



TRAIVR
Training of Refugee Offenders
by Virtual Reality

IO7. Assessment of Change in the Stress Management Skills of Refugee Probationers

Andrada Istrate
Oana Mureganu-Manolache
European Strategies Consulting

Inês de Castro
IPS | Innovative Prison Systems

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Author/s		ISTRADÉ; Andrada European Strategies Consulting MURGEANU-MANOLACHE; Oana European Strategies Consulting CASTRO; Inês IPS_Innovative Prison Systems	
Contributor/s		All partners	
Reviewer		All partners	

Table of Content

Change Control	2
Document Properties	2
Introduction	5
Foundations for development.....	6
Scenario Assessment Methodology	7
Assessment of change.....	10
Demographic data	10
VR DATA	11
Statistical analysis – Turkey	12
Game time	12
Score	13
Correlation between game time and game score	14
Choices in the VR scenarios	16
Statistical analysis – Portugal.....	21
Game time	21
Game score	21
Correlation between game time and game score	23
Choices in the VR scenarios	23
Emotion Regulation Questionnaire-Short Form (ERQ-S).....	26
VR data and the ERQ-S tool	29
Observation/Evaluation Form	30
Conclusions	31
Suggestions and points for improvement	32
Recommendations	33
References	35
Annexes	36
Demographic Form	36
Emotion Regulation Questionnaire – Short form (ERQ-S).....	37
Observation/Evaluation Form	38
VR Data	41

Table of Figures

Figure 1. Game time values	12
Figure 2. Game score values	14
Figure 3: Correlation between game time and game score	15
Figure 4: Flow of choices in Cafe scenario.....	16
Figure 5: Flow of choices in the Bus stop scenario.....	17
Figure 6: Bus stop scenario - distribution of choices from first to second trial.....	17
Figure 7: Official institution scenario - scenario - distribution of choices from first to second trial	19
Figure 8: Official institution scenario - distribution of choices	20
Figure 9: Park scenario - scenario - distribution of choices from first to second trial....	20
Figure 10: Game time (Portugal).....	21
Figure 11: Game scores for two scenarios *the Café scenario has a constant score of 12 and the Official Institution does not have a score.	22
Figure 12: Bus stop scenario - flow of choices	24
Figure 13: Cafe scenario - flow of choices	25
Figure 14: Park scenario - flow of choices.....	25
Figure 15: Official institution scenario - flow of choices	26

Introduction

The TRAIVR project is co-financed by the European Commission under the "ERASMUS + KA2 - Cooperation for innovation and the exchange of good practices" line, specifically "KA204 - Strategic Partnerships for adult education". It aims to develop Strategic Partnerships for adult education with virtual reality as an innovative solution to help vulnerable groups (refugees and substance users).

This project is funded by the Erasmus+ Program of the European Union. However, European Commission and Turkish National Agency cannot be held responsible for any use which may be made of the information contained therein.

The current project aims to bridge the language gap and facilitate rehabilitation for refugee probationers with substance use issues by developing a VR programme to enhance their coping skills. Substance use will manifest a lack of problem-solving skills, and the target group will be identified based on this criterion. VR's interactive learning environment allows participants to engage in and practice skills, thus providing superior adult learning opportunities, overcoming language barriers, and maintaining confidentiality.

Furthermore, the VR scenario's adaptability to various languages makes it cost-effective. The technique possesses preventative power as the same scenario can be utilized in standard settings. However, VR development demands substantial effort in content preparation, scenario creation, VR modelling, and training application for refugee probationers, necessitating collaborative work. Given that language barriers are widespread, international attention is crucial for solution implementation. Not only will the project enhance the management quality of refugee offenders, but it will also propose a solution and serve as a model for training non-natives. Ultimately, the project's end product could also be a preventative tool for refugees, equipping them with problem-solving skills before encountering risky situations.

This report marks the conclusion of the TRAIVR project, incorporating insights gathered from the needs analysis, theoretical knowledge, and very importantly, the practical experiences particularly with the pilots, the findings provided by the pilot studies, the staff

training and the training events (C1 and C2). Through all these endeavours, the TRAIVR consortium have acquired valuable suggestions, recommendations, and identified areas for improvement in the utilization of VR technology.

The report is part of the IO7 - **Assessment of Change in the Stress Management Skills of Refugee Probationers** - based on the pilot studies conducted on substance-user refugee offenders from Turkey and Portugal between November and December 2023.

Moving forward, it is intended to share the lessons learned from this project to inform and enrich future initiatives. This report will serve as a foundational document, integrating our experiences and findings to enhance VR solutions.

Foundations for development

The background data (IO1 and IO2) served as the foundation upon which the development of TRAIVR's manual for scenarios (IO3) and the creation of storyboards and specific details (IO4) were built. By examining the **best practices and up-to-date literature** on VR technology, the TRAIVR consortium gathered valuable insights for ensuring the efficacy of the intervention, allowing an understanding of the potential of VR in addressing the project objectives.

Simultaneously, conducting a thorough **needs analysis with our target group** was equally crucial. By understanding their unique challenges, preferences, and requirements, the consortium was able to tailor the approach to VR development to directly address their needs, ensuring that the interventions were not only grounded in evidence-based practices but also resonated with the specific needs of the target group.

Moreover, the significance of **clear and simple storyboards** cannot be overstated. This tool served as a bridge between researchers and VR developers, effectively conveying complex ideas and instructions in a manner that is easily understandable and actionable. By ensuring that the storyboards were concise, visually engaging, and communicated key concepts effectively, it was facilitated a smooth development process.

In light of this, it is imperative to highlight the importance of **ongoing communication between researchers and developers** in order to ensure alignment of objectives,

sharing insights, addressing challenges, and fostering collaboration throughout the development process. This consistency enables all parties to remain updated, adjust promptly to evolving requirements, and mutually drive the project towards a successful outcome.

After the software was completed, partners tested it during face-to-face transnational project meetings and provided feedback regarding its functionality, particularly what was working well and what were areas for improvement (bugs, difficulties, etc). This feedback was reported to Becure, who swiftly addressed and corrected the issues.

After the consortium validation, **user testing** was conducted particularly in training events, in which were provided firsthand feedback on the usability and functionality of TRAIVR, allowing to identify **opportunities for improvement**.

Insights collected from staff training, comprehensive stakeholder feedback, and pilots played a key role in shaping the refinement process of TRAIVR. As a result, **adjustments** were made to the scenario design to ensure relevance and engagement, user interfaces were optimised for intuitive navigation and accessibility, and interactive elements were **fine-tuned**. Hence, the consortium was able to **enhance the overall effectiveness and user satisfaction** of TRAIVR.

Scenario Assessment Methodology

The TRAIVR partnership is dedicated to ensuring a **thorough and effective assessment of the project's programme**. Hence, an assessment methodology aims to measure the improvement in specific skills addressed within each scenario, utilising pre and post-tests.

To achieve this, a **thorough identification of the skills targeted** in each scenario was conducted. This involves a detailed analysis of the objectives and learning outcomes associated with the scenario. **Existing assessments that align with the identified skills** were reviewed. These assessments are validated tools widely recognised for measuring the specific skills targeted in the scenarios.

From the selected assessments, 2-3 questions per skill were extracted to form the basis of the pre and post-tests. These questions were carefully chosen to gauge the

participants' proficiency in the targeted skills before and after engaging with the TRAIVR programme.

Participants' responses to the pre and post-tests are collected and analysed. This data provides **valuable insights into the baseline proficiency of participants and the potential improvements in skills resulting from their engagement with the TRAIVR scenarios.**

A quantitative analysis is performed on the collected data to measure the statistical significance of any observed changes. This analysis helps determine the effectiveness of the TRAIVR programme in enhancing the targeted skills. In addition to skill development, a more nuanced understanding of participants' **experiences and perceptions** regarding the program is included.

In all, this methodology results in **two surveys**, one to be applied before completing the program, and the other after its completion. These surveys include the questions extracted from the assessments concerning skills development, along with the participant's experiences.

By employing this comprehensive assessment methodology, the TRAIVR programme aims to provide **empirical evidence of its impact on the participants.**

The Assessment

Following an extensive review of the skills tackled within the VR scenarios, an evaluation of various validated assessments applicable to this group was selected. Specifically, cognitive reappraisal and expressive suppression were key indicators for this methodology.

These dimensions were specifically chosen for their universality across all scenarios. Not only do they offer a **holistic perspective on participants' cognitive and emotional states**, but they also align with the need for a **straightforward and concise assessment** process, recognising potential language barriers among the participants.

These selected skills encapsulate the **core of the abilities addressed in the scenarios**, providing robust indicators to gauge the effectiveness of TRAIVR in achieving its intended goals.

- ▶ **Cognitive Reappraisal:** Cognitive reappraisal is oriented to the change in the meaning of the situation; it involves changing the way we look at the stressful situation to reduce the reaction associated with discomfort. This skill involves the ability to reframe one's thoughts and interpretations of challenging situations, fostering adaptive coping mechanisms (Garcia et al., 2023).
- ▶ **Expressive Suppression:** Acknowledging that the management of external expressions of emotion is integral to successful interactions. This dimension involves the regulation of outward emotional displays, enhancing interpersonal interactions and mitigating potential conflicts (Garcia et al., 2023).

In line with this, the **Emotion Regulation Questionnaire-Short Form (ERQ-S)** (see appendix 1) was chosen for this purpose. The tool is a 6-item self-report measure of two key emotion regulation strategies: cognitive reappraisal and expressive suppression. The ERQ-S is a short form of the 10-item Emotion Regulation Questionnaire (Gross & John, 2003), the most widely used self-report measure of emotion regulation.

Originally developed in English, the ERQ has since been translated into 37 other languages (Stanford Psychophysiology Laboratory¹, 2023). The ERQ has demonstrated strong psychometric properties across a range of general community, college, and clinical settings, and across different countries or cultural groups (e.g., Preece et al., 2020; Sala et al., 2012; Santos et al., 2021; Eldeleklioglu & Eroglu, 2015; Sadiq & AL-Hadrawi, 2021; Wang et al., 2020). It is noteworthy to highlight that this tool is also key in the TRAIVR intervention as it has been validated into **Portuguese, Turkish** (where the national trainings will take place) along with **Arabic** (most refugees nationality, especially in Turkey) (Santos et al., 2021; Eldeleklioglu & Eroglu, 2015; Sadiq & AL-Hadrawi, 2021).

