

The Development of the SWEAT Questionnaire: a Scale Measuring Costs and Efforts Inherent to Conducting Exposure Sessions

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Abstract. For decades, empirical studies have shown the effectiveness of exposure techniques when used in cognitive-behavioral therapy (CBT) treatment for anxiety disorders. A few studies are now suggesting that using Virtual Reality (VR) may be an effective way to conduct exposure and overcome some of the limitations of *in vivo* exposure. The aim of this study is to validate the Specific Work for Exposure Applied in Therapy (SWEAT) questionnaire that measures costs and efforts required to conduct *in vivo* and *in vitro* exposure. A total of 265 exposure sessions (*in vivo* = 140; *in vitro* = 125) were rated by experienced psychologists. Reliability analysis revealed three main factors in the construct of the SWEAT questionnaire. Results also showed that conducting exposure in VR is less of a burden and more readily adapted to the patients' needs than *in vivo*.

Keywords. Virtual Reality, exposure, psychometric measure, social anxiety, CBT

1. Introduction

For decades, empirical studies have shown the effectiveness of exposure techniques when used in cognitive-behavioral treatment (CBT) for anxiety disorders [1-6]. A few studies are now suggesting that using Virtual Reality (VR) may be an effective way to conduct exposure (also called *in vitro* exposure) and overcome some of the limitations of *in vivo* exposure [7, 8]. For example, one significant limitation of the traditional *in vivo* exposure is the challenge faced by therapists to recreate adequate and controlled social exposure situations (e.g., audience to conduct the exposure, control over people's reactions, appropriate situations for exposure). VR overcomes these barriers, in addition to providing a treatment that is more enticing, and allows the client to interact with a phobic scenario in the safety and confidentiality of the office. A recent study also suggests that the advantages of using *in vitro* exposure may be to not only provide a more effective treatment option (as least, given the currently available virtual

environments), but to provide a treatment that is more flexible and cost-effective for therapists [9].

The aim of this study is to validate an instrument that measures specific costs and efforts required to conduct exposure sessions called the *Specific Work for Exposure Applied in Therapy* (SWEAT) questionnaire. The Cyberpsychology Lab of Université du Québec en Outaouais (Canada) developed and used this instrument, rated by therapists after each exposure session, in order to systematically assess the costs (e.g., the salary of the confederate audience used for exposure) and practical efforts (e.g., time spent going to the cafeteria with the patient, finding appropriate stimuli) required to conduct exposure in the treatment of social anxiety.

2. Method

A total of 265 individual exposure sessions (*in vivo* = 140 and *in vitro* = 125) were rated by four experienced therapists immediately after the exposure session during a 16-week CBT treatment program. A total of 39 adults receiving a DSM-IV-TR principal diagnosis of social anxiety (mean age = 37.9; 71.8% female) participated in this study, and after signing the consent form, were randomized in three treatment conditions (this study is part of a broader project): (1) CBT with *in vivo* only exposure ($n=16$); (2) CBT with *in vitro* only exposure ($n=14$); (3) CBT with combined exposure techniques (both *in vivo* and *in vitro*) ($n=9$).

3. Results

3.1. Development of the Scale

Originally, the questionnaire contained 16 items but four items were dropped since they were based on qualitative answers, and one item was dropped because it correlated poorly with the corrected item-total (-0.02 , ns). The SWEAT questionnaire is now composed of 11 items scored for analyses (see Appendix).

3.2. Psychometric Properties

First, the internal reliability coefficient of the SWEAT was good, with a Chronbach's alpha of .83. Also, an exploratory factor analysis was performed on the SWEAT Questionnaire. The Kaiser-Meyer-Olkin measure of sampling adequacy was .75, confirming the dataset was adequate for a principal component factor analysis. A three-factor solution was established based on the "minimum eigenvalue" of one criterion. This choice was supported by the scree test, the interpretability of the factor solution and unclear patterns of factor loadings for alternative two-factor and four-factor solutions. Factor loadings were interpreted after a varimax rotation (see Table 1 for loadings). Factor 1 explained 39.78% of variance and consisted of items 1, 4, 6, 7, 8, 9 and described the burden imposed on the therapist to prepare and conduct the exposure session. Factor 2 (17.44% of variance explained) consisted of items 10, 11 and expressed the challenge of ~~face-threatening~~ ^{FINE-TUNING} the exposure exercise. Factor 3 explained 12.56% of variance and was made of items 2, 3, 5; it captured the value of time required to plan and conduct the exposure. The correlation between the total score and

each factor was significant ($p < .001$), with $r = .88$, .62 and .41 for factor 1, factor 2 and factor 3, respectively. The correlations between each factor were significant (all $p < .01$) and varied from .18 to .26. For scoring, a total score can be rated with the sum of all items (value 0 to 6 each, for a maximum of 60) and a total score is also available for each factor (see Figure 1).

