduced their negative emotions. The same author, in 2019, highlighted through her study that coupling VR and Mindfulness was substantially more effective than Mindfulness practice alone.

On the other hand, research conducted in Oncology and Algology has provided relevant data on virtual reality usage in reducing pain, stress, and increasing well-being. **Researchers underline the effectiveness of virtual reality as a therapeutic solution in its own right.**

**Moreover, its use also complements traditional treatments.**



*C2Hypno - Big bowl of oxygen*

“

**The use of virtual reality in mindfulness groups offers a better therapeutic engagement <sup>1</sup>**

- Navarro-Haro et al. (2019)

”

### Relaxation environments available

- |                              |                      |                              |
|------------------------------|----------------------|------------------------------|
| • At the seaside             | • Stroll in the park | • The earth from space       |
| • Stroll in the forest       | • An Asian garden    | • Hot air balloon trip       |
| • A snowy garden             | • Scuba Diving       | • Path to the waterfall      |
| • Big bowl of oxygen         | • Evening at the sea | • Fireworks in the castle    |
| • The place by the fountains | • A Cove             | • Stroll between the bamboos |

### Medical sources

<sup>1</sup> Navarro-Haro et al. (2019) Annerstedt et al. (2013)  
Navarro-Haro et al. (2017)  
Hoffman et al. (2007)



Take advantage of the free demo version by creating a MyC2Care account.



## Customize your virtual reality tool

C2Custom is **the application that allows you to customize your care so that your patients can access a multitude of exposure environments.**

This software allows you to view images, videos, and 360° videos.

Import them easily from the internet; you will be able to project them in different formats.

C2Custom is a complement to C2Care software to allow therapists to maximize the therapies practiced: whether it is about phobias, addictions, eating disorders, or relaxation, thanks to C2Custom, **you can set up photos, videos, or 360° videos environments that perfectly match the - sometimes particular - needs of your patient.**



*C2Custom - Thunderstorm*

## Case study: Treating fear of thunderstorms

Brontophobia is a particular phobia. With C2Custom, you take advantage of a giant screen to broadcast storm sequences found on the net to trigger patient anxiety

**The software makes these images and videos immersive, and the exposure very gradual.** Depending on the patient's anxiety and tolerance level, you can search for videos with small, big storms or 360-degree videos.

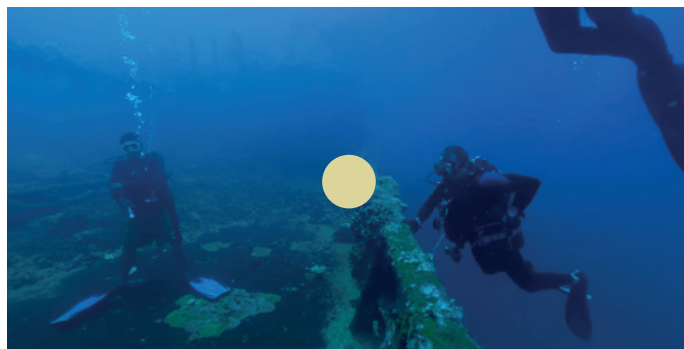


## Access to alternating bilateral stimuli

C2Custom is also intended for therapists who practice alternating bilateral stimuli (ABS).

**These therapies use bi-alternate sensory stimulation and auditory stimuli that we have recreated in a dedicated environment.**

The controllers supplied with the virtual reality headset replace the buzzers and can be easily maintained by the patient.



C2Custom - ABS

## PTSD: A specific environment for each patient

**Anxiety disorders have a multifactorial origin that is specific to each individual.**

When you have to treat post-traumatic stress disorder, the accessibility of the anxiety-provoking context is a real problem because of each case's singularity.

**C2Custom allows you to respond to this very specific request:** import photos from all over the world, photograph or film the appropriate contexts yourself, or download videos that will allow for efficient management of PTSD

## VRET and PTSD: what does scientific research say ?

The management of post-traumatic stress disorder has aroused the interest of many researchers.

Not only have the results concluded that the efficacy of validated classical therapies (CBT, emdr) on the general disorder is equivalent, but some authors have highlighted the superiority of virtual reality in the reduction of depressive symptoms and the reduction of interference in social life. Also, Botella (2015) has highlighted the high level of compliance

and satisfaction with care in patients who received VRET treatment for PTSD. In a study by ROY (2016), VRET had significant results compared to conventional exposure in war trauma patients.

**The research generated convincing results highlighting the value of the use of virtual reality for patients with PTSD.**



C2Phobia - ESPT

**“ Results as effective as CBT, but more significant improvements on depressive symptoms thanks to virtual reality <sup>1</sup>**

- Cuperus et al. (2016)

”

### Options available to set up the virtual reality environment

Choose your media to play, then select the medium type to display your images or videos in different ways in your VR headset:

- |               |                 |                   |
|---------------|-----------------|-------------------|
| • Cinema      | • Curved Screen | • ABS             |
| • Flat Screen | • Vidéo 360°    | • Custom Playlist |

### Medical Sources

<sup>1</sup> Cuperus et al. (2016)  
Règer et al. (2016)  
Banos et al. (2016)

McLay et al. (2017)  
Botella et al. (2015)  
Roy et al. (2016)



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## Treat Amaxophobia with Virtual Reality

Fear of driving is a common phobia, but its treatment by in vivo exposure can be complicated.