Corroborating the construct validity of the ERQ, self-reported scores on the questionnaire closely correspond with expected emotional experiences and behaviours

¹ <https://spl.stanford.edu/papers>

as postulated by the theoretical framework (Gross and John, 2003), and much of what is known about the role of cognitive reappraisal or expressive suppression in psychopathology comes from research using the ERQ (e.g., a pattern of low cognitive reappraisal use and high expressive suppression use on the ERQ usually being indicative of emotion regulation difficulties; Preece et al., 2018).

In contrast to assessments requiring complex tools or an intricate understanding of oneself, such as those measuring moral reasoning and refusal skills, the chosen dimensions allow for a more **accessible and streamlined evaluation**. Their simplicity facilitates effective measurement, ensuring that the assessment process remains clear and comprehensible to the group, **overcoming language challenges**.

Assessment of change

The assessment mechanisms identified were implemented for the pilot studies, allowing the partners to effectively monitor the performance and impact of TRAIVR post-implementation. Specifically, changes in cognitive reappraisal and expressive suppression were assessed, two key psychological processes targeted by TRAIVR. Findings indicate improvements in these areas following the completion of TRAIVR, demonstrating its efficacy in facilitating positive cognitive adjustments.

In addition to assessing cognitive processes, were also **evaluated various individual aspects** to gather comprehensive insights into the effectiveness of the methodology. This included assessing participants' mood, their perceptions about VR technology, their level of enjoyment and engagement with the scenarios, and exploring their overall satisfaction with the intervention. These **holistic assessments** provided valuable indicators of TRAIVR's effectiveness in enhancing participants' emotional well-being, cognitive functioning, and overall engagement with the intervention.

Demographic data

The pilot studies were conducted on ten substance-user refugee offenders from Turkey. In Portugal, five probationers were targeted without any refugee status conditions. This is because Portugal does not have specific cases like those in Turkey, where individuals

possess all three specified characteristics simultaneously. It's crucial to note that, due to this difference, the VR scenarios were designed to effectively accommodate individuals with all three specified characteristics (probationers + substance-user + refugee), as well as those who do not exhibit all of them.

The pilot studies in both countries were conducted between November and December 2023. All participants are male, and a significant majority (12) are employed. The average age of the participants is approximately 34.8 years, with a wide range of ages from mid-20s to late 50s. This age distribution suggests a mix of participants, providing a broad perspective on age-related experiences or viewpoints.

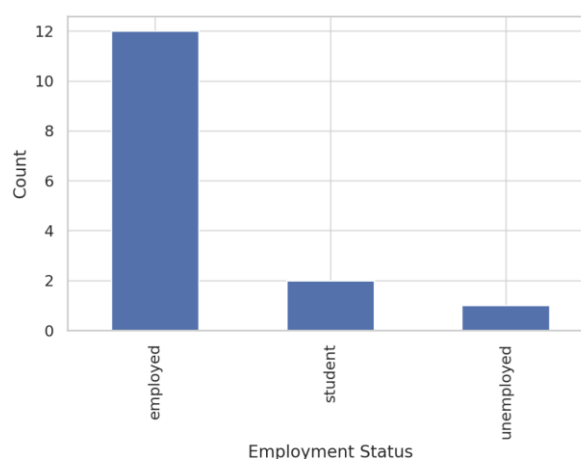
The predominant primary language among participants is Arabic, followed by Portuguese. Other languages spoken include Russian, Urdu, and Swahili. This linguistic diversity points to the varied cultural backgrounds of the participants and has implications for communication and interaction within the study.

Marital Status: 5 participants are married, and eight are single, a substantial portion of the group, and may reflect a younger demographic or those not currently in a marital relationship.

Most participants have completed primary education, followed by those with secondary education and a smaller number with higher education. One participant has no formal education. This spread in educational attainment may reflect different access to educational opportunities among the participants and could influence their perspectives and experiences in the study.

VR DATA

The TRAIVR VR training allows participants to go through four distinct scenarios, named after the setting, where they take place: the bus stop, café, official institution, and park. Three of the four scenarios –bus stop, the café, and the park have a scoring system. Regarding



the pre and post-test analysis in Turkey, each participant underwent two pilots, allowing for two comparisons. In Portugal, addressing participants at two different moments posed challenges. Therefore, an effective approach was adopted, utilising an assessment tool to analyse individuals both before and after the pilot.

Statistical analysis – Turkey

Game time

Participants' game time per scenario is, on average, 7:45 minutes, with a median of 8:07. The most time spent was for the café scenario, with one participant spending over 20 minutes in the scenario. The data shows that players spend varying amounts of time in different game scenarios. The Cafe and Bus Stop scenarios have the longest average and median times, indicating there might be more engaging or complex parts of the VR training. The Official Institution, with the shortest average and median times, might be a simpler or less engaging segment, as participants spend, on average, less than three minutes. The considerable range between the maximum and minimum times across all scenarios suggests that player engagement varies widely, which could be influenced by individual player preferences, game design, or difficulty levels of each scenario.

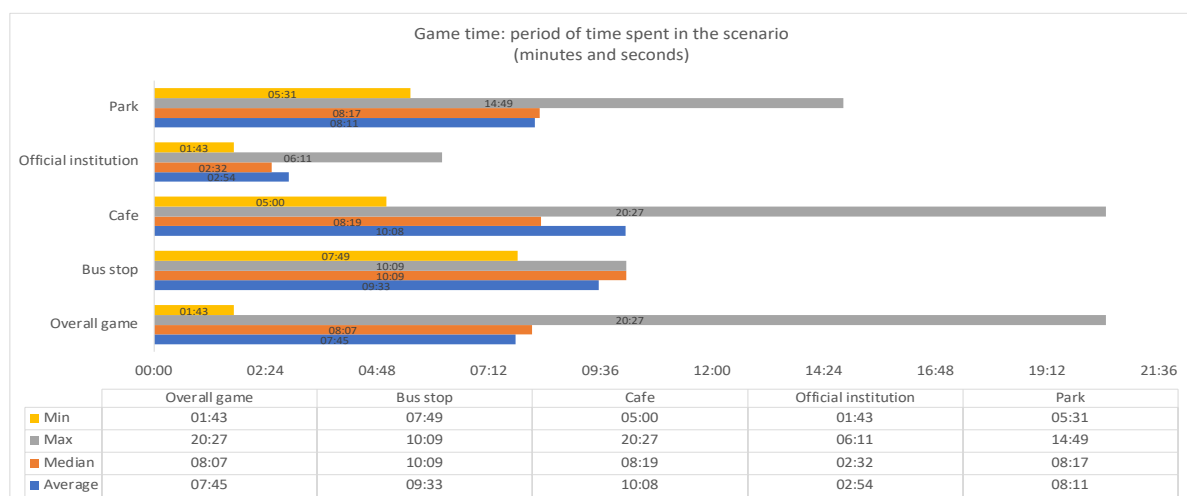


Figure 1. Game time values

On average, one participant needs approximately 31 minutes to go through all four scenarios (more precisely, 31 minutes and 4 seconds, a number resulting from calculating the average game time per scenario and summing the duration of all scenarios). The maximum time spent on the VR platform was 33.6 minutes, and the minimum was 20.5 minutes.

The range between the minimum and maximum times (about 13 minutes) suggests a variance in how participants engage with or find their way through the scenarios. If the goal is a uniform experience, the scenarios need adjustments to normalize the time spent. Furthermore, the variation in times might also reflect differences in user experience. For example, **users who spend more time might be more immersed or encounter usability issues.**

Score

Participants scored an average of 20 points per scenario. The "Overall game" scores range from 0 to 69, which is the widest range among all scenarios. However, the average score is relatively low compared to the maximum, suggesting that **while some players may achieve very high scores, many do not.** The "Park" scenario has the highest median and average scores, both at 25, **which could suggest that players generally score well in this scenario.** The "Cafe" scenario has the lowest maximum score at 12, and both median and average scores are also 12. This indicates a low score variability and suggests that players **may find this scenario less challenging or that there's a lower ceiling for the scores that can be achieved.** The "Bus Stop" scenario shows a wide range of scores from 3 to 65, with an average slightly higher than the median, which might imply that while some players score very high, the majority score closer to the median of 22. The Official institution scenario was removed from this analysis, as participants do not receive score for this scenario.

This analysis could be useful especially for both scenario and VR development, as it shows which parts of the game are the most and least challenging for participants. The data show that there are still opportunities to adjust the difficulty and scoring system to improve player engagement and satisfaction.

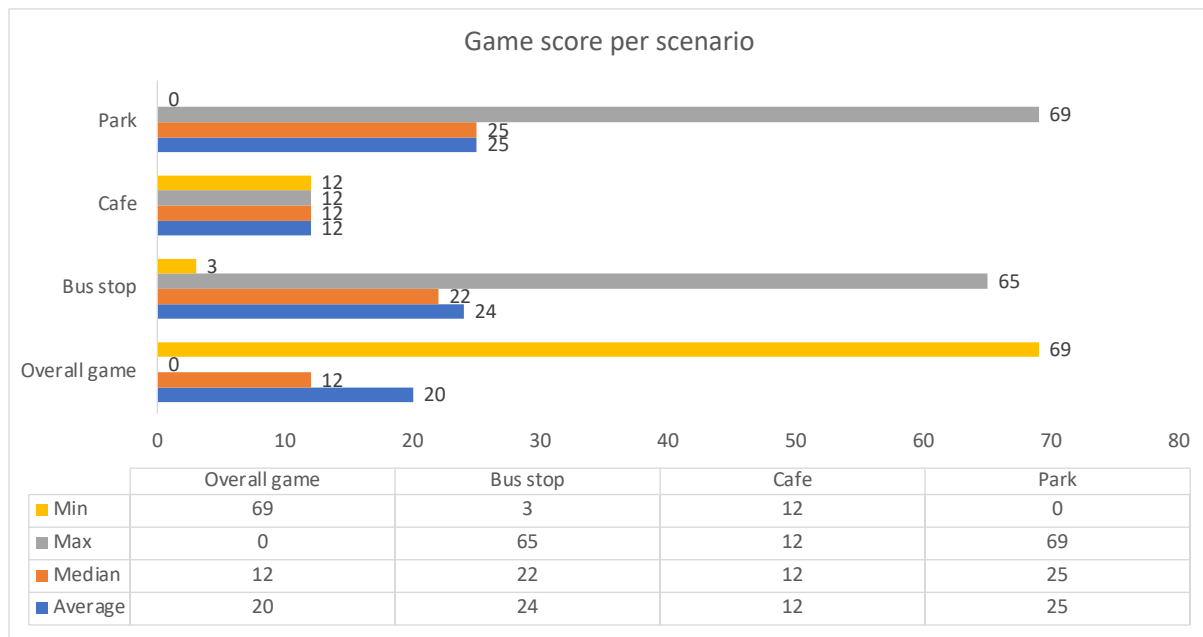


Figure 2. Game score values

As such, the data indicate that the Café scenario **could be scored differently, in order to allow for variability in game score and to ensure participant engagement.** Furthermore, the Bus stop scenario shows a great variability in terms of scoring, **which means that it might be the most engaging to participants.**

Correlation between game time and game score

Since there is a great deal of variability in terms of game time and game score, this analysis aims to investigate the relationship between the two variables. Understanding the relationship between the time spent in a game and the scores achieved **can help developers fine-tune game difficulty. If spending more time does not correlate with higher scores, it might indicate that parts of the game are too difficult or not intuitive enough, prompting a review of game design to enhance playability.** Furthermore, analysing how time invested affects scores can provide insights into player engagement. If players are spending a lot of time but not improving their scores, they

might become frustrated and stop playing. Conversely, if high scores are achieved too quickly, players might lose interest due to a lack of challenge.

