How to Cite:
Khaleghzadeh, L. ., Aghaei, A., & Farhadi, H. (2022). A comparative study on the effectiveness of virtual reality and cognitive behavioral therapies on ailurophobia and rumination in people with ailurophobia. *International Journal of Health Sciences*, *6*(S7), 1237–1248.
https://doi.org/10.53730/ijhs.v6nS7.11519

A comparative study on the effectiveness of virtual reality and cognitive behavioral therapies on ailurophobia and rumination in people with ailurophobia

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***Abstract*---**This study aimed to compare the effectiveness of virtual reality therapy (VRT) and cognitive behavioral therapy (CBT) on ailurophobia and rumination in people with ailurophobia. This study utilized a quasi-experimental pretest-posttest research design and a 1-month follow-up period with an experimental group implementing two methods, VRT and CBT, and a control group. The statistical population consisted of all people with ailurophobia in Isfahan in the summer and autumn of 2020. The sample size was determined at 30 people using the convenience sampling method. They were randomly divided into three groups: VRT, CBT, and Control. Measurement tools included Nolen-Hoeksema and Moro's 24-item Ruminative Response Scale (2008) and a 10-item researcher-made ailurophobia questionnaire. VRT and CBT methods were implemented in 8 sessions of 30 minutes and 9 sessions of 90 minutes, respectively, for two months for two experimental groups. Data were analyzed using multivariate analysis of covariance (MANCOVA). The results showed no significant difference ($p<0.05$) between VRT and CBT in terms of effectiveness on ailurophobia and rumination in people with ailurophobia. While CBT was shown to be effective in improving rumination and ailurophobia variables in the post-test phase, and treatment effects remained in the follow-up phase, VRT was shown to

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
Manuscript submitted: 9 April 2022, Manuscript revised: 18 June 2022, Accepted for publication: 27 July 2022

be ineffective on rumination and only effective in ailurophobia variables in the post-test phase, and treatment effects remained during the follow-up period. Meanwhile, no significant difference was observed between VRT and CBT in any of the research variables ($p<0.05$).

Keywords---*Virtual Reality Therapy, Cognitive Behavioral Therapy, Rumination, Ailurophobia.*

Introduction

The word ailurophobia comes from the Greek words "ailouros," meaning cat, and "phóbos," meaning intense fear (Idris, 2016). Other names for ailurophobia include elurophobia and gatophobia (XXX, 2015). Although The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) does not specify a specific name for fear of cats, it suggests that individuals may experience a particular fear of certain types of animals, including fear of cats. People with ailurophobia may experience extreme fear and anxiety when approaching or viewing photos or videos of cats. Psychologists have listed a variety of causes for such fears, including behavioral, social, cognitive, genetic, and biological (XXX, XXX, XXX, and XXX, 2016).

Studies have shown that most people with ailurophobia are constantly thinking about how they can avoid situations that cats may encounter, which in turn causes rumination (Lindsay and Powell, 2015). Rumination is defined as the preoccupation and brooding over an idea or topic (XXX and XXX, 2015). It can also be described as a set of repetitive and passive thinking that focuses on the causes and effects of symptoms that hinder the resolution of maladaptive problems and increase negative thoughts (Nolen-Hoeksema and Davies, 1999). When a person suffers from anxiety and fear and cannot overcome it, he turns to rumination to achieve peace. Rumination accompanied by phobias can have devastating effects on various aspects of life. This is where psychological interventions come into play. One of the best types of psychotherapy for phobias is CBT, to which people with phobias respond well. CBT is a problem-solving cognitive therapy, providing reflection instead of past experiences. Gradual exposure to cats is presented as a systemic approach, and at the same time, the person focuses on staying calm. This may include looking at pictures of cats, watching cat videos, seeing a cat through a window, and even being in a room with a cat or a kitten (Williams, 2009, citing Idris, 2016). Virtual Reality (VR) is to expose people with phobias to scary situations and to call risky situations for the patient (XXX, 2018). Currently, VR is widely used in medicine and psychological therapies (*Bakhov, I., et. al., 2020; Hanawi, S. A., et. al., 2020*).