Virtual reality has allowed us to create environments that realistically simulate anxiety-provoking contexts for phobic drivers and passengers on the road.

C2Drive software allows you to expose your patients to comprehensive environments in complete safety.

The various functionalities will assist the healthcare professional in managing amaxophobia and allowing for optimal virtual reality therapy.



*C2Drive - Tunnel with traffic jams*

## C2Drive: realism in complete safety !

**The C2Drive software is used with a virtual reality headset, steering wheel, and pedals, creating a perfect driving simulation.**

Progressively and safely, you will be able to expose your patients to multiple phobic contexts. To practice an adapted and progressive therapy, the health professional will have control over the meteorological stimuli, the driving context (day/night), and the patient's virtual position in the car (driver or passenger). Several situations are proposed by C2Drive, al-

lowing you to target the difficulties of your patients: highway entrance, traffic jams, overtaking trucks, etc. Our comprehensive environments will ensure optimal exposure.

**The high degree of realism guarantees an ideal simulation of road contexts. In virtuo exposure is your ideal therapeutically for the treatment of the fear of driving in complete safety.**



## Another situation is the fear of being on the highway

Insertion and then fast driving on freeways are situations apprehended by a large number of drivers or passengers.

**Experienced «in virtuo» by the patient, this situation can finally be worked on and treated in complete confidentiality and security within your practice.**

Panic at the idea of driving in a tunnel, refusing to take the highway, driving in heavy traffic, etc. All these situations are now available in virtual reality on C2Drive.



*C2Drive - Circulation modérée avec poids lourd*

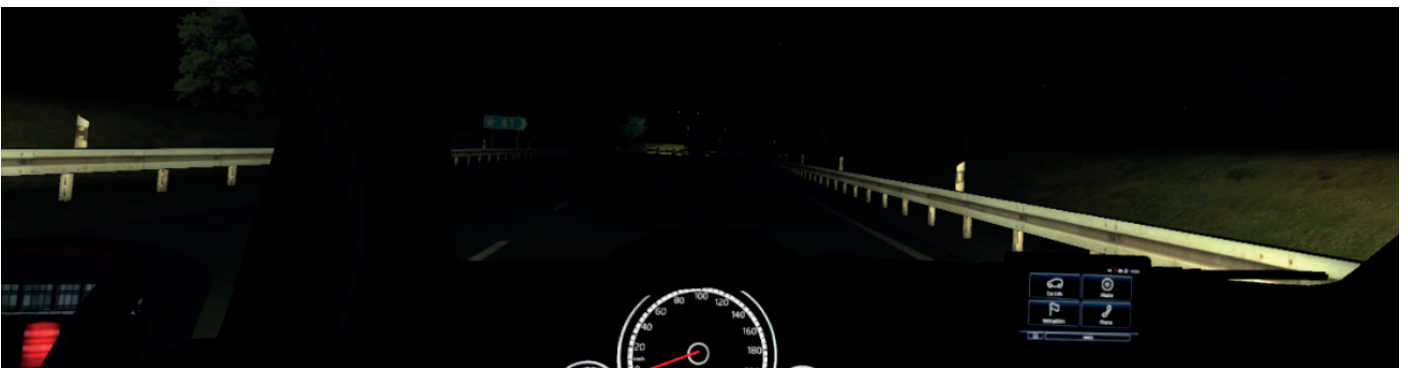
## Amaxophobia and VRET: what does scientific research say ?

Fear of driving is a relatively frequent phobia that handicaps people suffering from it daily. Researchers agree on the effectiveness of in vivo exposure to reduce the disorder.

However, the authors stress the inherent insecurity of the nature of this exposure (for the patient and the therapist). The treatment of amaxophobia by virtual reality has been evaluated through several studies. The results have shown that the onset

of anxiety is entirely possible via virtual environments.

The combination in virtuo-in vivo allows optimizing the therapeutic gains. Also, qualitative analyses underline that the method's security facilitates the commitment to care.



*C2Drive - Highway at night*

“ Participants perceived a marked improvement in their symptoms in their daily lives <sup>1</sup>

- Navarro-Haro et al. (2019) ”

### Environnements et options disponibles pour le traitement de l'amaxophobie

- |                    |                    |                   |
|--------------------|--------------------|-------------------|
| • Daytime highway  | • Autopilot        | • Fog             |
| • Highway at night | • Passenger option | • Rain            |
| • Tunnel           | • Trucks           | • Traffic Density |

### Sources médicales

<sup>1</sup> Wald (2004)  
Costal et al. (2018)  
Wald (2004)

Walshe et al. (2003)



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C2Care

Ilôt Les Picôtières  
101 Avenue Desmazes  
83110, Sanary-Sur-Mer

[www.c2.care](http://www.c2.care)

Phone : +33 4 83 57 51 58