As such, analysing the correlation between game time and game score shows that for the Café scenario, no correlation could be established due to insufficient variability in the data. As it is evident in the table above, all participants scored 12 in the game, the only variable being the game time duration.

The situation is different for the other two scenarios – that is, the Bus stop scenario and the Park scenario, as both show a relationship between the time spent in the game and the game score. As such, for the Bus stop scenario, there is a weak negative correlation (coefficient of approximately -0.115), **which suggests that as the game time increases, the game score tends to decrease slightly**. The relationship, however, is not strong. For the Park scenario, there is a weak negative correlation (coefficient of approximately -0.128), indicating a slight tendency for the game score to decrease as the game time increases. Similarly to the Bus stop scenario, the relationship is not strong.

It is important to note that the weak negative correlations suggest there is not a strong linear relationship between the time spent in the game scenarios and the scores achieved. **This could mean that spending more time does not necessarily lead to higher scores or that other factors, such as game difficulty or player skill, have a more significant impact on the scores than time alone**. Nevertheless, these values only measure the strength and direction of a linear relationship between two variables. They do not imply causation; other factors not included in the analysis might influence both game time and scores.

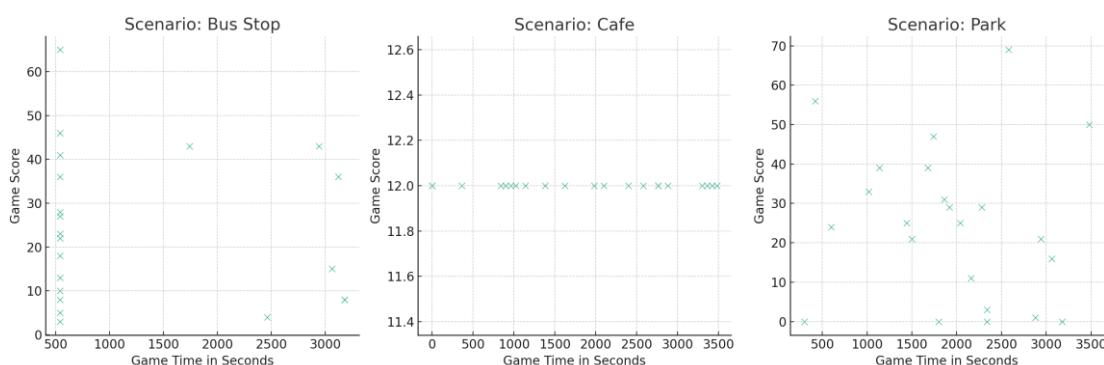


Figure 3: Correlation between game time and game score

Choices in the VR scenarios

The **Café scenario** shows the least amount of variability in terms of choices. The dataset contains information about the choices made by participants in the Cafe scenario for two trials (First trial and Second trial). Each row represents a participant's choices in a trial, including their ID, date, and three consecutive choices. As such, there is limited variability in the choices participants make. Except for three instances out of 21 entries where participants choose the option "Take drug," all other choices are to "Refuse drug" (see figure below)

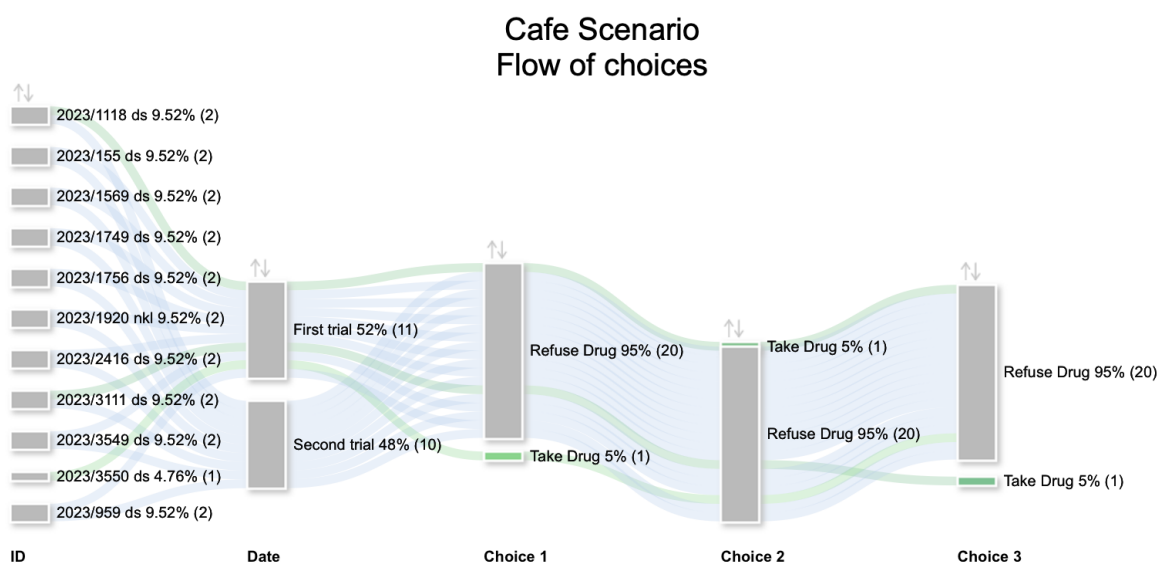


Figure 4: Flow of choices in Cafe scenario

The limited variability of the "Take drug" choice, as represented also in the figure below **can be explained in terms of social desirability bias**. This bias occurs when participants respond in a manner that they believe is favourable or acceptable in the eyes of others. **In this case, the presence of authority figures such as probation officers might have influenced participants to make choices that they perceive as more socially acceptable or responsible**, which in this context appears to be refusing the drug. Since the VR training in Turkey was applied with the help of probation officers, the authority relationship between counsellors and clients might have an effect on the choices participants make in the trial. This influence can significantly impact decision-

making, leading to less variability as participants might feel compelled to choose the option they believe is endorsed by the officers.

For the **Bus stop** scenario, the figure below shows the flow of choices within the same trial and from one trial to another. As such, 75% of participants chose in the first trial to help the old man. In the same trial, the second choice was identical for all participants, as all chose to help the pregnant woman. The third choice for 75% of participants was to refuse the troubled man, while 25% chose to help him.

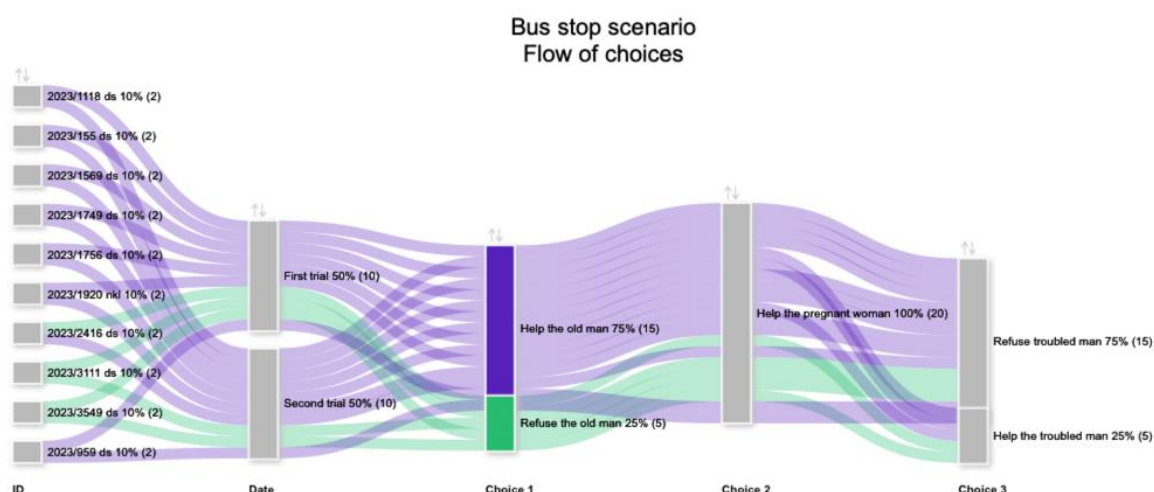


Figure 5: Flow of choices in the Bus stop scenario

When comparing the first and second trial, it seems that the data shows a strong tendency to help both the older man and the pregnant woman, with a perfect consistency in the choice to help the pregnant woman across trials. **There is minimal variability in participants' choices, which could suggest that the scenarios lead participants to**

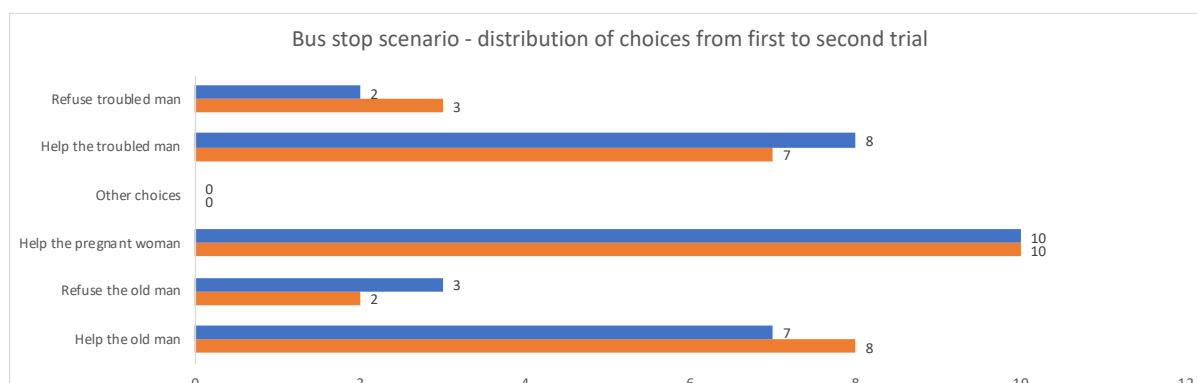


Figure 6: Bus stop scenario - distribution of choices from first to second trial

similar conclusions or that strong social norms or biases influence the decisions.

