

A Self-Applied, Virtual Therapist Assisted-Based “Thera” Treatment for Small Animal Phobia in Mexican Population: a preliminary evaluation

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Small animal phobias (AP) are a type of specific phobia where there is an intense and persistent, excessive, or irrational fear in the presence of a particular small animal. One of the most effective techniques to overcome specific phobias is Exposure Therapy, where the patient is exposed to the object of fear repeatedly and gradually. However, it is difficult to carry out this type of therapy when there is no full control of the feared object and there is no way to ensure gradual exposure. The objective of this study is to explore the feasibility of a self-applied exposure treatment for rat phobia called Thera. Thera is a verbally interactive virtual therapist assistant that uses smart devices to obtain contextual data. The treatment proposal was evaluated through a survey with 11 Mexican mental health professionals with experience working with patients with phobias. The results show that the specialists perceived the proposal as useful for the treatment of AP and that it would generate in patients an experience like that experienced with real objects of fear; they found the proposal to be useful to use; also, they showed a high intention to use it. In addition, they provided useful feedback on each of the proposed stages for the redesign of the proposed treatment.

Keywords: Virtual therapeutic assistant, Small animal phobia, Exposure therapies, Self-applied treatment

Animal Phobia (AP), along with the phobia of heights are among the most common types of phobias in the general population, and it is one of the most common phobias in children, adolescents, and adults (Eaton et al., 2018). Regarding developing countries, such as Mexico, it is estimated that 7% of the Mexican population suffers from this type of phobia (Renteria-Rodríguez, 2018), seriously affects the patient's daily activities and quality of life, because the persons suffering from AP have the need to anticipate and avoid possible situations where they could be exposed to the phobic stimulus (Baus & Bouchard, 2014).

AP is a mental disorder of an emotional, cognitive, and behavioral type, where there is usually an intense and persistent, excessive or irrational fear of a small animal, such as arachnids, reptiles and insects, which are commonly seen both inside and outside homes and places with public access such as parks. Also, Cognitive-behavioral therapy (CBT) is one of the most effective interventions in treating anxiety disorders, including specific phobias. Treatments using techniques such as exposure to the feared stimulus, lead to significant symptom improvement (Kaczurkin et

al., 2015). Therefore, within CBT, one of the most used techniques is Exposure Therapies (ET) (Hirai et al., 2007).

ETs, as their name implies, expose the patient to the phobic stimulus repeatedly and systematically with the aim of eliminating misinformation, negative thoughts and inappropriate behaviors, and controlling difficult emotions and symptoms that often manifest themselves. However, ETs for AP have little acceptance and are usually abandoned by patients, since this treatment cannot always control the behavior of the feared stimulus (live animals, for example), creating the possibility of aggravating the phobia (García-Palacios et al., 2007).

The use of different technological devices has allowed the development of different applications that support ET for AP. Oriented technologies such as Virtual Reality (VR) and Augmented Reality (AR) allow creating safe environments by controlling the behavior of the object of fear (Suso-Ribera et al., 2019).

Likewise, the incorporation of information technologies such as self-help applications through the Internet allows greater accessibility to different psychological treatments, providing

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support to solve different problems derived from the availability of experts, patient transfers over long distances, health, economic and social (Bados & García, 2011). Reasons why, in recent years, the development of applications that contribute to treatments for specific phobias using virtual Internet media has been increasing (Hnoohom & Nateeraitaiwa, 2017).

Online interventions are among the most cost-effective options to deliver psychological treatment to a broad population. Among one of the most effective proposals for delivering internet psychological interventions, are self-applied treatments. However, one of the main challenges on these interventions is the dropout rate, ranging from 2 to 83% with a weighted mean of 31% (Melville et al., 2010), and recent studies finding similar dropout rates between 0 to 75% with a mean of 32% (Schmidt et al., 2019). Therefore, more elements should be considered in order to reduce the participants' dropout rate.