The advantage of this system is that the user can easily move and interact with the system (XXX and XXX, 2018). The findings of some studies indicate the effectiveness of CBT and VRT in improving phobias and related disorders. Askari Ghale's (2019) study showed a significant effect of systematic desensitization therapy (SDT) on ailurophobia. XXX (2015) also showed that CBT was significantly effective in reducing rumination in depressed women. Other relevant

studies include the effectiveness of desensitization through eye movements and reprocessing of specific phobic disorders symptoms (Khanjani, Hashemi, and Vatani, 2016), the effectiveness of CBT on rumination and dysfunctional attitudes of divorced women with an anxiety disorder (Malardi, 2016), the effectiveness of mindfulness-based cognitive therapy in reducing rumination, dysfunctional attitudes and automatic negative thoughts (ANTs) in people with generalized anxiety (Moghtader, 2016), the effectiveness of cognitive-behavioral group therapy (CBGT) in reducing depressive symptoms and rumination in patients (XXX et al., 2017), the effectiveness of VRT in reducing depression, rumination, dysfunctional attitudes, social isolation and anger in people with PTSD (XXX, XXX, XXX, et al., 2017), and the effectiveness of behavioral therapy and psychotherapy in reducing ailurophobia (Idris, 2016). In light of the foregoing, no comparison has been made so far between the therapeutic approaches used with VRT to treat ailurophobia. This study aimed to compare the effectiveness of VRT and CBT on ailurophobia and rumination in people with ailurophobia.

Method

This study used quasi-experimental and three-group research design methodologies, including two treatment groups and one control group, in three stages: pre-test, post-test, and a 1-month follow-up period. The statistical population consisted of all people with ailurophobia in Isfahan in the summer and autumn of 2020. Among them, 30 people who volunteered to participate in the study and met the inclusion criteria were selected using the random convenience sampling method and divided into three groups: VRT, CBT, and control. Inclusion criteria included informed consent to participate in therapy sessions, obtaining a score of 5 or higher on the ailurophobia questionnaire, having a history of ailurophobia in counseling centers, having a minimum secondary education to understand the questionnaire questions, being in the age group of 22-41 years, and not having a history of drug abuse. Exclusion criteria also included being absent from more than two therapy sessions, starting or continuing to attend psychological therapies other than VRT and CBT three months before participating in the present study, not doing homework, and taking psychotropic medications due to mental disorders.

Nolen-Hoeksema and Moro (2008) attempted to build a 22-item questionnaire. In this questionnaire, subjects choose one of 4 options (1 = almost never to 4 = almost always), rated 0, 1, 2, 3, respectively. The higher the score scored by the person in this test, the higher his rumination rate. Nolen-Hoeksema and Moro reported that the reliability of the rumination test was 0.82 using the retest method. Also, concurrent validity was determined through the relationship between rumination scores and Beck Depression Inventory (BDI), indicating a significant correlation between them (0.55). XXX (2015) examined the validity and reliability of the questionnaire in Iran and proved that it was valid (Cronbach's alpha = 0.86). In this study, the reliability of the questionnaire was calculated to be 0.83.

Askari Ghale (2019) designed a 10-item ailurophobia questionnaire based on a 3-point Likert scale (including yes, between the two, and no). A higher score obtained on this scale (upper limit = 20; Lower bound: 0) means more fear.

Herein, the reliability of the questionnaire was determined on 30 clients. Cronbach's alpha of the questionnaire was equal to 0.87. After completing the questionnaires in the pre-test stage, VRT was implemented in 8 sessions of 30 minutes and behavioral-cognitive therapy for 9 sessions of 90 minutes for 2 months for two experimental groups. The control group did not receive any therapy. At the end of the sessions, all three groups completed the questionnaires as a post-test after a 1-month follow-up period. Tables 1 and 2 provide a summary of the content of therapy sessions.