The absence of choices for 'Other choices' might point to a lack of compelling alternatives to the presented options or a design of the scenarios that does not encourage exploring those alternatives.

There is a slight increase in the number of participants who chose to help the older man in the second trial (8) compared to the first trial (7). This could suggest that **participants are slightly more inclined to help as they repeat the scenario**, perhaps due to a growing familiarity with the situation or a change in their decision-making approach after experiencing the first trial. The number of participants who refused to help the old man decreased from 3 in the first trial to 2 in the second trial. This further **supports the idea that participants are more willing to help upon repeating the scenario.**

The number of participants who helped the pregnant woman remained consistent at 10 for both trials. This indicates a strong preference for this choice, suggesting that helping the pregnant woman is seen as a clear priority or socially desirable action by the participants. **There were no participants who selected 'Other choices' in either trial, which could mean that the other options presented were not appealing or clear enough, or that the scenario strongly guided participants towards the options of helping.**

The number of participants who helped the troubled man decreased slightly from the first trial (8) to the second trial (7). This small change might not be significant but could indicate a shift in decision-making or a redistribution of priorities when participants are given a chance to re-evaluate their choices. Conversely, the number of participants who refused to help the troubled man increased from 2 in the first trial to 3 in the second trial. **Although the change is minimal, it might suggest that some participants who helped in the first trial decided to refuse in the second, perhaps to explore different outcomes or because of reconsideration of the scenario context.**

The official institution scenario helps players **develop a deeper understanding of their emotions, leading to better decision-making and better self-management.** Emotional intelligence allows players to understand others' emotions, fostering stronger interpersonal interactions. Identifying emotions also promotes emotional regulation,

allowing players to make thoughtful, rational decisions, reducing conflicts and promoting favourable outcomes.

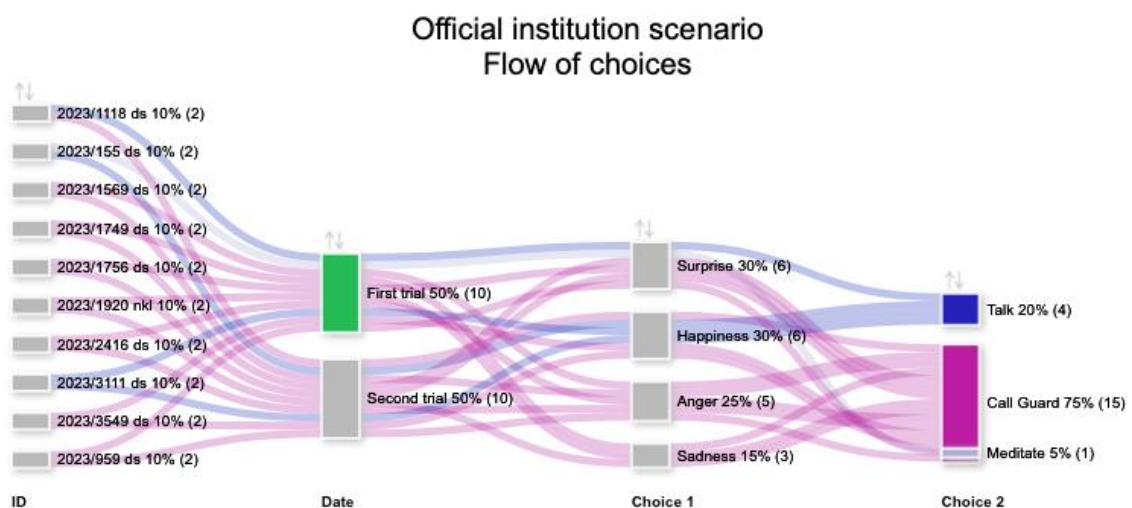


Figure 7: Official institution scenario - scenario - distribution of choices from first to second trial

Each participant went through two trials where an emotional response (surprise, anger, sadness, happiness) prompted different reactions (meditate, talk, call guard). The positive choices (surprise and happiness) remained constant throughout the two trial but reversed the distribution of values. As such, four participants expressed surprise in the first trial, as compared to two participants in the second trial. Two participants expressed happiness in the first trial, as compared to the four in the second trial. **"Happiness" and "Surprise" are associated with "Talk" in some instances, indicating a possible scenario where participants felt more open to communication.** "Anger" and "Sadness" always lead to "Call Guard," **suggesting a scenario where negative emotions prompt a call for help or intervention.** Several participants exhibit consistent emotional responses and actions across both trials (e.g., ID 2023/1569 ds with 'Anger' and 'Call Guard' in both trials). **This could indicate a strong emotional reaction to the scenario that is not easily swayed by repetition or reflection.**

"Call Guard" is the predominant choice, which may reflect the design of the scenario where calling for assistance or security is the most appropriate response within the context of the scenario or the most straightforward choice presented. The choice to

"Talk" or "Meditate" is less frequent, suggesting that these options might be perceived as less effective or relevant in the scenario.

		First trial	Second trial
Choice 1	Surprise	4	2
	Anger	2	3
	Sadness	2	1
	Happiness	2	4
Choice 2	Talk	2	2
	Meditate	1	0
	Call Guard	7	8

Figure 8: Official institution scenario - distribution of choices

In the **Park scenario**, all participants went through two trials, with the exception of one participant who chose to go through the VR scenario three times.

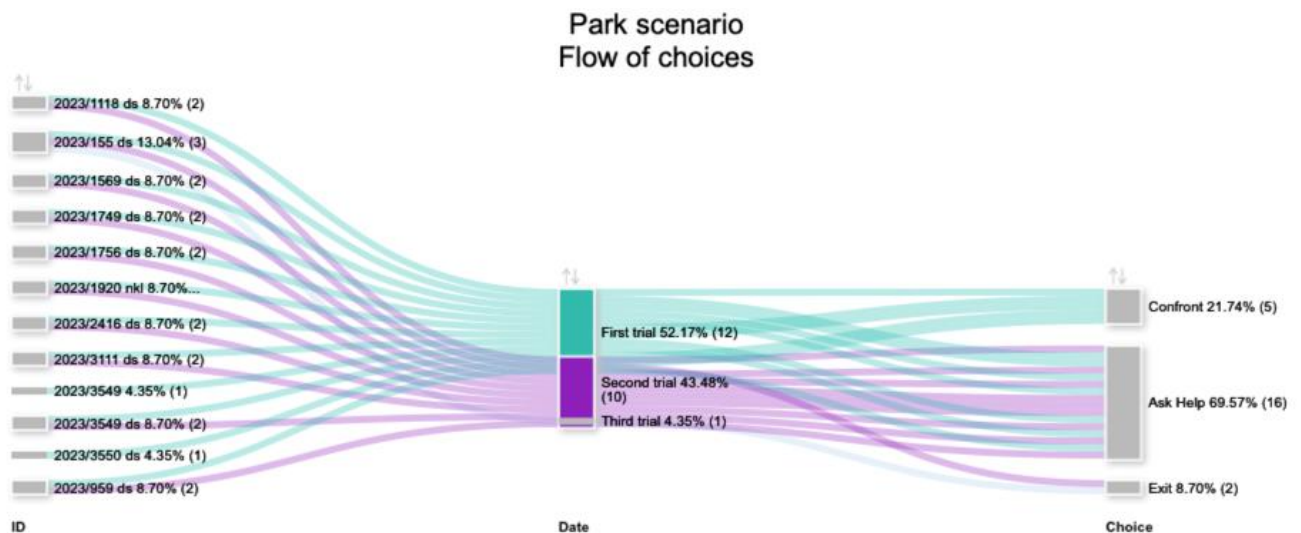


Figure 9: Park scenario - scenario - distribution of choices from first to second trial

In terms of choice variability, it is interesting to note that in the first trial, participants chose to either "Confront" or "Ask Help." **The choice to "Confront" disappeared altogether in the second and third trials, participants choosing the variant: "Ask Help" or "Exit."**

Statistical analysis – Portugal

The pilot conducted in Portugal involved 5 people, which does not allow for a similar statistical analysis as above.

Game time

Participants spent, in average, 7 minutes and 10 seconds in one scenario. For the whole four scenarios, one participant would need, in average, 28 minutes and 40 seconds.

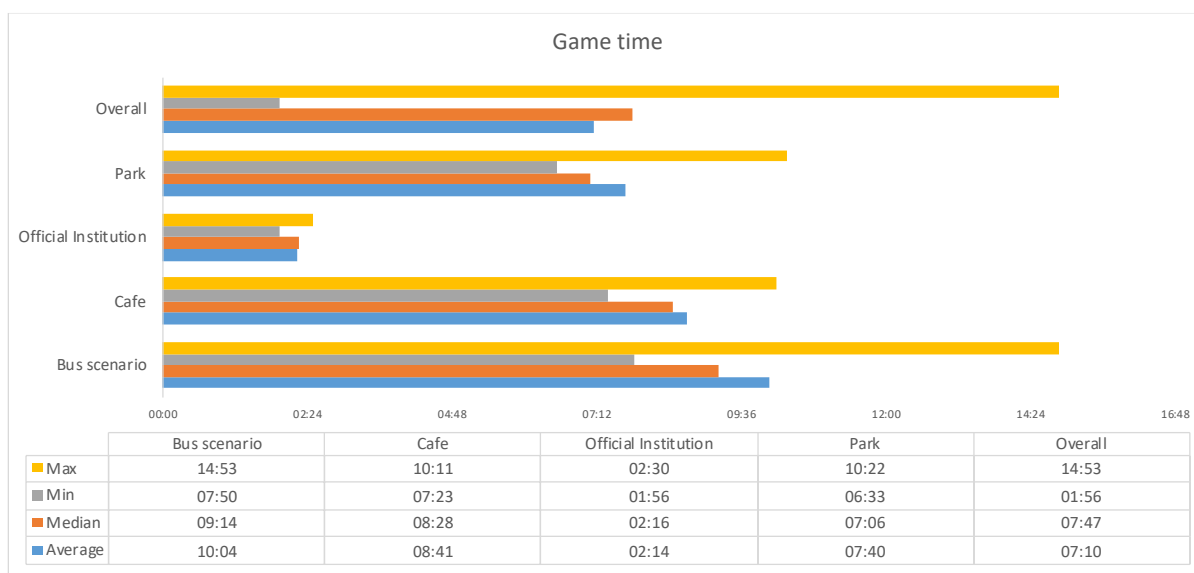


Figure 10: Game time (Portugal)

Game score

The average score for the Bus Stop scenario is 16.4, which is higher than the average score for the Park scenario, which is 11. This suggests that on average, players scored higher in the Bus Stop scenario. The median score for the Bus Stop scenario is 13, compared to a median score of 7 for the Park scenario. The median being lower than the average in both scenarios suggests a right-skewed distribution, meaning there are some higher scores pulling the average up more than the median.

