

SCIENTIFIC EN PILOT STUDIES



STUDIE 1: D-EMDR VIRTUAL REALITY UTILIZATION DURING EMDR THERAPY

Uitvoerder: Maastricht University & behandelkliniek U-Center

GOAL

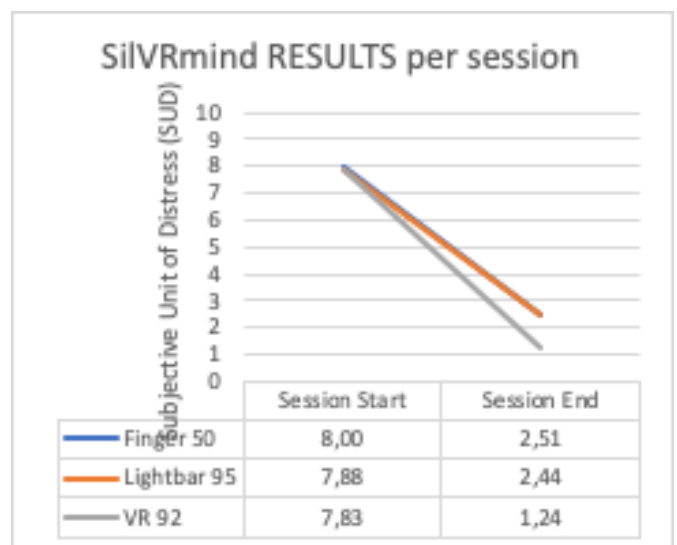
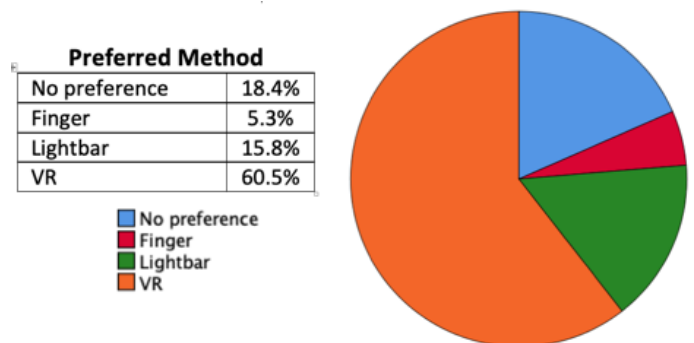
A feasibility study investigated whether the Digital (D-EMDR) in Virtual Reality could be applied effectively in a clinical setting on PTSD patients in the specialized mental health care.

METHOD

62 international patients in specialized care, of which 46 with a diagnosis of PTSD, with a treatment indication for EMDR, were offered the VR, lightbar and finger movement methods. A total of 237 EMDR sessions were performed. This study was not randomized; patients always chose the method themselves for each EMDR session, some patients chose only one method, other patients chose different methods within their EMDR trajectory. SUD measurements were taken per session and averages of the three methods were compared. patients were allowed to choose and indicate preference. Afterwards, open feedback was also requested about the experience.

RESULTS

- Per session there was on average more reduction of SUD via VR within one session compared to the lightbar and traditional finger movements (assumably because of better working memory load, see Study 2).
- A majority of patients preferred the VR method because of better perceived effectiveness, more immersion, better focus and a more anonymous experience, which was experienced as pleasant (see appendix 1 Patient/User statements).



	Session start	Session end
Finger 50	8,00	2,51
LIGHTBAR 95	7,88	2,44
VR 92	7,83	1,24

STUDIE 2: Virtual Reality utilization for the examination and enhancement of Working Memory Load for visual and auditory dual tasking.

Conducted from Maastricht University

In preparation for scientific publication

BACKGROUND

The mechanism of action of EMDR is explained by working memory theory. Innovation technology can be used to measure working memory load of various tasks and thereby increase the effectiveness of EMDR.