One option to increase a patient's adherence could be a virtual therapist assistant (VTA), that is an application focused on the area of health therapies that uses an interaction with the user based on voice commands. To mention some examples of VTA's, EuTalk™ is a Virtual Therapist and Speech Assistant developed to help people with communication disabilities by supporting communication needs, providing highly accessible rehabilitation regimes among other options (Wang et al., 2013). In other publication of the same authors where the EuTalk™ was included, it was concluded that all the participants agreed that the app that included EuTalk™ established a usable alternative treatment protocol for communication rehabilitation (Wang et al., 2018). Another example of intervention supported by a virtual assistant is the study of Buinhas et al., (2019), where the assistant can speak and express emotions through facial and body animations, and the main goal is to increase the adherence to medication, physical activity, diet, and to adjust the intervention to the needs of the users and their characteristics; this proposal was validated with a sample of 10 academic nurses with experience in primary care, obtaining positive opinions and suggestions for improvements.

Although the demonstrated benefits of the CBT and the application of VR, AR and VTA's, these technologies and online treatments are scarce in low-income and developing countries such as México. Therefore, the purpose of this paper is to describe Thera, a VTA self-applied exposure treatment for AP and the validation of the first treatment proposal with professionals working in México, using technologies to treat phobias, and that assessed the feasibility of the proposal and the theoretical contents of the intervention.

Proposed Treatment

The purpose of the study presented is to know the perspective of expert psychologists in the area, on a new system that integrates: exposure therapies using different types of multimedia support, such as images, videos, interactive games, and immersion of VR in real scenes through the use of 360° videos that generates a gradual phobic intensity, self-applied with remote access for rat phobia; that consider the physiological context of the user to determine the progress of the treatment; in addition, have the guidance of a virtual

assistant called Thera who provides information and help to the patient on the possible options that the system can provide to give greater adherence to treatment (Félix et al., 2019).

The proposed therapy used by Thera was designed based on the literature (Ruiz & Valero, 2017; Flobak et al., 2019; Morán et al., 2020; Campos et al., 2019) and the multidisciplinary work of the co-authors of this work, aiming at increasing the accessibility, motivation, and acceptance of ET for rat phobias. For this reason, prior to its evaluation with real patients, it was decided to carry out a consultation exercise with different specialists in the country with experience in the treatment of phobias, in order to receive feedback on the proposed treatment.

This work presents the results of the consultation made to the specialists and the main adjustments that were made to the intervention proposal, that will give it a greater basis for its application in the context of the Mexican population.

Treatment description. The exposure treatment consists of four stages that consider a gradual exposure focused on the realism, interaction, and intensity of the visual representation of the object of fear. The taxonomy proposed by Morán et al. (2020), has been considered. During the first and second stages, the user is exposed to the phobic object through multimedia material based on the Multimedia Behavioral Avoidance Test (MBAT) instrument. The MBAT is a reactive test in which the participant is presented with various visual stimuli (that is, images and videos) related to the object of fear (Ruiz & Valero, 2017). In the third stage, the user interacts virtually with 3D model representations of rats in a video game, the interactions between the user and the rats occur at different levels of gradual exposure (some works that similarly consider the use of 3D models are (Shunnaq & Raeder 2016; Hnoohom & Nateeraitaiwa, 2017). Finally, in the fourth stage, the user, through 360° videos, using a smartphone and google cardboard, which are accessible elements, is immersed in a virtual reality environment simulating a natural situation, including different rats in the video content, real situations showing different types of behavior.

Table 1 shows the main aspects of each of the stages. The first column indicates the stage of treatment, following the type of visual element, the intensity of the severity of the phobia, the number of elements in each stage and finally, the duration of each element. The severity intensity of the phobia is defined based on the scale used to measure the severity of specific phobia in adults (scale: none, mild, low, moderate, severe or extreme) (Schmit & Balkin, 2014).