The minimum score in the Bus Stop scenario is 8, while for the Park scenario, it's 4. This indicates that the lowest scores were higher in the Bus Stop scenario than in the Park scenario. The maximum score in the Bus Stop scenario is 37, compared to 32 in the Park scenario. Both scenarios have relatively high maximum scores, but the Bus Stop scenario has the highest score overall.

The difference between the average and median scores, as well as the range between the min and max scores, suggests that the score distribution is likely not symmetrical for either scenario. The larger range and difference between the average and median in the Bus Stop scenario might imply more variability in scores compared to the Park scenario. **The data might imply that participants find the Bus Stop scenario slightly easier or more straightforward, allowing for higher scores on average and fewer low scores.**

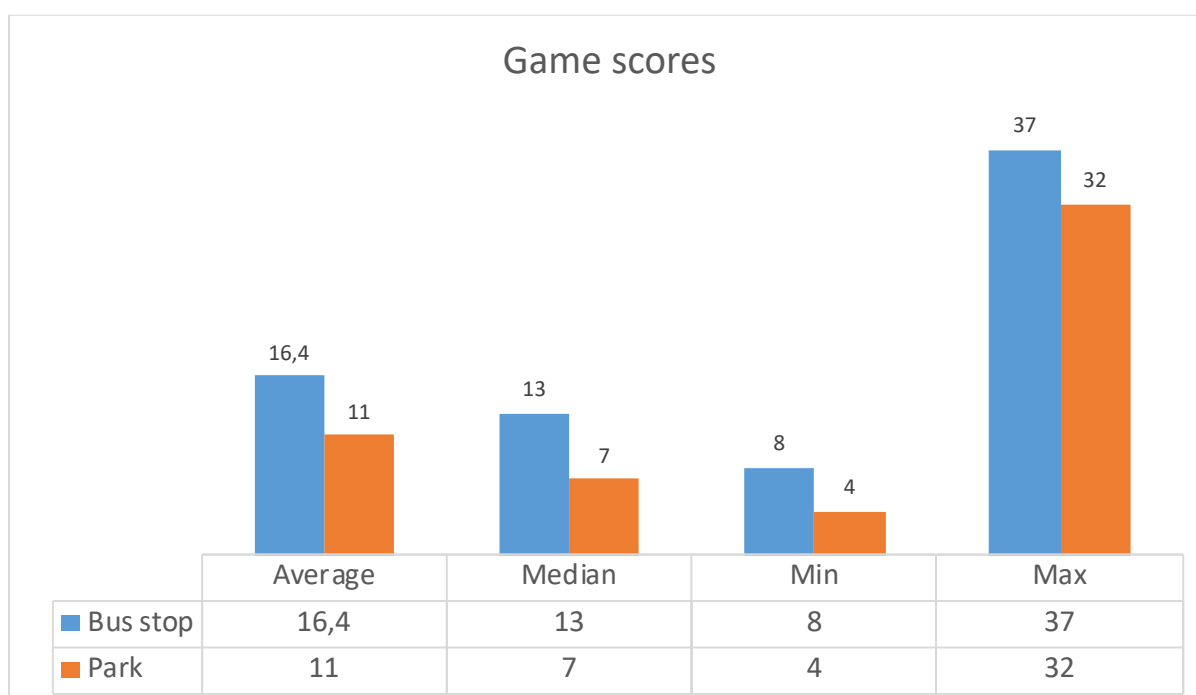


Figure 11: Game scores for two scenarios *the Café scenario has a constant score of 12 and the Official Institution does not have a score.

Correlation between game time and game score

Bus Stop - Time and Score: The correlation coefficient is approximately -0.294. This indicates a weak negative correlation between game time and game score in the Bus Stop scenario. As time increases, the score tends to decrease slightly, but the relationship is not strong.

Bus stop - t	-0,29418
Park - time	-0,47044
Overall	-0,16154

Park - Time and Score: The correlation coefficient is approximately -0.470. This suggests a moderate negative correlation between game time and game score in the Park scenario. Here, as the game time increases, the game score tends to decrease at a more noticeable rate than in the Bus Stop scenario.

Overall: The overall correlation coefficient is approximately -0.162. This indicates a very weak negative correlation when combining the data from both scenarios. This weak correlation suggests that when considering all the data together, **there is a slight tendency for game scores to decrease as game time increases, but the relationship is not strong and other factors could be influencing the game score.**

These coefficients suggest that there is some degree of negative relationship where longer game times might be associated with lower scores, particularly in the Park scenario. However, it's important to note that correlation does not imply causation.

Choices in the VR scenarios

For the purpose of this analysis, three graphs were generated in order to understand the flow of choices within each VR scenario. It is important to mention that in Portugal, each participant underwent one trial, which does not allow for analysis regarding the changes from one trial to the other.

In the **Bus stop scenario**, all five participants in the pilot made the same choice to help the old man. This unanimous decision may suggest a strong social norm or a clear benefit in helping the old man that resonates with all participants. Similarly to Choice 1, in the second choice, all participants also chose to help the pregnant woman. This could be indicative of a social bias towards helping those who are seen as vulnerable or in

need of assistance. In the third choice, there is a variation in the responses. P1, P3, and P5 chose to help the troubled man, while P2 and P4 chose to refuse the troubled man. This variation might reflect a more complex scenario where the "correct" choice is less clear or where individual differences in decision-making become more pronounced (Figure 12).

In the **Café scenario**, participants P1 and P3 consistently refused the drug across all three stages. This could indicate a strong personal stance against drug use, adherence to a rule, or a reaction to the scenario that discourages drug-taking behaviour. This was not the case with participant 5 who consistently took the drug at all stages, which may imply a more favourable attitude towards the drug, a willingness to take risks, or a lack of concern for potential negative consequences. The majority choice at any stage is to refuse the drug, with three refusals in the first and third stages and four in the second. This could indicate that the scenario is designed to encourage refusal or that there is a strong social norm against taking the drug in the given context (Figure 13).

In the **Park scenario** (Figure 14), there are two reactions elicited by participants, namely Ask help (three choices) and Confront (two choices).

And lastly, in the **Official institution scenario** (Figure 15), majority of participants (P1, P3, P4, P5) chose to 'Talk' regardless of whether the emotion was positive or negative, which could suggest a preference for communication in dealing with emotional situations.