OBJECTIVE

To potentially improve the effectiveness of EMDR, the aim of the present study was to explore possibilities to tax working memory by manipulating the speed of eye movements (EMs), the predictability of eye movement direction, and adding an additional task to the eye movements.

METHOD

39 Psychology students each went through several conditions (It is a within-design and therefore their own control group). Subjects performed an Auditory RIR (Reaction Time) task in Virtual Reality as well as visual tasks examining differences in eye movement pattern (horizontal vs. random) and speed of EMs (no EMs 0hertz, slow 0.8hertz; mean 1.0 hertz and fast 1.2 hertz). A third visual task was also added, which consisted of reacting to the ball when it changed shape into a cylinder. Response times were measured for each task using the primary auditory RIR task.

RESULTS

- 1: The combination of the working memory tasks resulted in maximum working memory load for the auditory modality of working memory. There was a so-called ceiling effect.
- 2: Combining the working memory tasks was so taxing that making/adding eye movements, regardless of the speed of these movements, no longer resulted in additional working memory load for the auditory modality of working memory. For the visual modality of working memory, faster eye movements did lead to more working memory load.
- 3: Adding additional tasks seems better than intensifying a task (eye movements)

STUDIE 2: Virtual Reality utilization for the examination and enhancement of Working Memory Load for visual and auditory dual tasking.

Conducted from Maastricht University

In preparation for scientific publication

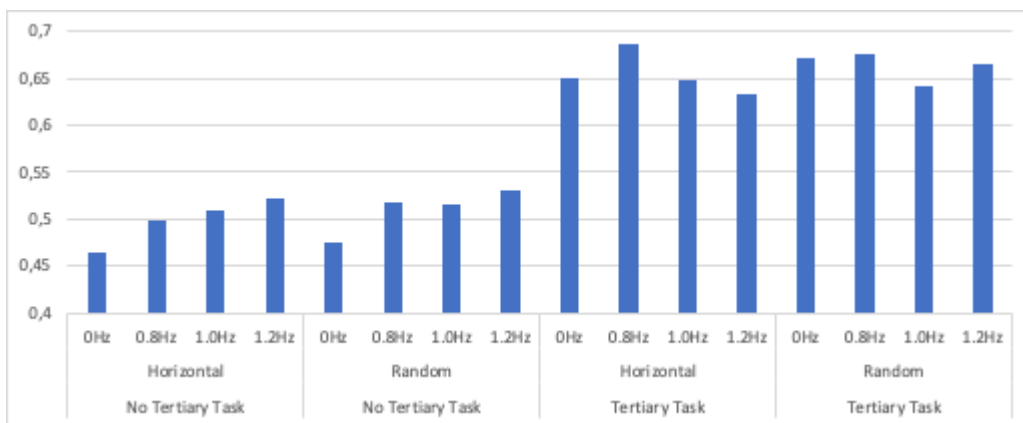


Figure 1: Mean response times for the auditory RIR task for the horizontal and random eye movement directions for all speeds.

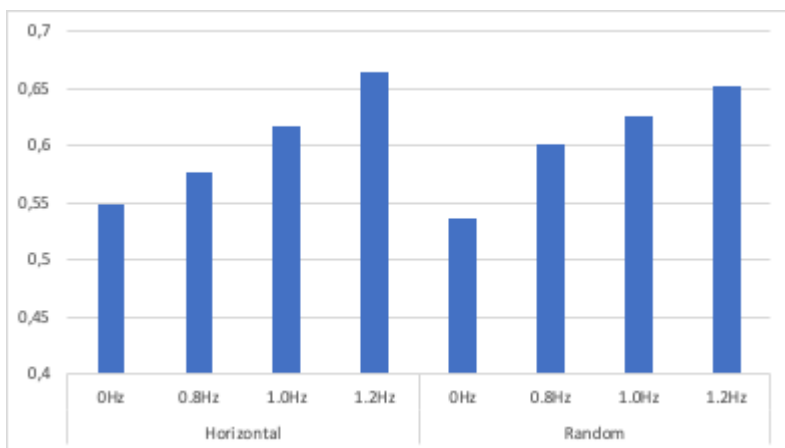


Figure 2 Average response times for the visual RIR task for the horizontal and random eye movement directions for all speeds.

