The Efficacy of Single-Session Exposure Therapy Using Virtual Reality

Joseph Saito[1], Jovian Lam[1], Nathan S. Rose[1], Michael Villano[1], Jesse R. Cougle[2], Jennifer L. Hames[1]

[1]University of Notre Dame, [2]Florida State University

Introduction

- Acrophobia is classified in the DSM-V as a specific phobia of height-related situations (American Psychiatric Association, 2013)
- Exposure therapy is effective, but underutilized, likely due to fear of direct confrontation and geographic limitations
- Virtual reality, if efficacious, may provide a more scalable and accessible form of exposure therapy

Research Questions:

1. Does VR-based exposure therapy lead to comparable decreases in fear as the gold-standard in-vivo exposure treatment?
2. If so, does fear attenuation persist following a 1-week time delay after treatment?
3. Do the effects of VR-based exposure therapy diminish with increased age (i.e. individuals who have been experiencing symptoms for longer)?

Methods

Participants (N = 122; 18-83 years; M_{age} = 28.8; SD_{age} = 13.9; 36M: 86F) were screened* to confirm clinical fear levels using the following:

- Acrophobia Questionnaire (AQ)
- DSM-5 Measure for Specific Phobia – Heights
  - Severity
  - Specificity
- Credibility/Expectancy Questionnaire (CEQ)

Session 1:

1. DSM-5 diagnostic interview for specific phobia of heights
2. Behavioral Approach Test– Pre-Treatment
3. Exposure Treatment (3 Floors; 2 Trials/Floor; 36 min. total)

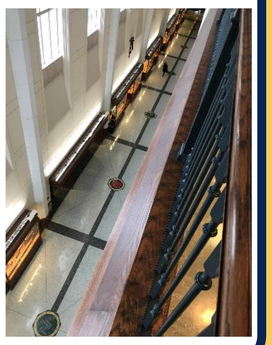
VR Condition

Lean Over Railing (2 minutes)

Lean Over Railing + Hands Behind Back (2 minutes)

Lean Over Railing + Hands Behind Back + Stand on Tip-Toes (2 minutes)

In-Vivo Condition



4. Post-Treatment Self-Report Measures
5. Behavioral Approach Test– Post-Treatment

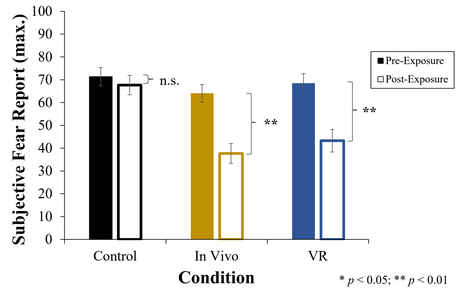
Session 2 – 1 Week Delay:

1. Follow-Up Self-Report Measures
2. Behavioral Approach Test

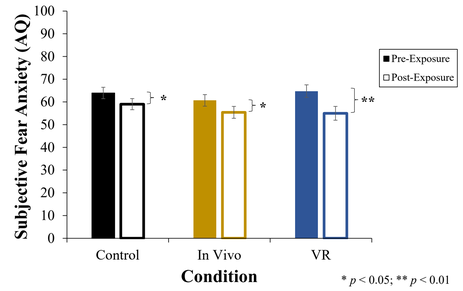
* Eligibility to participate in the VR system was screened using a physiological screening criteria to account for risk factors

Results

Differences in Fear Following Exposure Treatment (Pre. Vs. Post.)

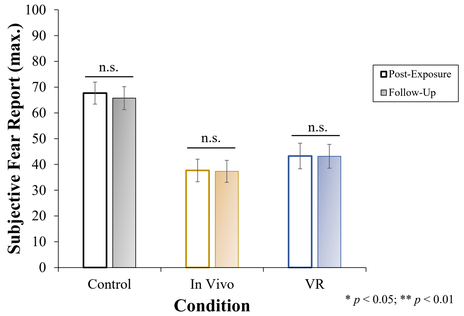


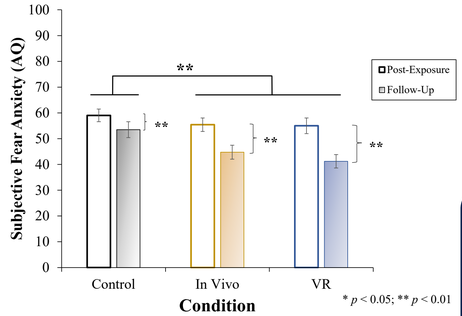
Session x Experimental Condition interaction driven by significant decreases in fear in the in-vivo & VR conditions
$F(2,119) = 18.96$, $p < 0.01$, $\eta p^2 = 0.24$



