

Project No: 2018-3-TR01-KA205-061550



**VRforDrugRehabilitation:**  
Developing and Using Virtual Reality  
Technology for Rehabilitation of Drug Users in  
Probation Service

**HANDBOOK OF  
VRFORDRUGREHABILITATION  
PROGRAMME**



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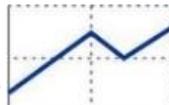
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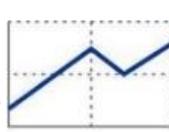
## PARTNERSHIPS

- Ege University, Institute on Drug Abuse, Toxicology and Pharmaceutical Science, Turkey
- District Governorate of Torbali, Turkey
- Ministry of Justice Izmir Probation Directorate, Turkey
- European Strategies Consulting, Romania
- Innovative Prison Systems, Portugal
- Savunmasan Company, Turkey





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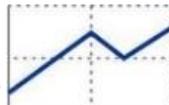


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## 1. Overview

According to the Council of Europe latest report, there are around 1.6 million people under the supervision or care of the probation services in Europe, representing an average rate of 219 probationers per 100.000 inhabitants. It is well documented the high prevalence of drug use among probationers and the wider offender population. In fact, a large proportion of people who come into contact with the criminal justice system has a history of drug use and many continue to use drugs while imprisoned, switching to more harmful patterns of drug use in some cases.

Research also shows that ex-inmates return to environments that strongly trigger relapse to drug use and put them at risk of overdose. For these reasons, prison and probation contexts are important settings for the provision of responses that address drug use and its harms to health.

In terms of treatment options, research shows that new technologies such as Virtual Reality (VR), augmented reality, hold promise in supporting individuals in substance misuse treatment and rehabilitation. VR – immersive, multi-sensory and viewer-centred three-dimensional computer-generated environments – is gaining considerable attention as a research, education, and treatment tool.

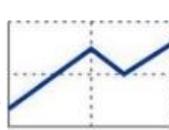
## 2. Aim of the project

The project assumes that using life-like scenarios in virtual environments. It is the only project to prepare, apply and share a methodology for drug rehabilitation by using virtual reality technology in European countries and Turkey.

VRforDrugRehabilitation aims to support youth workers by promoting a quality Virtual Reality (VR) technology for drug addiction rehabilitation, in the probation systems, for young adult offenders, empowering them to change their lives.

### Objectives

- Decrease drug use among young probationers through a VR drug treatment programme;
- Develop an assessment tool for testing VR sessions' effects;





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- Enhance awareness and capacity on probation services to create a methodology of rehabilitation by using VR;
- Increase young adult people's motivation to change their lives;
- Reduce stereotypes in the community that drug addicted people cannot change;
- Disseminate the project's outputs to other prison and probation services.

### 3. What is addiction?

#### 3.1. Epidemiology

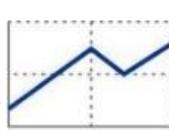
Substance Use Disorder (SUD) and behavioral addiction are prevalent in many countries and require a multidisciplinary approach. Unfortunately, only a minority (7.1%) of patients even in high income countries, receives adequate treatment.

According to the 2021 European Drugs Report;

- Around 83 million or 29.9% of adults (aged 15-64) in the European Union are estimated to have used illicit drugs at least once in their lifetime.
- Experience of drug use is more frequently reported by males (50.6 million) than females (32.8 million).
- The most commonly tried drug is cannabis (47.6 million males) and (30.9 million females).
- An estimated 17.4 million young adults (ages 15-34) used drugs in the last year (16.9%).

#### 3.2. Explaining the Addiction

Addiction is defined as a chronic, relapsing disorder characterized by compulsive drug seeking and use despite adverse consequences (National Institute on Drug Abuse (NIDA)). Addiction is considered a brain disease because the substance used changes the structure and way of working of the brain. Changes related to these deteriorations in the brain in people who use substances can be long-lasting and lead to harmful behaviors (National Institute on Drug Abuse-NIDA). For example, cigarettes, alcohol or other substances. Addiction is not only with substance use, but there are also some behavioral addictions other than substance; such as gambling, internet, food, sex, shopping addiction etc.





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### 3.2.1. Reward System:

There are mechanisms that regulate the reward response (reward system) in the affected brain. One of the very basic elements of learning is the reward system. For example, the child performs a behavior, receives a positive verbal response from her/his mother as a reward, and as a result, the child does the same behavior again, and the child's behavior is reinforced.

### 3.2.2. Physiological Regulation:

*Allotaxis* and *homeostasis* are two processes involved in physiological regulation.