STUDIE 3: Study 3 online EMDR what do we think about it?

Performed by EMDR Association Netherlands (VEN)
Published in EMDR Magazine: edition 25

OBJECTIVE

Pilot study among EMDR therapists on the change in their treatment attitude towards online EMDR therapy after working with the D-EMDR (computer) application for several weeks.

METHOD

Attitude questionnaires were administered on effectiveness and aspects of use (ease of use) and treatment compared with face-to-face EMDR. a total of 80 pre-measurements and 55 post-measurements were gathered.

RESULTS

Positive treatment attitude towards Online EMDR - No differences compared to face-to-face in domains such as perceived effectiveness, emotional closeness, process distractibility. Positive treatment attitude towards Online EMDR and no differences compared to face-to-face in domains such as perceived effectiveness, emotional closeness, process distractibility.

	Pre-measurement	Post-measurement
Treatment attitude in general:	Very Negative(0) – Very Positive(10)	
Online EMDR-treatment	7.47	7.55
Private use of online EMDR	7.54	7.45
Effectively using EMDR using The digital application	7.34	7.29
Fear with online EMDR because of:	Very Negative(0) – Very Positive(10)	
Lesser notice of body language	6.20	6.22
Assumptions of Technical defuncts	4.70	4.66
Worsening of client relationships	6.13	5.42
Online EMDR in relation to face-to-face EMDR:	Very Negative(0) – Very Positive(10)	
Quality of the Therapeutic relations	4.46	4.56
Expected given results	4.90	5.04
Total of assumed sessions	5.21	5.04
Providing a degree of closeness and opportunity for empathy	5.21	5.82
Keeping focus	4.97	5.28
Preventing misunderstandings in communication	4.71	4.68
Openness of clients	4.54	4.28
Degree of working memory load	5.93	5.82

STUDIE 4: Online D-EMDR Effectiveness

Conducted from Maastricht University with Mondriaan Foundation

GOAL

A scientific pilot study to measure the attitude of practitioners and patients, and the effectiveness of online D-EMDR use.

METHOD

21 practitioners completed the pre-test and 11 active practitioners completed the post-test. 26 patients with psychiatric diagnoses (80% PTSD, avg. 10 years of symptoms) were treated with online D-EMDR. The treatment attitude towards the online EMDR was measured among therapists and patients in questionnaires, in which complaints questionnaires were also administered to patients to determine effectiveness.

Results

Therapists:

- Very positive attitude by therapists in general experience, ease of use and intention for the future/sense to get started.
- attitude towards online EMDR towards face-to-face better for relationship quality and working memory load.
- Before use, therapists thought the application implied longer treatment time, however after use, therapists evaluated time through D-EMDR to be shorter.

Clients:

- Clients indicate that they are quite satisfied with the online treatment. They experience the online D-EMDR treatment as positive, convenient to use and have not experienced many problems. A minority indicated that they experience the lack of physical contact with the practitioner as a disadvantage.
- Half of clients experienced the online D-EMDR as accessible, better for the continuity of their treatment. Patients see it as an advantage that they can follow the treatment from their own safe environment.