Both experimental conditions showed significant improvements in fear anxiety following exposure treatment
$F(1,119) = 24.38$, $p < 0.01$, $\eta p^2 = 0.17$

Maintenance of Fear Attenuation After 1-Week Delay (Post vs. 1-Week Follow-Up)





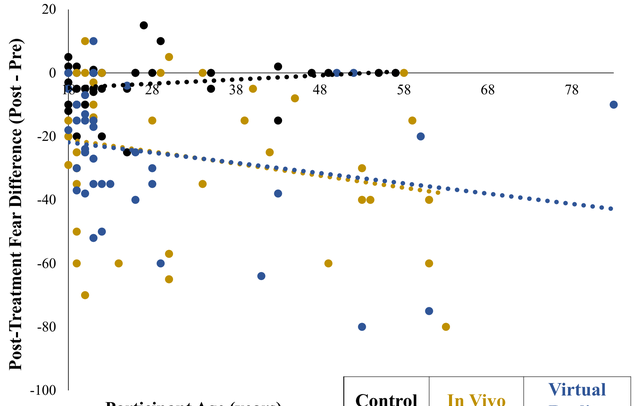
Fear levels following a delay period were not significantly different than those immediately following treatment
$F(1,119) = 0.53$, $p = 0.47$, $\eta p^2 < 0.01$

Surprisingly, fear anxiety significantly decreased in all conditions following the delay
$F(1,119) = 91.39$, $p < 0.01$, $\eta p^2 = 0.43$

Session x Condition interaction was driven by greater decreases in anxiety in In-Vivo & VR conditions relative to control
$F(2,119) = 5.36$, $p < 0.01$, $\eta p^2 = 0.08$

Both experimental conditions' reported fear anxiety was no longer significantly above clinical anxiety thresholds, while control levels remained above threshold
Control: $t(41) = 2.61$, $p = 0.01$
In-Vivo: $t(39) = -0.26$, $p = 0.80$
Virtual Reality: $t(39) = -1.62$, $p = 0.11$

The Relationship Between Age and Post-Exposure Fear Attenuation



		Control	In Vivo	Virtual Reality
		Post-Treatment Fear Difference		
Age (years)	*r*	0.17	-0.24	-0.23
	p	0.29	0.13	0.15

The relationships between age and post-treatment fear attenuation were insignificant

This suggests that the duration of time that participants have been experiencing symptoms did not impact treatment effects

Conclusions

- A single session of VR-based exposure treatment was validated after showing comparable decreases in self-reported fear measures as the in-vivo exposure treatment
- A single session of VR-based & in-vivo exposure was able to decrease fear anxiety to non-clinical levels
- Single-session exposure therapy may be equally effective across the lifespan, but requires greater evaluation of older age groups (65 years+)

How persistent is fear attenuation following exposure therapy across longer delay periods?

Are multi-session/longitudinal forms of VR-based exposure therapy as effective as traditional in-vivo forms? Are there different patterns of diminishing returns?

References

Wolitzky, K. B., & Telch, M. J. (2009). Augmenting in vivo exposure with fear antagonistic actions: A preliminary test. *Behavior Therapy*, *40*(1), 57-71.

Steinman, S. A., & Teachman, B. A. (2014). Reaching new heights: Comparing interpretation bias modification to exposure therapy for extreme height fear. *Journal of consulting and clinical psychology, 82*(3), 404.

Emmelkamp, P. M., Krijn, M., Hulsbosch, A. M., De Vries, S., Schuemie, M. J., & van der Mast, C. A. (2002). Virtual reality treatment versus exposure in vivo: a comparative evaluation in acrophobia. *Behaviour research and therapy, 40*(5), 509-516.

Craske, M. G., Treanor, M., Conway, C. C., Zbozinek, T., & Vervliet, B. (2014). Maximizing exposure therapy: an inhibitory learning approach. *Behaviour research and therapy, 58*, 10-23.

Coelho, C. M., Silva, C. F., Santos, J. A., Tichon, J., & Wallis, G. (2008). Contrasting the effectiveness and efficiency of virtual reality and real environments in the treatment of acrophobia. *PsychNology Journal, 6*(2), 203-216.

The researchers declare no conflict of interest
Funds for this study were provided by:
AD&T Discovery Fund Grant for JLH, NSR, MV