Homeostasis is the ability of a biological system to maintain a dynamic internal balance according to changes in the internal or external environment. Homeostasis is the state of maintaining a stable physical and chemical environment within a living organism. Therefore, it keeps all the conditions of the body at their optimum values.

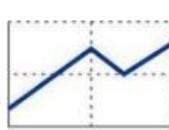
Allotaxis is the process of maintaining homeostasis. Allotaxis is a regulatory process responsible for maintaining balance through change.

- There is a structural change in allotaxis.
- A structural change occurs in the formation of addiction.
- A new structural change may occur in the end of addiction.
- The formation of addiction is a process, but also ending the addiction is a process.

### 3.2.3. Receptors:

Every neuron in our brain has *receptors* on its surface that receive signals from nearby neurons. And these receptors can be affected by drug use (NIDA). For example, if nicotine reaches the brain, there are nicotinicacetylcholine receptors to which it binds, and as a result of binding, nicotine shows its effect in the brain.

Repetitive substance intakes may include changes in the number of these receptors, in the prevalence of representation areas in the brain, or in the sensitivity of the receptor. For instance; repetitive use of alcohol increasing the dose needed to achieve the same effect





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### 3.3. Parts of the Brain Related to Addiction

Addiction treatments means a new process of adaptation and change.

Nucleus Accumbens:

- It is part of the limbic system.
- It is responsible for sexual arousal.
- It is responsible for the emergence of the effects of pleasant substances.
- Its effects are largely related to dopaminergic connections.

Prefrontal Cortex:

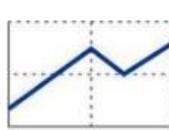
It is where information from different sources is organized and combined and the behavior to be revealed is decided.

- The human prefrontal cortex carefully collects, integrates, formulates, applies, supervises, modifies, and judges information in all nervous system activities.
- In the evolutionary process, the more advanced species have grown in volume.
- Prefrontal cortex and age variables are correlated with each other. As the individual ages, the prefrontal cortex develops.
- The prefrontal cortex is the part that takes the longest to develop during human development. Myelination continues until puberty.
- Child or a young adult may have difficulty in making the right decision in their behavior due to the immaturity of prefrontal cortex development.
- Drinking driving-decision making

VTA (Ventral Tegmental Area):

It is the region where the dopaminergic cell bodies of the mesocorticolimbic system originate.

- Associated with natural and drug-related reward circuits
- Motivation, orgasm





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- Has neurons that extend to many brain areas

Amygdala:

The region with a primary role in the formation of emotional memory and emotional reactions.

- It is part of the limbic system.
- It plays a role in the creation and storage of memory related to emotional processes (eg, fear conditioning).

Example of monkey-snake fear (*snake-monkey experiment in psychology; monkeys are afraid of snakes, monkeys with damaged amygdala are not afraid of snakes*).

### 3.4. Withdrawal Syndrome:

Physiological adaptation processes (allostasis processes) that occur as a result of repeated substance use result in the organism's inability to function normally in the absence of the substance.

There are withdrawal syndrome situations that vary according to the properties of the substances, continue for different durations and occur in different severity.

This is related to the difference in the changes that occur in the adaptation processes.

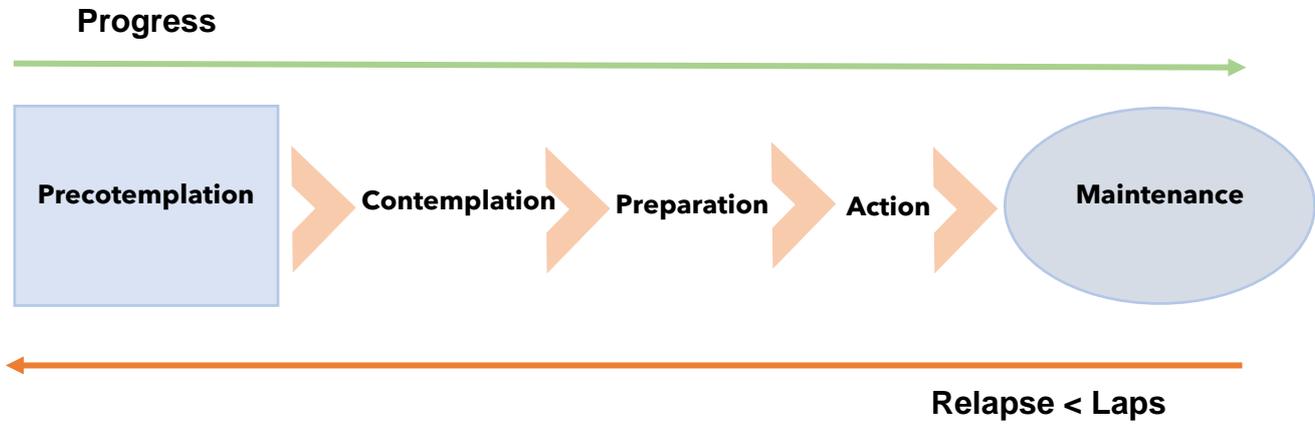
For example, symptoms such as tension, irritability, feeling of frustration, loss of attention, and excessive appetite increase in tobacco withdrawal.