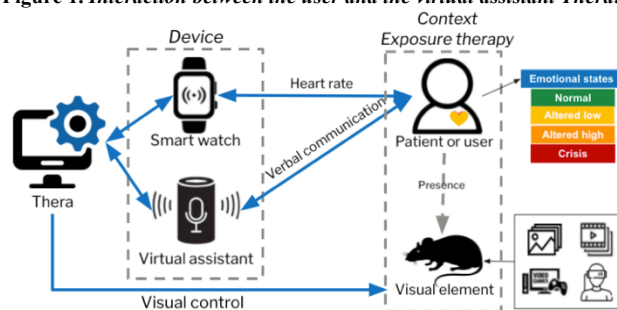
Table 1. Content in each of the treatment stages.

Stage	Visual Element	Intensity of the Phobia	Quantity	Duration per element
1	Images	Moderate	10	10 seg.
2	Videos	Moderate	6	1 min.
3	Virtual 3D Models	Low	5	Varied
4	Videos 360°	Mild	2	3 min.

Treatment performance and materials. Thera uses a smartwatch to obtain the heart rate in real time and verifies the emotional state of the user: normal, altered low, altered high or in crisis. In case Thera detects that the user is in a highly altered state, it first verifies the current action of the user, whether s/he is observing an image or video, interacting with a 3D rat model, or immersed in a 360° video. The above, to make a relevant decision, which may be to stop showing on the screen, pause the video game or stop the 360° video. And later, it suggests to the user whether s/he wants to perform a deep breathing exercise that allows normalizing or lowering the state of alteration. On the other hand, when the user is in a crisis state, Thera’s action is to stop the treatment for a moment and suggest a deep breathing exercise and wait for the user to stabilize. As can be seen in Figure 1, the virtual assistant allows to maintain a verbal communication to inform, instruct and ask the patient during ET. The constant monitoring of this data allows to obtain feedback from the context, where Thera determines the progress of the treatment considering the opinion and the emotional state of the patient, while it shows the visual element.

Thera dialogue flow. During the intervention of each of the treatment stages, Thera has the purpose of guiding the user. The following dialogue flow is managed: 1) welcoming the user; 2) inform the user about the content, purpose and instructions; 3) make sure the user is ready before starting to show any visual elements; 4) show the visual elements one by one according to the stage that will be presented; 5) analyze the data obtained during the stage, such as duration, alteration in heart rate, evasive phrases from the user to request pauses, and decide if the user requires any deep breathing exercise support; 6) finalize the stage.

Figure 1. Interaction between the user and the virtual assistant Thera.



Method

Participants. In the preliminary evaluation carried out for the proposed ET, 17 psychology professionals participated, 11 of which met the inclusion criteria: professional in the area of clinical psychology with experience in treating phobias; at least 1 year of experience; and to work in México as a psychologist.

The final sample of participants consisted of 8 women and 3 men. The mean age was 35.91 (SD = 12.71). Seven participants work in Mexican universities, three in private institutions and one in a government institution. Regarding the experience of working with treatments of phobias, of the 11 participants: five had between

one to two years, three between two to five years, one with more than five, and two with more than ten years.

The average percentage of patients treated by the participants referring to patients with some phobia is 3.5% with a SD = 2.25. It was also found that 8 of the 11 experts have cared / cared for people over 18 years of age.

Design. Due to the health restrictions derived from COVID-19, an online consultation was designed, using a questionnaire with multiple-choice questions and open questions. The intervention considers that each participant will carry out the evaluation of the proposed exposure therapy individually, autonomously, and when the participant has the opportunity to receive the treatment. For the recruitment, an invitation was designed for the participation of all those professionals with experience in the treatment of phobias and interest in participating in the evaluation. This invitation included the link (URL) of the questionnaire. The invitation was shared on the co-authors’ social networks, social networks of different Mexican psychology associations, as well as by email to the coordinators of the country’s psychology educational programs, so that they in turn, could share it with the program’s teachers.