FINE-TUNING BURDEN

Table 1. Factor analysis of the SWEAT questionnaire.

SWEAT - Items	Factor 1 "Burden"	Factor 2 "Fine-tuning"	Factor 3 "Time"
8: Number of people involved	.95		
9: Costs related to exposure	.91		
7: Confidentiality compromised	.86		
6: Time constraints	.82		
4: Difficulty to access/use stimuli	.68		
1: Time searching for exposure stimuli	.43		
11: Efforts to conduct exposure were a burden		.91	
10: Difficult to conduct exposure		.91	
2: Time to go to exposure situations			.79
3: Difficulty to access/use location of exposure			.73
5: External constraints			.61

Note: Loadings below .42 are omitted.

3.3. Comparison *In Vivo* Versus *In Vitro*

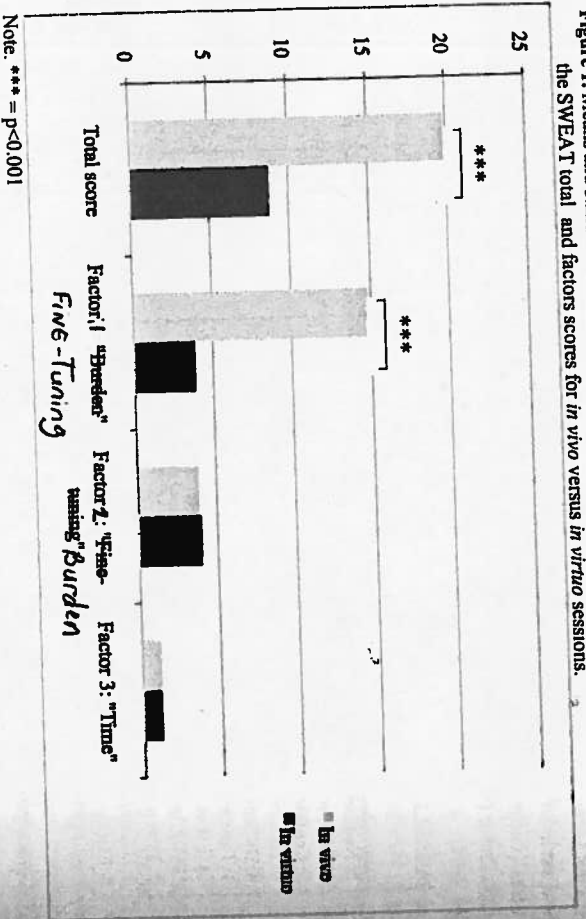
The total non-recurrent cost for the 23 patients who received at least one of the 125 *in vitro* exposure sessions was established at 0.0 \$ and the total of non-recurrent costs for the 25 patients who were involved in at least one of the 140 *in vivo* sessions was established at 2 232.45\$. A non-parametric Mann-Whitney analysis was performed (due to lack of variance in one condition) and was significant [$U = 2125$, $p < .001$].

Results on the total score and the subscales of the SWEAT (see Figure 1) were compared with Student t-tests for sessions involving *in vivo* and *in vitro* exposure. This analysis revealed that *in vitro* exposure sessions required less effort to surpass burden constraints (e.g. confidentiality issues, schedule constraints, etc.) [SWEAT total score, $t(99) = 11.01$, $p < .001$] refining our understanding by looking at the subscales revealed that the significant difference was specific to how cumbersome exposure *in vivo* exposure was [Factor 1, $t(170) = 15.04$, $p < .001$].

4. Conclusion

The SWEAT is proposed as a new measure to document the efforts, burden, costs, time and constraints inherent to conducting exposure in therapy sessions. The original pool of items was developed during discussions with clinicians and, after being put to the test, the number of items was reduced and some of the rating scales (e.g., exact time spent to search for stimuli and prepare the exposure, exact cost of each exposure session) modified to produce categories allowing to sum each item and report a total score.

Figure 1. Means and standard deviations total and factor scores and t-tests comparing the SWEAT total and factors scores for *in vivo* versus *in vitro* sessions.



The final instrument taps on three factors describing how difficult it may be for a therapist to set up and conduct exposure sessions: the burden for the therapist, the difficulties in fine-tuning the exposure and time constraints. The scale was developed with the hope of being used with any type of exposure stimuli, but its validation was conducted with patients suffering from social phobia. The exposure stimuli were both *in vivo* and *in vitro*. The cost generated by an exposure stimulus was estimated for each specific session as opposed to the recurrent inclusion costs (e.g., VR software and hardware, furniture, silly hats used for exposure) because the value of a fixed asset depends on how frequently a piece of equipment is used. For example, our data suggest that the return on the investment for a virtual audience, as opposed to taking up staff members' time, become profitable after about 140 exposure sessions if both hardware and software were purchased for 2 200\$.