Table 1
Description of VRT sessions

Description of sessions
Session 1: Familiarity with Yen clients, establishing an intimate relationship with Yen clients, explaining research objectives, familiarity with VR device, presenting questionnaires Session 2: Identify the causes of rumination about ailurophobia, relaxation training, explanations about the environment and how to play collect pocket cats, play collect pocket cats Session 3: Summarize the previous session and review the results of the game and identify the factors of rumination regarding ailurophobia, relaxation, explanation, and play pocket kitten-catch to collection Session 4: Summarize the previous session and, review the results of the game and identify the causes of rumination regarding ailurophobia, relaxation, present VR videos about cats for clients Session 5: Summary of the previous session and review of the results of watching movies and description of clients' feelings, explanations about the environment and how to play ar cat and how to play ar cat Session 6: Summarizing the previous sessions and reviewing the results of watching movies and playing games, playing ar cat game, and explanations about my kitten game Session 7: Investigate clients' feelings about seeing cats on the street and up close, watching VR movies, playing my kitten and using Google AR 3D animals, and approaching or touching cats in the presence of a therapist. Session 8: Reviewing the videos and games presented in the previous sessions, summarizing the content presented and clients' comments, performing post-test

Table 2
Description of CBT sessions (Malardi)

Description of sessions
Session 1: Familiarity with clients, establishing an intimate relationship with clients, explaining research objectives Session 2: Assessing the nature and extent of ailurophobia, assessing clients' perceptions of the problem, describing clients at the onset of the problem, Assignment: Assessing ailurophobia from a client's perspective Session 3: Summary of the previous session, identifying rumination regarding ailurophobia, reconstruction of cognitive biases and rumination (by discussing with clients), Presentation: Reconstruction of rumination-related cognitive biases regarding

ailurophobia at home Session 4: Summary of the previous session, review of clients' tasks, cognitive reconstruction, and discussion about ailurophobia, relaxation performance, presentation Task: writing the correct behavior when facing a cat Session 5: Summary of the previous session, review of tasks performed by clients and their positive effects, discussion about the negative effects of ailurophobia in life, assignment: negative effects of ailurophobia in life, and preparation of real photos or posters of cats
Session 6: Summary of the previous session, review of tasks performed by clients, teaching positive self-talk technique about cats, cat innocence, assignment: using positive self-talk technique about cats and performing relaxation Session 7: Summary of previous sessions, review of homework done by clients, training skills related to keeping a friendly talk with a cat and caressing a cat photo (PowerPoint), assignment: keeping a friendly talk with a cat and caressing a cat photo Session 8: Summary of the previous session, review of tasks performed by clients and their positive effects, discussion on how to provide the necessary facilities to keep a cat, the effect of the cat as a reliable companion, approaching or touching a cat in the presence of the therapist, assignment: the effect of the cat as A reliable companion and perform relaxation Session 9: Reviewing the topics presented in previous sessions, summarizing the content presented and clients' comments, post-test implementation

Then, the data extracted from the questionnaires were analyzed at two levels, namely descriptive statistics and inferential statistics, using SPSS-22 software. In descriptive statistics, frequency, percentage, mean, and standard deviation were used, while inferential statistics used repeated-measures ANOVA.

Findings

Table 3 presents the descriptive findings of the research variables for each group separately.

Table 3
Descriptive indicators of rumination and ailurophobia scores for three groups and three stages of research separately

Variable	Group	Pre-test		Post-test		Follow-up	
		M	SD	M	SD	M	SD
Rumination	VRT						
	CBT						
	Control						
Ailurophobia	VRT						
	CBT						
	Control						

Examination of the normality of control group and treatment group data in the pre-test, post-test, and follow-up stages using the Kolmogorov-Smirnov test showed that the distribution of scores was no different from the normal distribution of these dimensions (P>0.05). The results of Levene's test on the

homoscedasticity of the scores of the two groups in the community showed that the groups did not have any statistically significant differences. Also, the assumption of homoscedasticity was confirmed by Box's M test in ailurophobia and rumination variables (P>0.05). The assumption of homoscedasticity was not confirmed by Mauchly's sphericity test for ailurophobia and rumination (P<0.5). Therefore, the Conservative Greenhouse-Geisser test was used to analyze the variables. Table 4 shows the test-group interaction effect of the multivariate test results on the scores of the research variables.