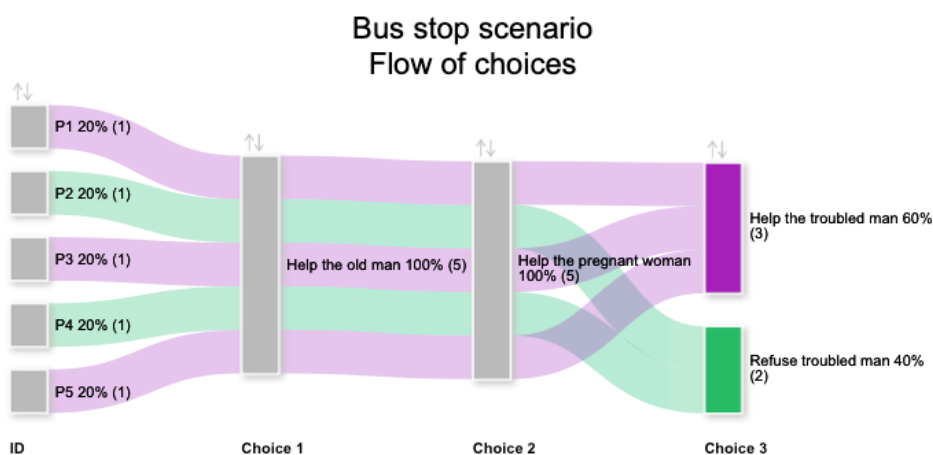


Figure 12: Bus stop scenario - flow of choices

Cafe Scenario Flow of choices

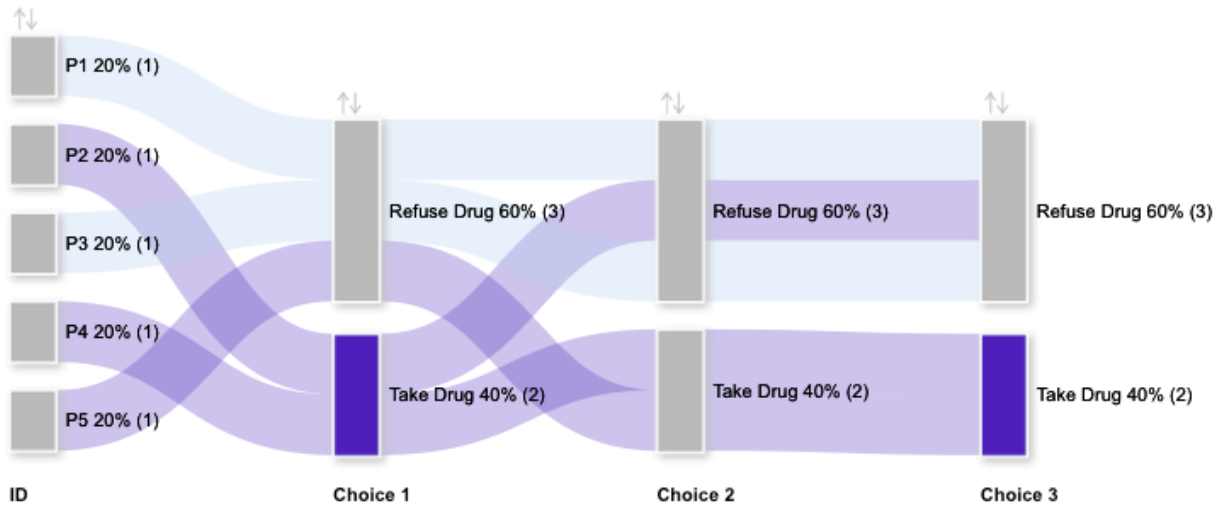


Figure 13: Cafe scenario - flow of choices

Park scenario Flow of choices

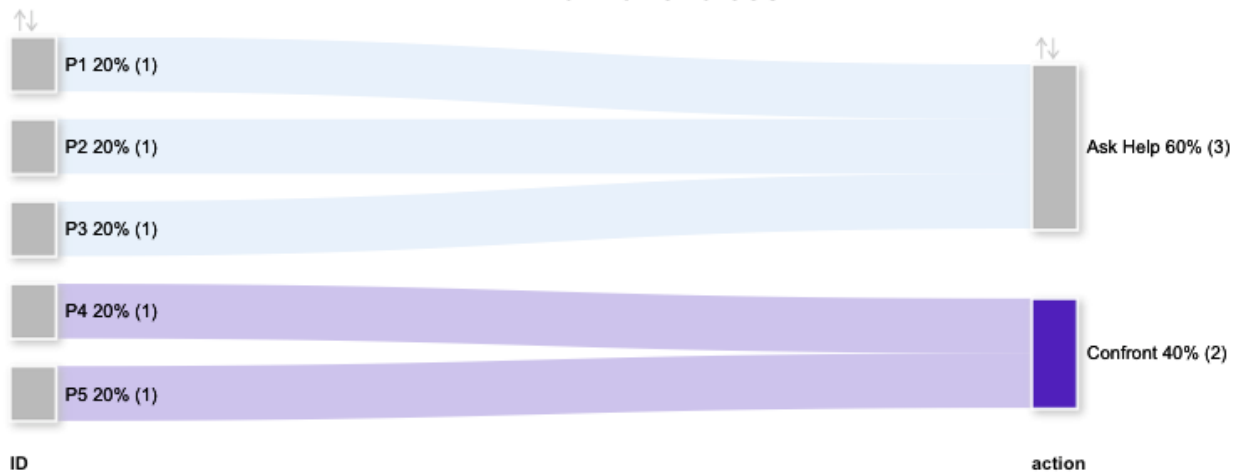


Figure 14: Park scenario - flow of choices

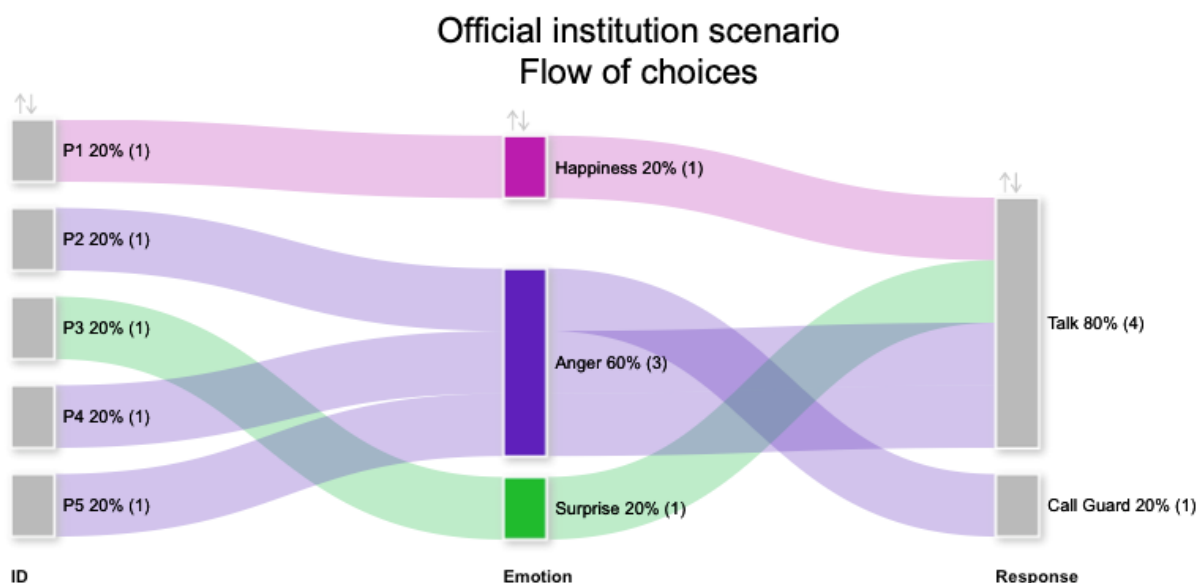


Figure 15: Official institution scenario - flow of choices

Emotion Regulation Questionnaire-Short Form (ERQ-S)

In Portugal pilot study a pre- and post-assessment was used to directly assess the experiences and skill development of the probationers. These assessments are designed to offer **insights into the cognitive changes observed before and after engaging with the TRAIVR scenarios.**

A quantitative analysis is performed on the collected data to measure the statistical significance of any observed changes. This analysis helps determine the **effectiveness of the TRAIVR programme in enhancing the targeted skills.** In addition to skill development, a more nuanced understanding of participants' experiences and perceptions regarding the program is included.

In all, this methodology results in two surveys, one to be applied before completing the program, and the other after its completion. These surveys include the questions extracted from the assessments concerning skills development, along with the participant's experiences.

By employing this comprehensive assessment methodology, the TRAIVR programme aims to provide empirical evidence of its impact on the participants.

Following an extensive review of the skills tackled within the VR scenarios, an evaluation of various validated assessments applicable to this group was selected. Specifically, cognitive reappraisal and expressive suppression were key indicators for this methodology.

These dimensions **were specifically chosen for their universality across all scenarios.**

Not only do they offer a holistic perspective on participants' cognitive and emotional states, but they also align with the

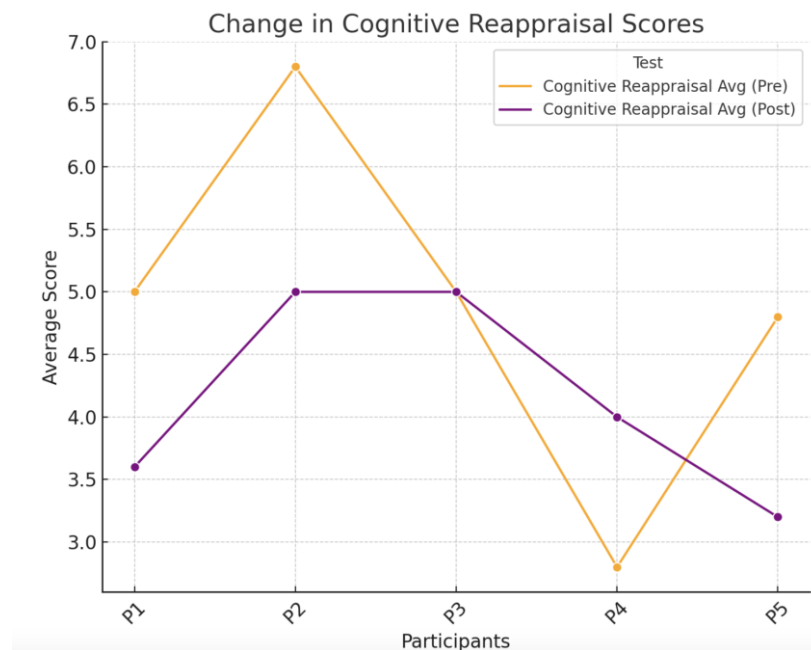
need for a straightforward and concise assessment process, recognising potential language barriers among the participants.

These selected skills encapsulate the core of the abilities addressed in the scenarios, providing robust indicators to gauge the effectiveness of TRAIVR in achieving its intended goals.

In contrast to assessments requiring complex tools or an intricate understanding of oneself, such as those measuring moral reasoning and refusal skills, the chosen dimensions allow for a more accessible and streamlined evaluation. Their simplicity facilitates effective measurement, ensuring that the assessment process remains clear and comprehensible to the group, overcoming language challenges.

Cognitive Reappraisal: Cognitive reappraisal is oriented to the change in the meaning of the situation; it involves changing the way we look at the stressful situation to reduce the reaction associated with discomfort. This skill involves the ability to reframe one's thoughts and interpretations of challenging situations, fostering adaptive coping mechanisms (Garcia et al., 2023).

Respondents' answers are scored on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). The scoring takes the average of all the scores in each



subscale of cognitive reappraisal and expressive suppression. The higher the score, the greater the use of that particular emotion regulation strategy; conversely, lower scores represent less frequent use.

Pre-test: Scores varied significantly (2.8 to 6.8), with a mean of 4.88, suggesting a moderate to high use of cognitive reappraisal strategies among participants.

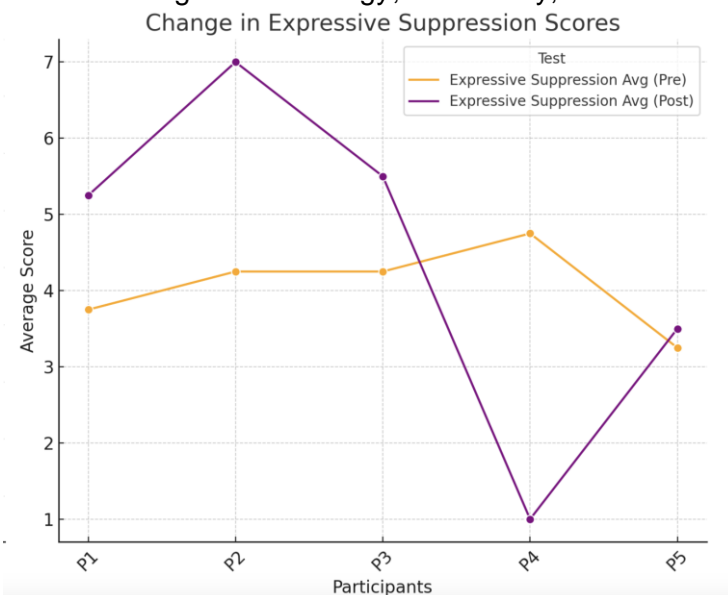
Post-test: Scores became more closely clustered (3.2 to 5.0) with a lower mean of

4.16. This indicates a reduction in the use of cognitive reappraisal strategies post-intervention.

The post-test scores are more clustered (ranging from 3.2 to 5.0) compared to the pre-test (ranging from 2.8 to 6.8). This indicates a convergence in participants' responses, suggesting that the intervention had a somewhat uniform effect in terms of reducing the variability in their use of cognitive reappraisal.