The selection of the participants according to the inclusion criteria was carried out automatically within the design of the same questionnaire; the first section of the questionnaire included sociodemographic data and experience in managing phobias. According to the specific responses to the inclusion criteria, the following sections that contain the description of the treatment and questions for evaluation are continued, or directly go to the section of completion and gratitude for participation.

Materials. Materials designed for this assessment include: a) a video where the proposed ET is described in a general manner. b) a document that describes the ET in detail. c) a Questionnaire in Google Forms, containing: informed consent form, sociodemographic data section (inclusion criteria), proposal description section (links to the video and detailed description) and evaluation section.

Evaluation of Intervention. The intervention considers that each interested participant must perform at least five steps in the evaluation form: 1) read and accept the consent and confidentiality form; 2) fill in sociodemographic and general data; 3) review an explanatory video of the general scenario of the proposed treatment with an approximate duration of 8 minutes; 4) review the documentation in greater detail of the proposal; and 5) Answer a questionnaire to evaluate and provide feedback on the proposal.

The last three steps are only taken if the inclusion criteria are met.

Evaluation metrics. The evaluation carried out with specialists in the treatment of phobias, seeks to know their perception regarding: i) the usefulness of the ET that is proposed, and ii) the user experience that a patient may have when participating in it.

Additionally, questions were included to find out their general opinion regarding the accessibility of the proposal, the perceived ease of use, their intention to use it, the relevance of the proposal and their perception of the patient’s anxiety monitoring mechanism.

The evaluation instrument consists of 30 questions on the Likert scale (1-7), where 1 means extremely disagree and 7 means

extremely agree. The questions were divided regarding: i) the general perspective of the proposal; ii) the perception of stage 1; iii) the perception of stage 2; iv) the perception of stage 3; v) the perception of stage 4; and vi) the perception of the monitoring mechanism.

In each of these sections, in addition to the closed questions, an open question was included so that they could optionally justify some of their answers and / or provide feedback on the proposal.

Results

Tables 2 and 3 show the average results obtained from the evaluated participants. It can be observed that most of these results were favorable in the evaluated metrics, that is, the average is greater than 3.5 of the scale to be evaluated and having little variation with a scale of 1-7 (1 = extremely disagree, 7 = extremely agree).

Table 2 shows the results of the evaluation of the general perspective of the treatment by experts. The highest evaluated results, with 5.82 / 7, indicate that for the experts the development of this type of applications for Mexico is relevant. Perceived usefulness follows with a valuation of 5.61 / 7. The lowest results correspond to the user experience with 4.55 / 7 and accessibility with 5.0 / 7.

Table 2. Results of the general perspective of the treatment.

General perspective			
Perceived usefulness	5.61	Ease of use	5.27
User experience	4.55	Intent to use	5.55
Relevance of the project	5.82	Accessibility	5.00

Table 3 shows the results obtained from each of the stages, comparing perceived usefulness and user experience. The highest values achieved by the metrics coincide to be found in stage 4, where usefulness reaches 6.09 / 7 and user experience reaches 5.73 / 7. The lowest value of usefulness is found in stage 2 with 5.55 / 7, and in the case of user experience the lowest value is presented in stage 1 with 5.09 / 7.

Table 3. Results of each stage of the treatment.

	Stage 1	Stage 2	Stage 3	Stage 4
Usefulness	5.82	5.55	5.77	6.09
User experience	5.09	5.33	5.70	5.73

Another aspect that was evaluated individually is the monitoring perspective, specifying only the use of physiological data of the user's heart rate, in order to classify the emotional state of the patient; for this aspect a value of 4.36 / 7 was obtained.

Additionally, 22 open answers were received, as follows. For the first section that covers the general perspective of the

treatment, positive observations were obtained from 5 participants that include constructive suggestions and a limitation of the treatment. Suggestions were: to consider a gradual treatment centered on the user where the start of the treatment may vary according to the severity of the phobia and the user's symptoms; prior to the intervention, if the user requires it, add a stage to become familiar with the virtual assistant; update treatment based on experiences gained from users who have completed treatment.