Table 4
Multivariate test results of ailurophobia and rumination scores of people with ailurophobia

Variable	Effects		Factor	F	Assumption's degree of freedom	Error degree of freedom	p-value	Effect size	Statistical power
Ailurophobia	Time effect	Pillai's trace							
		Wilks' lambda							
	Group-by-time interaction effect	Pillai's trace							
		Wilks' lambda							
Rumination	Time effect	Pillai's trace							
		Wilks' lambda							
	Group-by-time interaction effect	Pillai's trace							
		Wilks' lambda							

The results showed the importance of multivariate analysis of ailurophobia and rumination for time effect and group-by-time interaction effect (p<0.001). In other words, the minimum stages of research, i.e., pre-test, post-test, follow-up, or time effect, are different in the three groups. Table 5 lists the results of comparisons between subjects, namely ailurophobia and rumination.

Table 5
Results of between-subjects effect analysis on ailurophobia and rumination variables of people with ailurophobia

Variable	Source	SS	DoF	Mean SS	F	Sig.	Effect size	Statistical power
Ailurophobia	Group		2	700/60				
	Error		27	001/14				
Rumination	Group		2	678/218				
	Error		27	337/52				

The results showed a significant difference between the mean scores of ailurophobia and rumination in the treatment and control groups (P<0.05). Also, 24.3% of individual differences in ailurophobia and 23.6% of them in rumination are related to differences between the three groups. Table 6 details the results of within-subjects effects analysis of ailurophobia and rumination variables using repeated-measures tests for time effect and group-by-step interaction.

Table 6
Results of within-subjects effects analysis in research stages and group-by-step interaction for ailurophobia and rumination

Variable	Source	Test	SS	DoF	Mean SS	F	Sig.	Effect size	Statistical power
Ailurophobia	Time effect	Assumption of sphericity		2					
		Greenhouse-Geisser							
		Huynd-Feldt							
		Lower bound		1					
	Group-by-time interaction	Assumption of sphericity		4					
		Greenhouse-Geisser							
		Huynd-Feldt							

		Lower bound	2
Rumination	Time effect	Assumption of sphericity	2
		Greenhouse-Geisser	
		Huynd-Feldt	
		Lower bound	1
	Group-by-time interaction	Assumption of sphericity	4
		Greenhouse-Geisser	
		Huynd-Feldt	
		Lower bound	**2**

The results of the analysis of the within-subjects effects generally showed a significant difference between the mean scores of ailurophobia (59.4%) and rumination (21.4%) in the pre-test, post-test, and follow-up stages ($p<0.001$). Also, group-by-time interaction in ailurophobia and rumination was significant ($p<0.001$). Table 7 lists the parameter estimation results for pairwise comparison of groups in the research stages.

Table 7
Results of parameter estimation for dependent variables separately or mean ailurophobia and rumination scores

Variable	Step	Comparison of groups		B	SD	T	Sig.	Effect size	Statistical power
Ailurophobia	Pre-test	**VRT**	**Control**						
		CBT							
		VRT	**CBT**						
	Post-test	**VRT**	**Control**						
		CBT							
		VRT	**CBT**						
	Follow-up	**VRT**	**Control**						
		CBT							
		VRT	**CBT**						
Rumination	Pre-test	**VRT**	**Control**						
		CBT							
		VRT	**CBT**						

	Post-test	**VRT**	**Control**
		CBT	
		VRT	**CBT**
	Follow-up	**VRT**	**Control**
		CBT	
		VRT	**CBT**

The results of ailurophobia estimates in the pre-test stage indicated the lack of a significant difference between the three groups. However, in the post-test and follow-up stages, a significant difference was observed between the control group and the CBT group and also between the control group and the VR group ($p<0.001$). The effectiveness of VRT on ailurophobia was 46.4% and 53.3% in the post-test and follow-up stages. In contrast, CBT efficacy was 36.2% in the post-test phase and 41.7% in the follow-up phase. Also, while there was no significant difference in rumination between the three groups in the pre-test stage, there was a significant difference ($p<0.05$) between the control group and the CBT group in the post-test and follow-up stages. The effectiveness of this treatment on rumination was 21.3% and 26.4% in the post-test and follow-up stages, respectively. The results showed an insignificant difference between control and VRT groups regarding rumination. Also, no significant difference was observed between the effectiveness of VRT and CBT on the rumination of people with ailurophobia.