The intervention has reduced the overall tendency to engage in cognitive reappraisal across participants, as indicated by the lower average score and the narrower score range post-test. This could imply that the **intervention either made participants less reliant on reinterpreting their emotional experiences or shifted their emotional regulation strategies.**

The data suggest that the intervention had a measurable impact on participants' emotional regulation strategies, particularly in reducing the use of cognitive reappraisal. This could reflect **the nature of the intervention, its effectiveness, or the adaptability of the participants to the strategies promoted during the intervention.** Understanding these changes is crucial for evaluating the intervention's effectiveness and for planning future strategies or interventions in similar contexts.



Expressive Suppression: Acknowledging that the management of external expressions of emotion is integral to successful interactions. This dimension involves the regulation of outward emotional displays, enhancing interpersonal interactions and mitigating potential conflicts (Garcia et al., 2023).

Pre-test: More consistent scores (3.25 to 4.75) with a mean of 4.05, indicating a moderate use of expressive suppression.

Post-test: A much wider score range (1.0 to 7.0) and a higher mean score of 4.45. This suggests not only an increased use of expressive suppression on average but also greater variability in how participants used this strategy after the intervention.

The intervention seems to have led to an increase in the average use of expressive suppression, along with more varied responses among participants. This increased variability and higher average score could suggest that the intervention had diverse effects on participants' tendencies to suppress their emotions, with some possibly becoming more inclined to suppress their emotions while others less so.

VR data and the ERQ-S tool

There could be a correlation between the VR scenarios and changes in emotional regulation strategies. For instance, **the unanimous decision to help in the Bus Stop scenario** could correlate with a decrease in cognitive reappraisal, as participants might feel less need to reassess their initial, altruistic impulse.

In the Café scenario, participants' drug refusal could correlate with an increase in cognitive reappraisal. Here, individuals might reassess the situation, recognizing the social and personal implications of drug use. This decision aligns with societal norms against drug consumption. Also, expressive suppression could be observed as participants might conceal any curiosity or peer pressure influenced emotions to maintain their stance against drug use.

In the Park scenario, the varied responses of seeking help or confronting the situation could be linked to different levels of cognitive reappraisal. Those who seek help might reassess the situation as beyond their control, requiring external assistance. In contrast, those who confront may reappraise their ability to handle the situation themselves.

Expressive suppression could be significant in both cases, either to hide vulnerability when seeking help or to maintain composure during confrontation.

In the Official Institution scenario, the preference for dialogue could suggest a decrease in cognitive reappraisal, as participants might feel more comfortable expressing emotions in a structured setting, reducing the need to reassess or reframe their emotional responses. Expressive suppression might be lower in this scenario, as the environment encourages open communication and emotional expression.

In conclusion, scenarios requiring social norm adherence or conflict management elicit higher cognitive reappraisal and expressive suppression, reflecting the participants' adjustment to complex social interactions.

Also, VR scenarios impacted emotional regulation strategies, with participants adjusting their cognitive reappraisal and expressive suppression levels based on the social complexities and emotional demands of each scenario.

Observation/Evaluation Form

Pre-Session

Participants generally exhibited a calm or neutral emotional state (8 out of 11), with a high willingness to engage (7 out of 11). Most reported being confident in their technological familiarity, suggesting a positive attitude towards engaging with the VR content.

During Session

The high engagement and active interaction (10 out of 11) with VR content indicate that the VR experience was well-received. The predominant emotional response was enjoyment (10 out of 11), which aligns with the high engagement levels.

Post-session, most participants remained calm or neutral, with some excitement. A significant willingness to participate in future sessions was observed, indicating a positive overall experience.

The VR experience appears to have been engaging and enjoyable for most participants, as indicated by their active interaction and positive emotional responses. The readiness and technological confidence observed pre-session might have contributed to the high

engagement levels. The willingness to participate in future sessions, despite some experiencing discomfort or less engagement, suggests a generally positive reception of the experience.

One participant mentioned that have some nausea after using the VR. Some participants mentioned that couldn't find the time bar on the game, that the clock is not visible. Also, some participants said that although they wanted to help the men in "Bus station" scenario to find the watch, it was really hard to find it increasing the frustration.

Conclusions

The IO7 Data Analysis Report acknowledges language barriers as a significant aspect of the VR program for refugee probationers. The program aimed to bridge language gaps and to facilitate rehabilitation by developing a VR program adaptable to various languages, thereby enhancing coping skills among participants with substance use issues. This adaptability to different languages was seen as a cost-effective approach and essential for engaging participants from diverse linguistic backgrounds.

The report highlights the program's methodology, which incorporated surveys before and after program completion to understand participants' experiences and perceptions. This approach was specifically designed to be straightforward and concise, recognizing the potential language barriers among participants. The chosen dimensions for assessment, such as cognitive reappraisal and expressive suppression, were selected for their universality and simplicity. This was done to ensure that the assessment process remained clear and comprehensible to all participants, overcoming language challenges.

Overall, the report suggests that language barriers were anticipated and addressed in the design of the VR program and its assessment methodology, aiming to make the program accessible and effective for participants with diverse language backgrounds.

The primary aim of the program was to enhance coping skills among refugee probationers with substance use issues. The adaptability of the VR scenarios to various languages and the interactive learning environment were crucial in achieving this goal. This setup provided an engaging way for participants to practice and develop new skills in a supportive, confidential setting.

The program focused on developing specific emotional skills such as cognitive reappraisal and expressive suppression. **The shift in ERQ-S scores post-intervention indicated that participants were learning to reframe stressful situations more positively and manage their emotional responses more effectively.**

Also, the program's design, which accommodated multiple languages, helped bridge language gaps. This adaptability **ensured that participants from various linguistic backgrounds could engage with and benefit from the VR content.**

Observational data and participant feedback indicated high levels of engagement and enjoyment. The VR scenarios, like the 'Park' or 'Café', provided relatable and interactive settings that facilitated active participation and learning. Participant choices in VR scenarios provided insights into their social behaviors and preferences, which could be used to further tailor the program to their needs.

In conclusion, the TRAIVR program appeared to **successfully engage refugee probationers and enhance their coping skills, particularly in emotion regulation.** The adaptability to language barriers and the focus on relevant social scenarios further added to its effectiveness. However, the varying levels of engagement and the individual differences in learning and response to the program suggest that ongoing adaptation and personalization would be beneficial for maximizing its impact.

Suggestions and points for improvement

One significant observation made during the implementation of TRAIVR is the dependency on specific **hardware configurations**. As TRAIVR is designed to be operated using VR headsets connected to a computer, this may present logistical challenges. The need for a compatible computer with adequate processing power and graphics capabilities may impose constraints on the accessibility of the solution. Not all users may have access to or be familiar with the type of PC required, thus limiting the potential user base and hindering widespread adoption.

Moreover, the smooth implementation of TRAIVR relies on stable and **high-speed Wi-Fi connectivity**. However, some offices may not have robust Wi-Fi infrastructure in place, leading to potential connectivity issues and disruptions during usage.

Recommendations

The development of TRAIVR has provided the partnership with valuable insights and recommendations for future initiatives:

- ▶ Robust understanding of the background through thorough research, needs analysis, and staying updated with best practices and current literature is essential.
- ▶ Clear and concise storyboards are critical in guiding the development process and facilitating effective communication between researchers and developers.
- ▶ Continuous testing and refinement based on user feedback and evaluation results are essential.
- ▶ Comprehensive training and support resources for professionals are key to ensure a smooth implementation.
- ▶ The incorporation of scenarios where participants can make their own decisions is a valuable feature.
- ▶ Scenarios where participants can interact with the environment adds a layer of immersion and engagement.
- ▶ Attention to hardware requirements and connectivity issues is crucial.
- ▶ Develop a long-term sustainability plan for the methodology to ensure its continued availability should be considered.

In conclusion, the development and implementation of TRAIVR have enabled the partnership to adhere to best practices in the field while addressing the needs of our target audience effectively.

As a result, partners are proud of the outcomes achieved and remain committed to disseminating the insights gained to inform and enhance future initiatives. Through TRAIVR, was not only progressed the use of virtual reality in rehabilitation of probationers in situations of vulnerability but has also delivered impactful and innovative solutions for the benefit of individuals and communities.

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Annexes

Demographic Form

Participant ID² _____

Age: _____

Gender: Male Female Other:

Marital Status _____

Offence type _____

Country of Origin: _____

Duration of Displacement (years/months): _____

Current Residence/Camp: _____

Legal Status: Asylum Seeker Recognized Refugee Other: _____

Primary language: _____

Other languages: _____

Highest Level of Education Completed:

- No formal education
- Primary education
- Secondary education
- Higher education

Current Employment Status: Employed Unemployed Student.