### 3.5. Change Consists of Stages:

The Transtheoretical Model (TTM) is an integrative, biopsychosocial model to conceptualize the process of intentional behavioural change. The Transtheoretical Model determine the Stages of Change. Stages of change approach is used in addiction field commonly. Behavioural change can be thought of as occurring as a progression through a series of stages. Previous research has measured a number



of cognitive and behavioral markers that have been used to identify these stages.  
(TTM; Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992)



## 4. Using Virtual Reality Technology in Addiction Field

### 4.1. What is Virtual Reality?

VR is a computer-generated simulation. It is generally images and sounds illustrating a real environment in which an individual can have interactions through its special equipment. VR is also able to represent and display sensations and voices and with the use of headsets, it can make users feel the sensation of a virtual world (Segawa et al., 2020).

### 4.2. How to Use Virtual Reality Technology in Addiction Field?

Treatment and psychoeducation interventions should be arranged according to the stage of change which the substance addicted patient is in. Thus, the right target is determined in ending the patient's addictive behavior. In this respect, the VRforDrugRehabilitation Program is assumed to be in the pre-contemplation or contemplation phase to quit substance use by young adults in conflict with the law, and in this context, the content of the VRforDrugRehabilitation program was created.

Individuals diagnosed with substance use disorder (SUD) experience several relapses after interventions and a lower quality of life because of the chronic nature of these disorders. Therefore, there is an urgent need to conduct more research to expand assessment and treatment approaches. Virtual reality (VR) is emerging as



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one of the technological keys, it is increasingly accessible, and easy-to-use, and has recently attracted attention because of its potential utility for individuals with SUD. Until recently, VR was limited by its cost and by the quality of the multimedia content. In these systems (Playstation4 VR, Oculus Quest, etc.), a different model and sector has recently emerged with the increasing interest of the video game industry in this technology. Decreasing costs and increasing power are making it useful for performing an ecological assessment of cognition, emotions, and behavior in real-time.

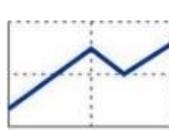
### 4.3. Mindfulness Practices with Virtual Reality

There are also other approaches using virtual reality such as *mindfulness*. Mindfulness has been applied as clinical interventions based on the notion that it is a method for training *attention and awareness* (Kabat-Zinn, 1982) to cope with addiction problems and to provide stress management in daily life. Different types of meditation practice may be associated with unique frequency patterns, reflecting the form of attention (Dunn et al., 1999).

As mindfulness may be considered to be a method of attention training and emotion regulation, corresponding neurophysiological states may be observable. Patterns of EEG activity to particular meditative states have been investigated. A commonly reported feature of meditation has been theta and alpha event-related synchronization (Fell et al., 2010), which are regarded as markers of internally-directed attention processing (Shaw, 1996).

According to a systematic review study; mindfulness is associated with increased alpha and theta power in both healthy individuals and in patient groups. This co-presence of elevated alpha and theta may signify a state of relaxed alertness which is conducive to mental health (Lomas et al., 2015).

Mindfulness interventions study on dependence, craving, and other addiction-related symptoms as well as improving depression, anxiety, and perceived stress and emotion regulation difficulties. Studies generally indicates that a combination of a mindfulness intervention together with treatment as usual (TAU) (including active treatments) would be the best treatment option(Santa et al., 2018).





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To understand the link between mindfulness and neural correlates in addiction can inform the refinement of Mindfulness-Based Interventions (MBIs) to produce larger clinical effects and additional long-term therapeutic benefits. An emerging body of research suggests that MBIs have so far proved effective in reducing craving, reward sensitivity, stress reactivity and negative affect on a general level in substance use disorder (SUD).