Regarding stage 1, that refers to exposing the user to images, three comments were obtained. Two of the comments agree that the perception of exposure transmitted by the images compared to a real rat is low, however, being a gradual ET, this is adequate to start the treatment.

Regarding stage 2, that consists of exposing the user with videos, only one comment was obtained. The participant comments that the use of different videos is the appropriate type of exposure to continue with a gradual ET. Also, it is recommended to add some informative videos about rats.

Regarding stage 3, which corresponds to the exposure and interaction with 3D rat models in a video game, three comments were obtained. They agree that the interaction with a virtual object is the indicated one, since it can evoke physiological reactions similar to a real situation. In addition, a comment was obtained regarding the video game scenario, proposing a more realistic one and even selecting it from several scenarios.

Regarding stage 4, two comments were obtained where the participants agree that the use of immersive videos elicits a higher perception. It benefits the user in that at the moment they are exposed to a real situation, they can have greater control of the situation.

Also, a question was considered from the monitoring perspective, this being the open question most commented on by the 8 participants. Participants suggest monitoring other physiological variables such as: sweating, muscle tension, respiration rate, facial and body expressions. Also, the heart rhythm is one of the physiological symptoms that is manifested in most phobic patients, although it is not the case of all. Therefore, it is suggested to consider subjective feedback from the patient each time s/he is exposed to the phobic stimulus.

Discussion

The aim of this study is to introduce a self-applied exposure treatment with a virtual therapy assistant for the treatment of small animal phobia in Mexican population. This evaluation of Thera was obtained from experts in the treatment of phobias who work face-to-face with this problem in Mexico, and the results of the evaluation have supported the feasibility of the proposal and the relevance of the theoretical contents defined for the intervention. A discussion on these results follows.

General perception of the treatment. The general perception of the specialists regarding the proposed treatment was very positive (5.4 / 7), highlighting the relevance (5.82 / 7) of the

proposal for self-applied treatments, mainly in confinement situations such as currently due to COVID-19. Also, the feasibility of the treatment is validated as it was perceived as a very useful proposal for the treatment of AP (5.61 / 7), with a high intention to use it (5.55 / 7) and as easy to use (5.27 / 7). Accessibility was one of the variables with the lowest scores obtaining 5.0 / 7 (see table 2). Observing among the open questions, a participant told the following:

"It seems to me as a very interesting treatment proposal that can be very effective to treat mild and moderate rat phobias, however the limitations could be [on] the need for specific devices for the treatment and that for some people who are not so familiar with the technologies it may be difficult to use".

The argument of the authors of this study is that even though the awareness of the use of the proposed devices increases the cost and accessibility of the treatment, the devices are essential to consider the physiological state of the patient, and to evaluate the overcoming of each stage. Likewise, they are essential to be constantly aware of the patient's state, and as a means to provide a type of relaxation strategy when it is necessary. Consequently, our proposal takes advantage of commercial devices that are easy to use (Wang et al., 2020).

Regarding user experience, it was perceived by the experts as the lowest result in Table 2, with a value of 4.55 / 7. Looking for a possible explanation, we found that the question "Do you think the proposed exposure treatment will be to the liking of rat-phobic patients?" was the second lowest evaluated, assuming that experts are aware that a phobic user who wishes to treat his phobia through exposure is not a pleasant experience. However, this type of treatment seeks to expose the patient to the feared animal in order to reduce the emotions and behaviors that they produce (Garcia-Palacios et al., 2007).

Perceived usefulness. Comparing the perceived usefulness that is obtained between the different stages (see Table 3), we can observe a behavior that is increasing from stage 2 to 4, verifying that for the experts the order of the stages is adequate. Further, stage 1, whose value was higher than stages 2 and 3, was due to the fact that the experts evaluated the question: "Do you think that the gradual exposure of stage 1 with the use of images is adequate?", with a very high score, being the best evaluated question with a value of 6.18 / 7.