² Please use the same ID number as the one used on VR Software

Observation/Evaluation Form

Participant ID³ _____

Pre-session

Initial Emotional State:

- Calm/Neutral
- Anxious
- Excited
- Other: _____

Willingness/Readiness to Engage:

- Eager
- Hesitant
- Indifferent
- Other: _____

Technological Familiarity/Confidence:

- Confident
- Some Confidence
- Little to No Confidence
- Not Assessable

Notes/Comments:

³ Please use the same ID number as the one used on VR Software

During Session

Engagement with VR Content:

- Highly Engaged
- Engaged
- Disengaged
- Other: _____

Emotional Response During VR Experience:

- Enjoyment
- Discomfort
- Indifference
- Stress
- Other: _____

Interaction with VR:

- Active Interaction
- Passive Interaction
- No Interaction
- Other: _____

Notes/Comments:

Post-session

Emotional State Post-VR:

- Calm/Neutral
- Anxious
- Excited
- Other: _____

Verbal Feedback (if any):

Willingness to Participate in Future Sessions:

- Willing
- Not Willing
- Uncertain
- Other: _____

Notes/Comments:

Other observations

VR Data

	A	B	C	D	E	F	G	H	I	J
1	ID,Date,Scenario,Game Time,Game Score,Choice 1,Choice 2,Choice 3,Choice 4									
2	P1,06/12/2023,Park,7:45,7,Ask Help									
3	P1,06/12/2023,Cafe,7:23,12,Refuse Drug,Refuse Drug,Refuse Drug									
4	P1,06/12/2023,Bus Stop,10:9,11,Help the old man,Help the pregnant woman,Help the troubled man									
5	P1,06/12/2023,Official Institution,2:10,Null,Happiness,Talk									
6	P2,06/12/2023,Park,7:6,5,Ask Help									
7	P2,06/12/2023,Cafe,9:6,12,Take Drug,Refuse Drug,Refuse Drug									
8	P2,06/12/2023,Bus Stop,7:50,13,Help the old man,Help the pregnant woman,Refuse troubled man									
9	P2,06/12/2023,Official Institution,2:30,Null,Anger,Call Guard									
10	P3,06/12/2023,Park,10:22,4,Ask Help									
11	P3,06/12/2023,Cafe,10:11,12,Refuse Drug,Refuse Drug,Refuse Drug									
12	P3,06/12/2023,Bus Stop,14:53,13,Help the old man,Help the pregnant woman,Help the troubled man									
13	P3,06/12/2023,Official Institution,2:16,Null, Surprise, Talk									
14	P4,06/12/2023,Park,6:37,7,Confront									
15	P4,06/12/2023,Cafe,8:19,12,Take Drug,Take Drug,Take Drug									
16	P4,06/12/2023,Bus Stop,9:14,8,Help the old man,Help the pregnant woman,Refuse troubled man									
17	P4,06/12/2023,Official Institution,1:56,Null,Anger,Talk									
18	P5,06/12/2023,Park,6:33,32,Confront									
19	P5,06/12/2023,Cafe,8:28,12,Refuse Drug,Take Drug,Take Drug									
20	P5,06/12/2023,Bus Stop,8:17,37,Help the old man,Help the pregnant woman,Help the troubled man									
21	P5,06/12/2023,Official Institution,2:21,Null,Anger,Talk									
22										
23										
24										
25										

data-pilot study of the TRAIVR programme

ID	Date	Scenario	Game Time	Game Score	Choice 1	Choice 2	Choice 3
yd1234	30.10.2023	Park	6:4		1	Confront	
yd1234	30.10.2023	Park	36:22		5	Ask Help	
yd1234	01.11.2023	Park	5:38		5	Exit	
2023/155 ds	01.11.2023	Park	7:39		0	Ask Help	
2023/155 ds	01.11.2023	Cafe	12:35		12	Refuse Drug	Refuse Drug
2023/155 ds	01.11.2023	Park	5:31		31	Exit	
2023/1569 ds	01.11.2023	Park	14:49		21	Ask Help	
2023/1569 ds	01.11.2023	Cafe	8:19		12	Refuse Drug	Refuse Drug
2023/3550 ds	01.11.2023	Park	6:30		0	Confront	
2023/3550 ds	01.11.2023	Cafe	17:33		12	Take Drug	Refuse Drug
2023/1569 ds	02.11.2023	Bus Stop	10:9		23	Help the old man	Help the pregnant woman
2023/1569 ds	02.11.2023	Official Institution	2:54	Null		Anger	Call Guard
2023/155 ds	03.11.2023	Bus Stop	10:9		8	Help the old man	Help the pregnant woman
2023/155 ds	03.11.2023	Official Institution	4:16	Null		Surprise	Meditate
2023/1118 ds	03.11.2023	Park	5:48		1	Confront	
2023/1118 ds	03.11.2023	Cafe	14:0		12	Refuse Drug	Take Drug
2023/3549 ds	13.11.2023	Park	6:5		0	Confront	
2023/3549 ds	13.11.2023	Cafe	20:27		12	Refuse Drug	Refuse Drug
2023/3549 ds	14.11.2023	Bus Stop	10:9		3	Refuse the old man	Help the pregnant woman
2023/3549 ds	14.11.2023	Official Institution	6:11	Null		Happiness	Call Guard
2023/1118 ds	14.11.2023	Bus Stop	10:9		13	Help the old man	Help the pregnant woman
2023/1118 ds	14.11.2023	Official Institution	3:1	Null		Surprise	Talk
2023/155 ds	15.11.2023	Park	5:38		29	Exit	
2023/155 ds	15.11.2023	Cafe	9:6		12	Refuse Drug	Refuse Drug
2023/1920 nkl	15.11.2023	Park	5:51		16	Confront	
2023/1920 nkl	15.11.2023	Cafe	7:56		12	Refuse Drug	Refuse Drug
2023/3549 ds	15.11.2023	Park	8:32		29	Ask Help	
2023/3549 ds	15.11.2023	Cafe	7:46		12	Refuse Drug	Refuse Drug
2023/3549 ds	16.11.2023	Bus Stop	8:53		8	Refuse the old man	Help the pregnant woman
2023/3549 ds	16.11.2023	Bus Stop	8:53		8	Refuse the old man	Help the pregnant woman
2023/3549 ds	16.11.2023	Official Institution	3:1	Null		Happiness	Call Guard
2023/3549 ds	16.11.2023	Park	8:28		39	Ask Help	
2023/1920 nkl	17.11.2023	Bus Stop	7:51		15	Help the old man	Help the pregnant woman
2023/1920 nkl	17.11.2023	Official Institution	3:56	Null		Sadness	Call Guard
2023/1920 nkl	21.11.2023	Park	8:17		33	Ask Help	
2023/1920 nkl	21.11.2023	Cafe	7:43		12	Refuse Drug	Refuse Drug
2023/959 ds	21.11.2023	Park	9:34		25	Ask Help	
2023/959 ds	21.11.2023	Cafe	10:48		12	Refuse Drug	Refuse Drug
2023/1756 ds	21.11.2023	Park	9:29		47	Ask Help	
2023/1756 ds	21.11.2023	Cafe	6:58		12	Refuse Drug	Refuse Drug
2023/3111 ds	21.11.2023	Park	8:53		0	Ask Help	
2023/3111 ds	21.11.2023	Cafe	18:55		12	Refuse Drug	Refuse Drug
2023/1569 ds	21.11.2023	Park	7:58		50	Ask Help	
2023/1569 ds	21.11.2023	Cafe	6:17		12	Refuse Drug	Refuse Drug
2023/2416 ds	21.11.2023	Park	6:39		3	Confront	
2023/2416 ds	21.11.2023	Cafe	24:5		12	Refuse Drug	Refuse Drug
2023/1756 ds	22.11.2023	Bus Stop	10:9		36	Help the old man	Help the pregnant woman
2023/1756 ds	22.11.2023	Official Institution	2:10	Null		Surprise	Call Guard
2023/3111 ds	22.11.2023	Bus Stop	10:9		10	Refuse the old man	Help the pregnant woman
2023/3111 ds	22.11.2023	Official Institution	3:32	Null		Happiness	Talk
2023/959 ds	22.11.2023	Bus Stop	10:9		18	Help the old man	Help the pregnant woman
2023/959 ds	22.11.2023	Official Institution	4:28	Null		Surprise	Call Guard
2023/1569 ds	22.11.2023	Bus Stop	7:49		43	Help the old man	Help the pregnant woman
2023/1569 ds	22.11.2023	Official Institution	1:43	Null		Anger	Call Guard
2023/1118 ds	22.11.2023	Park	9:24		25	Ask Help	
2023/1118 ds	22.11.2023	Cafe	9:16		12	Refuse Drug	Refuse Drug
2023/2416 ds	22.11.2023	Bus Stop	8:41		4	Refuse the old man	Help the pregnant woman
2023/2416 ds	22.11.2023	Official Institution	3:7	Null		Anger	Call Guard
2023/1749 ds	22.11.2023	Park	9:10		24	Ask Help	
2023/1749 ds	22.11.2023	Cafe	8:15		12	Refuse Drug	Refuse Drug
2023/155 ds	23.11.2023	Bus Stop	10:9		5	Help the old man	Help the pregnant woman
2023/155 ds	23.11.2023	Official Institution	2:30	Null		Happiness	Talk
2023/1756 ds	23.11.2023	Park	8:7		56	Ask Help	
2023/1756 ds	23.11.2023	Cafe	6:14		12	Refuse Drug	Refuse Drug
2023/3111 ds	23.11.2023	Park	7:36		11	Ask Help	
2023/3111 ds	23.11.2023	Cafe	11:40		12	Refuse Drug	Refuse Drug
2023/959 ds	23.11.2023	Park	8:19		39	Ask Help	
2023/959 ds	23.11.2023	Cafe	7:23		12	Refuse Drug	Refuse Drug
2023/1749 ds	23.11.2023	Bus Stop	10:9		41	Help the old man	Help the pregnant woman
2023/1749 ds	23.11.2023	Official Institution	1:54	Null		Sadness	Call Guard
2023/2416 ds	23.11.2023	Park	10:25		21	Ask Help	
2023/2416 ds	23.11.2023	Cafe	10:46		12	Refuse Drug	Refuse Drug
2023/1920 nkl	24.11.2023	Bus Stop	7:52		36	Help the old man	Help the pregnant woman
2023/1920 nkl	24.11.2023	Official Institution	2:14	Null		Sadness	Call Guard
2023/959 ds	24.11.2023	Bus Stop	10:9		46	Help the old man	Help the pregnant woman
2023/959 ds	24.11.2023	Official Institution	2:7	Null		Anger	Call Guard
2023/1756 ds	24.11.2023	Bus Stop	8:29		43	Help the old man	Help the pregnant woman
2023/1756 ds	24.11.2023	Official Institution	1:58	Null		Surprise	Call Guard
2023/3111 ds	24.11.2023	Bus Stop	10:9		27	Refuse the old man	Help the pregnant woman
2023/3111 ds	24.11.2023	Official Institution	2:28	Null		Happiness	Talk
2023/1749 ds	24.11.2023	Park	9:43		69	Ask Help	
2023/1749 ds	24.11.2023	Cafe	5:57		12	Refuse Drug	Refuse Drug
2023/1118 ds	24.11.2023	Bus Stop	10:9		28	Help the old man	Help the pregnant woman
2023/1118 ds	24.11.2023	Official Institution	2:35	Null		Happiness	Call Guard
2023/2416 ds	24.11.2023	Bus Stop	10:9		22	Help the old man	Help the pregnant woman
2023/2416 ds	24.11.2023	Official Institution	2:17	Null		Anger	Call Guard
2023/1749 ds	27.11.2023	Bus Stop	10:9		65	Help the old man	Help the pregnant woman
2023/1749 ds	27.11.2023	Official Institution	1:53	Null		Surprise	Call Guard



TRAIVR

Training of Refugee Offenders
by Virtual Reality



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