Discussion and Conclusion

Comparison between the effectiveness of VRT and CBT on ailurophobia and rumination of people with ailurophobia showed a significant difference between the mean scores of ailurophobia in the post-test and follow-up scores in people with ailurophobia in the experimental and group groups. Therefore, it can be said that VRT and CBT helped reduce ailurophobia in people with ailurophobia. The effectiveness of CBT on ailurophobia was 36.21% in the post-test stage and 41.7% in the follow-up stage. In contrast, the effectiveness of VRT on ailurophobia was 46.4% and 53.3% in the post-test and follow-up stages, respectively. Also, no significant difference was observed between VRT and CBT regarding the mean scores of ailurophobia (reduction of ailurophobia) in the post-test stage. Findings were consistent with those of Najafi et al. (2018), Ghaffari Nejad (2018), Eslami et al. (2013), XXX et al. (2019), and XXX and XXX (2018). Studies by Najafi et al. (2018), Ghaffari Nejad (2018), Eslami et al. (2013), XXX et al. (2019), and XXX and XXX (2018) confirmed the effectiveness of VR software on phobias, VR on claustrophobia treatment orientation, VRT on phobias, virtual reality-assisted cognitive behavioral therapy (VRCBT) on acrophobia, and VRT on specific phobias and anxiety, respectively. Explaining the research findings, it can be said that CBT has succeeded in educating people with ailurophobia to identify, define and deal with their problem (i.e., ailurophobia) and reach the best solution for it. By acquiring these skills, they avoid dealing emotionally or emotionally with their problem. By changing their cognition and managing their emotions and feelings, they realize that cats are not scary but harmless (inoffensive). In another explanation for VRT, a stimulating environment, not being afraid of failure, not being disappointed in disability, imagining movement, and observing movement

can be considered as positive features of VRT. It increases motivation and self-confidence, encourages relief from fear, and helps control emotions and feelings about situations in people with ailurophobia in the experimental group. This way, they can control this phobia and eventually eliminate it.

A comparison between the effectiveness of VRT and CBT on the rumination of people with ailurophobia showed a significant difference ($p<0.05$) between control and CBT groups in the post-test and follow-up stages. The effectiveness of this treatment on rumination was 21.3% in the post-test stage and 26.4% in the follow-up stage. In contrast, no significant difference was observed between the mean rumination scores in the post-test and follow-up stages in people with ailurophobia in the VRT and control groups. Therefore, CBT can be said to be effective in reducing rumination in people with ailurophobia. Also, other results indicated a lack of a significant difference between the mean rumination scores in the post-test and follow-up stages in people with ailurophobia in the VRT and cognitive-behavioral groups.

Findings were consistent with those of Kaviani et al. (2009), XXX (2015), Malardi (2016), XXX et al. (2017), and Ghaffari Nejad (2018). Studies by Malardi (2016), XXX (2015), Kaviani et al. (2009), and XXX et al. (2017) confirmed the effectiveness of CBT on the rumination and dysfunctional attitudes of divorced women with anxiety disorder, rumination, ANTs, and rumination, dysfunctional attitude, depression and anxiety, and symptoms of depression and rumination (CBGT), respectively.

Explaining the findings, it can be said that CBT has made people with ailurophobia remember the past had led to irrational thoughts and ailurophobia. It really reminds CBT members that they have a phobia of rumination for no reason. The members of this group practice skills, emotional arousal, self-perception, and review of the real world and become aware of the ambiguous aspects of their emotional experiences. People with ailurophobia under CBT can overcome their phobia by modifying their negative attitudes and thoughts about cats. This way, they can deal with such phobias more logically. Finally, due to research limitations due to the outbreak of the COVID-19 pandemic, it is suggested that further studies on other phobias be conducted in other cities.

The authors hereby sincerely thank all the research participants, clinics, and supervisors and consultants.

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