Among the limitations of this study, we must point out that data collection was performed in only one research lab, in French and with social anxiety-related exposure stimuli. Further studies should also assess convergent and divergent validity.

Nevertheless, the comparison between the different modalities of exposure revealed clear advantages for therapists of using VR over real-life situations such as mock audience, going to washrooms wearing a silly hat or going out to a restaurant.

References

- [1] D.H. Barlow. Anxiety and its disorders: the nature and treatment of anxiety and panic 2nd edition. New York: Guilford Press, 2002.
- [2] M. Stein. Evidence-based treatment of anxiety disorders. *International Journal of Psychiatry in Clinical Practice* 10 (2006), 16-21.

- [3] U. Stangier, T. Heidenreich, M. Peitz, W. Lauterbach, D.M. Clark. Cognitive therapy for social phobia: individual versus group treatment. *Behaviour Research and Therapy* 41 (2003), 991-1007.
- [4] D.M. Clark, A. Ehlers, A. Hackmann, F. McManus, M. Fennell, N. Grey et al. Cognitive therapy versus exposure and applied relaxation in social phobia: A randomized controlled trial. *Journal of Consulting and Clinical Psychology* 74 (2006), 568-578.
- [5] S.G. Hofmann. Perception of control over anxiety mediates the relation between catastrophic thinking and social anxiety in social phobia. *Behaviour Research and Therapy*, 2005, 885-895.
- [6] I.K. Wilson, R.M. Rapee. The interpretation of negative social events in social phobia: changes during treatment and relationship to outcome. *Behaviour Research and Therapy* 43 (2005), 373-389.
- [7] E. Klinger, S. Bouchard, P. Légeron, S. Roy, F. Lauer, I. Chemin, P. Nuygues. Virtual reality therapy for social phobia: A preliminary controlled study. *Cyberpsychology and Behavior* 8 (2005), 76-88.
- [8] G. Robillard, S. Bouchard, S. Dumoulin, T. Guillard, G., & E. Klinger. Using virtual humans to alleviate social anxiety : preliminary report from a comparative outcome study. Oral Presentation at the 15th Annual CyberTherapy Conference 2010, Seoul (Korea), June 13-15.
- [9] G. Robillard, S. Bouchard, S. Dumoulin, & T. Guillard, G. Comparing the costs and efforts required to conduct exposure *in vivo* or in virtual reality during CBT for social phobia. Poster presented at the 44th Annual Conference of the Association for Behavioral and Cognitive Therapy, San Francisco (CA), November 18-21.

APPENDIX

Specific Work for Exposure Applied in Therapy (SWEAT) Questionnaire

The questionnaire must to be filled immediately after the exposure session you conducted with your patient. Indicate your answer by marking an "X" in the appropriate value on to 0-6 points scale under each item. Please write in consideration the intermediate levels in each scale. For example: if your answer is "a bit", the second box on the left is probably appropriate. If your response is "considerably" (but not totally), the fifth box should be used. Note that the plural form of stimuli is used to reflect the possibility of more than one stimulus being used during a session.

Stimuli used for exposure : _____

1. How much time (in seconds) did you spend searching and preparing the exposure stimuli (social situations, virtual environments, looking on Internet or on a map, etc.) for this exposure session?

0	1-120	121-240	241-360	361-480	481-600	601 or +
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Specify the exact number of seconds: _____

2. How much time (in seconds) did you spend going to the location targeted for exposure (bar, cafeteria, bridge, remote location on the highway, etc.) for this exposure session?

0	1-120	121-240	241-360	361-480	481-600	601 or +
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Specify the exact number of seconds: _____

3. To what extent did you have difficulties to access and use the physical location (room, necessary permission, elevator, etc.) required for the exposure session?

0	1	2	3	4	5	6
MODERATELY						TOTALLY

NOT AT ALL

4. Did you have difficulties to access and use the stimuli (recruit people, virtual environments, snake, etc.) required for the exposure session?

0	1	2	3	4	5	6
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0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY

5. To what extent did the exposure session was influenced by external constraints (weather, costs, unpredictability of the stimuli, etc.)?

0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY

6. To what extent did the exposure sessions was influenced by time constraints (duration, time of day, etc.)?

0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY

7. To what extent was confidentiality compromised by this exposure session?

0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY

8. Excluding you and the patient, how many people were involved to realize this exposure session?

0 1 2 3 4 5 6 and more

9. Document the costs related to this exposure sessions and specify their source (employees other than you, material, driving, etc.) :

0\$ 1-10\$ 11-20\$ 11-30\$ 31-40\$ 41-50\$ 51\$ or more

Specify the expenses, their exact value and do not include fixed costs (e.g. purchase of material) :

10. In general, to what extent did you find it difficult to conduct the exposure during this session?

0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY

11. To what extent did the efforts required to conduct this exposure session bothered you as a therapist?

0 1 2 3 4 5 6
NOT AT ALL MODERATELY TOTALLY