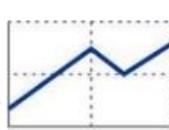
## 5. Advantages and Disadvantages of Using Virtual Reality in Addiction Intervention Field

### 5.1. Advantages:

- It is cost-effective in terms of time and location.
- Many visual and auditory stimulus items can be provided to the patient in a way that creates a realistic effect.
- It provides a safe environment for the patient for application.
- It is an innovative and promising approach in the healthcare system.
- The VR glasses have a user-friendly hardware feature that is easy to wear.
- Addiction interventions, which include psychoeducational studies, provide the opportunity for more permanent learning in the VR environment compared to classical intervention methods (such as PowerPoint presentation or verbal expression).
- It may reduce lack of motivation and/or attention when it is compared to the traditional interventions.
- It may cost less time of a session for both expert and patient since its intensive stimulus.

### 5.2. Disadvantages:

- It is expensive.
- It is unreal.
- It is not suitable for every patient. It is not suitable for people with severe substance use, visual impairment or epilepsy.
- Before each intervention to the patient, it requires technical (charging, checking for malfunctions, checking for software-related error codes, etc.) and hygiene cleaning preparation procedure.





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## 6. Structure of VRforDrugRehabilitation Programme

### 6.1. How to structure a pre-interview?

*The following forms are applied to the patient/client/user the day before the 1st session or the day of the 1st session.*

#### 6.1.1. Informed Consent Form

The participant is informed about all aspects of the program before being admitted to the program with the Informed Consent Form by the expert. Written informed consent about voluntary participation in the study is obtained from the participant.

#### 6.1.2. Case Report Form (Demographic Information Form)

It is the form that includes questions about the participant's demographic information after the participant signs the informed consent form. The form will be filled on in the computer in the web interface to be used by the expert. The participant will be asked verbally by the expert and the answers will be noted down in the computer environment by the expert.

#### 6.1.3. Warwick-Edinburgh Mental Well-Being Scale- WEMWBS

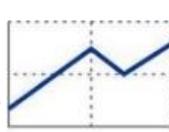
The Warwick-Edinburgh Mental Well-Being Scale will be available on the web interface. The participant will be asked verbally by the expert and the answers will be noted down in the computer environment by the expert.

#### 6.1.4. Five-Facet Mindfulness Questionnaire (FFMQ)

The participant will be asked verbally by the expert and the answers will be noted down in the computer environment by the expert. The Five Facet Mindfulness Questionnaire (FFMQ), a multifactorial scale developed by Baer et al. (2006), has been widely used owing to its practical psychometric properties. The five factors of the FFMQ are: observe, describe, act with awareness, non-judging, and non-reactivity. There is original FFMQ and short forms. There is not short form of FFMQ in each partner country (Portuguese, English, Turkish and Romanian).

#### 6.1.5. Change Stages Form

The Change Stages Form will be located in the Expert web interface. The participant will be asked verbally by the expert and the answers will be noted down in the computer environment by the expert. It is a form created by the project team using





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the Transtheoretical Model, which is thought to contribute to the interpretation of the pilot study according to the scales.

## 6.2. Flow of the VrforDrugRehabilitation Programme

The scenario flow has been created and are based on Prochaska's Transtheoretic Model, Prochaska and DiClemente's stages of change (Prochaska et al., 1997) and Kabat-Zinn's mindfulness approach (Kabat-Zinn&Chapman-Waldrop, 1988). The process of becoming addicted involves forming a new habitual behavior as opposed to adapting or stopping an existing behavior. The transtheoretical model proposes that healthy behavior change consists of pre-contemplation, contemplation, preparation, action, and maintenance stages. The scenario assumes that the user is at least in the pre-contemplation or contemplation stage.

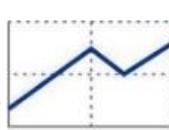
Mindfulness is a cognitive skill of paying attention to internal phenomena (e.g., thoughts, emotions) or external phenomena (e.g., walking, talking) in a way that is intentional rather than automatic, non-reactive rather than reactive, and accepting rather than judgemental (Kabat, 1990). Mindfulness training (MT) has begun to show benefits in several psychiatric disorders, including depression, anxiety and more recently, in addictions. Breath awareness, concentration or focused attention, emotional expression, feedback of performance, mind-body dialogues, mindfulness meditation, physiological measures are the main key elements on mindfulness techniques that are generally used in addiction therapy (Kitson et al., 2018).

## 6.3. Implementation of Sessions of VRforDrugRehabilitation

The objectives and content study of each session in the 3-month (6 sessions) virtual reality technology supported psychoeducation program for adult drug addicts were carried out within the scope of the VRforDrugRehabilitation Project and are as follows:

First Session: The purpose of this session is to provide to the patient; is to encourage them to reevaluate their thoughts and feelings that lead to change

Second Session: It aims to teach the individual mindfulness-based exercise in order to make a commitment to change the behavior pattern of the substance addicted individual and to contribute to the development of a plan and strategy for change.