Perception of user experience. In the case of the perception of user experience between the different stages, we can observe that its value keeps increasing consistently between stages 1 to 4 (see Table 3). This means that the experts perceive that the experience that users may have in each of the stages should increase in exposure, confirming that the order of the stages is pertinent.

Some comments regarding the user experience that the patient may experience during the different stages of treatment were: during stage 1, "it could be that an image does not evoke the same effect as an actual rat, but being the first stage and the exposure gradual, it seems very appropriate"; During stage 3, "integrating this serious game into the treatment seems very

appropriate, since it allows greater interaction between the patient and the feared stimulus, I believe that this exposure can evoke physiological reactions that resemble to the actual situation, which can increase the effectiveness of the intervention"; During stage 4, "by having greater interaction of the user with the feared stimulus, the exposure is similar to a more realistic situation and this is beneficial for the patient, since, when facing real life, s/he will have greater control of the situation, since they have been exposed to a similar situation."

Monitoring perception. The question with the lowest value was "Do you think that just by obtaining the user's heart rate it is possible to classify the patient's emotional state as normal, altered or in crisis?" with a value of 4.36 / 7. This may be due to the suggestions regarding to add other physiological variables such as: sweating, muscle tension, respiration rate, facial and body expressions. Also, the heart rhythm is one of the physiological symptoms that are manifested in most phobic patients, although it is not the case of all (Gonçalves et al., 2015). Therefore, it is suggested to consider subjective feedback from the patient each time s/he is exposed to the phobic stimulus. Our justification is that the measurement of other variables requires other specialized devices that could raise the cost, which would complicate user monitoring (Zaki & Islam, 2021). Thus, in case the user does not show an alteration in his heart rate but is anxious, s/he could express verbally at any time if s/he needs help. Likewise, Thera will consider indicators of subjective units of anxiety, avoidance and physiological alterations identified by the user in the middle and at the end of each stage.

Furthermore, two of the main causes of this was the difficulty in reaching potential participants who met the inclusion criteria and the tightness of their schedule. However, we consider that the sample obtained includes researchers from the clinical and psychological areas with experience in the treatment of our interest, and that their feedback was useful to reinforce the design and implementation of the system, and that in future studies we will be able to carry out validations with a greater number of participants. Even with this number of participants, this is one of the few studies in which a treatment proposal with these characteristics and objectives has been validated with the Mexican population before its creation, and in this way, evaluate the possibility of success of the tool to be developed.

Conclusion and future work. In addition to validating the proposal with the participation of specialists in the treatment of AP, we received additional feedback that will allow us to improve the proposal. This allowed us to identify additional design insights, including: i) allow for a gradual user-centered treatment, where its start may vary depending on the severity of the phobia and the user's symptoms; ii) add a stage to become familiar with the virtual assistant, if the user requires it; iii) add an informative video of the feared animal in the second stage, at the end of the video exhibition list; and iv)

allow to change the setting and context of the video game to make it more realistic.

The main benefits of the proposed ET were: i) being a virtual therapeutic assistant that interacts with voice, which facilitates its use (Wang et al., 2020); ii) uses context data, such as heart rate, to identify the anxiety level of the patient to stop or continue the session, adapting it in real time and in a personalized way, in order to avoid treatment dropout by the patient (Zaki & Islam, 2021); iii) in addition, it considers the verbal communication of the patient to know his emotional state, allowing him to maintain control of the rhythm of the session (Catania et al., 2021); iv) as it is a self-administered and low-cost treatment, patients will be able to schedule their sessions at the times that best suit them (Rachamim et al., 2020).

The main limitation of the treatment proposal is the need to have the required materials and familiarization. However, Alexa was selected for being one of the most used commercial devices in various domains (de Barcelos Silva et al., 2020).

As future work, the functionalities identified from the design insights from this study will be included in the development of Thera, in order to have a redesigned version to be evaluated with actual patients.

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