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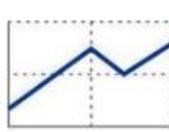


**Third Session:** In the third session, it is the period when the individual implements the plan, takes steps to change the existing behavior pattern and starts to create a new behavior pattern. It is aimed to implement change strategies, restructure the plan when necessary, and maintain its commitment to change decisions when faced with difficulties.

**Fourth Session:** In the fourth session, it is the period when the individual implements the plan, takes steps to change the existing behavior pattern and starts to create a new behavior pattern.

**Fifth Session:** In the fourth session, it is the period when the individual implements the plan, takes steps to change the existing behavior pattern and starts to create a new behavior pattern

**Sixth Session:** In the sixth session, the "Five-Factor Wise Awareness Scale" to assess the level of mindfulness learned from the second session, the "Warwick Edinburgh Mental Well-Being Scale" to measure the level of mental well-being, and the qualitative aspect of not using substances, to evaluate the change process and the "Change Stages Form" will be applied to the patient by the specialist.



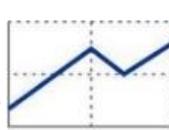


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## 7. BIBLIOGRAPHY

- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). *Using Self-Report Assessment Methods to Explore Facets of Mindfulness. Assessment, 13*, 27–45. doi:10.1177/1073191105283504
- Boston, C. (2002). *The concept of formative assessment*. ERIC Clearinghouse on Assessment and Evaluation College Park: MD. (ERIC Reproduction Service No. ED470206). Retrieved May 20, 2009, from <http://www.ericdigests.org/2003-3/concept.htm>
- Dunn, B. R., Hartigan, J. A., & Mikulas, W. L. (1999). Concentration and mindfulness meditations: unique forms of consciousness? *Applied Psychophysiology and Biofeedback, 24*, 147–165. doi:10.1023/a:1023498629385
- Fell, J., Axmacher, N., & Haupt, S. (2010). From alpha to gamma: Electrophysiological correlates of meditation-related states of consciousness. *Medical Hypotheses, 75*, 218-224. doi:<http://dx.doi.org/10.1016/j.mehy.2010.02.025>
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*, 33-47. doi: [http://dx.doi.org/10.1016/0163-8343\(82\)90026-3](http://dx.doi.org/10.1016/0163-8343(82)90026-3)
- Kabat-Zinn, J., & Chapman-Waldrop, A. (1988). Compliance with an outpatient stress reduction program: Rates and predictors of program completion. *Journal of Behavioral Medicine, 11*, 333–352. <https://doi.org/10.1007/BF00844934>
- Kabat-Zinn, J. (1990). *Full catastrophe living. Using the wisdom of your body and mind to face stress, pain, and illness*. New York: Guilford Press.
- Kitson, A., Schiphorst, T., & Riecke, B. E. (2018). Are You Dreaming? Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18. doi:10.1145/3173574.3173917

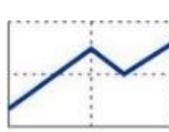




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- Lomas, T., Ivtzan, I., & Fu, C. H. Y. (2015). A systematic review of the neurophysiology of mindfulness on EEG oscillations. *Neuroscience & Biobehavioral Reviews*, *57*, 401–410. doi:10.1016/j.neubiorev.2015.09.018
- Maslow, A. (1954). *Motivation and personality*. Harper and Row, New York, London.
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, *51*, 390–395. <https://doi.org/10.1037/0022-006X.51.3.390>
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, *47*, 1102–1114. <https://doi.org/10.1037/0003-066X.47.9.1102>
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, *47*, 1102–1114. doi:10.1037/0003-066x.47.9.1102
- Segawa, T., Baudry, T., Bourla, A., Blanc, J.-V., Peretti, C.-S., Mouchabac, S., & Ferreri, F. (2020). Virtual Reality (VR) in Assessment and Treatment of Addictive Disorders: A Systematic Review. *Frontiers in Neuroscience*, *13*. doi:10.3389/fnins.2019.01409
- Yardley, S., Teunissen, P. W., & Dornan, T. (2012). Experiential learning: AMEE guide no. 63. *Med Teach*, *34*, 102–115.
- Yin, R. (1994). *Case Study Research: Design and Methods (2nd edition)*. Beverly Hills, CA: Sage Publications.





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