Questionnaire: PCL	Pre-measurement	Post-measurement
PCL Totalscore	47,75 (11,40)	28,77 (17,76)*
Cluster Intrusions	11 (4,03)	7,44 (5,96)*
Cluster Avoidance	5,7 (1,83)	3 (2,27)*
Cluster Negative cognitions	16,2 (4,57)	9,3 (5,96)*
Cluster Arousal	12,4 (3,25)	9 (5,26)*

Questionnaires: WHOQoL	Pre-measurements	Post-measurements
Quality of life	2,9 (0,78)	3,4 (0,69)
Quality of health	11 (4,03)	2,8 (1,06)
Cluster Physical health	5,7 (1,83)	2,96 (0,77)*
Cluster Psychological health	16,2 (4,57)	9,3 (5,96)*
Cluster Social relationships	12,4 (3,25)	9 (5,26)*
Cluster Enviroments	3,3 (0,43)	3,6(0,47)

STUDIE 5: WORKING MEMORY LOAD DURING D-EMDR (SMARTPHONE)

Conducted with Universiteit Twente

GOAL

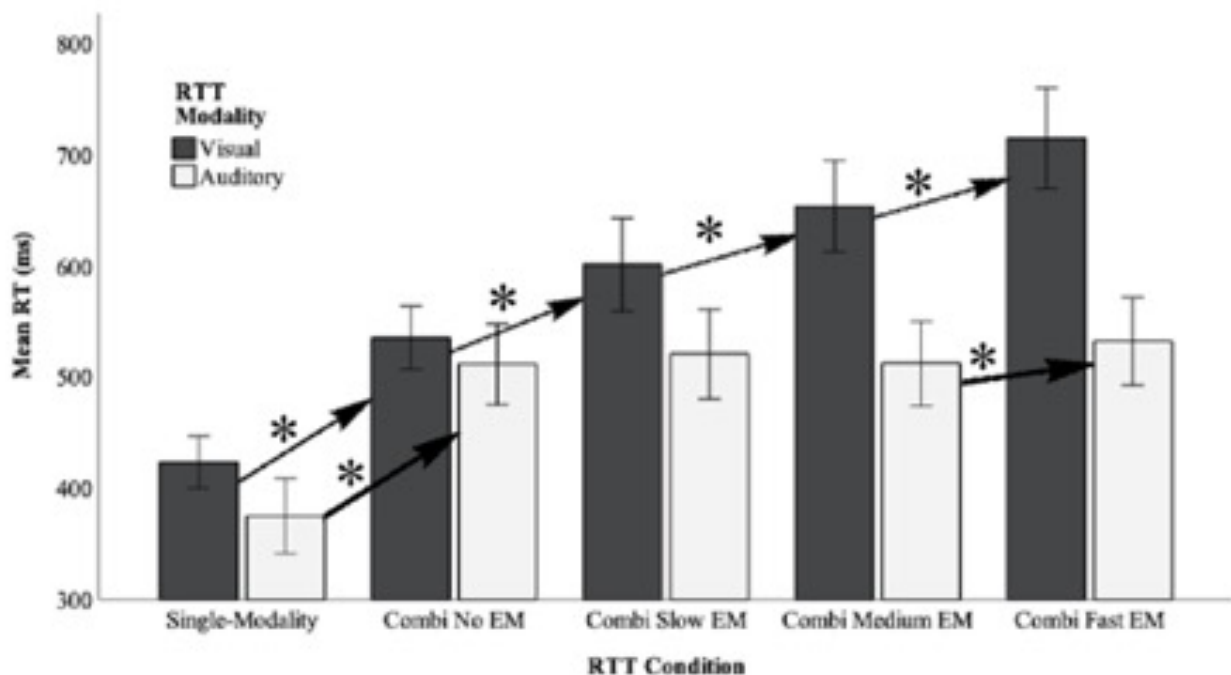
Previous research showed that increasing working memory load is beneficial in the desensitization effect in EMDR; some tasks are more superior in load than others, and the complexity can be increased within a task. The present study examined the effects of combining multiple tasks (Visual RIR task + Auditory RIR task + eye movements) and looked at effects of eye movement speed and the presentation of RIR tasks in simultaneous or serial order.

METHOD

52 Psychology students each went through several conditions (It is a within-design and therefore participants are their own control group). Subjects performed an auditory and visual RIR task with eye movements in the D-EMDR smartphone application looking for differences in combination order (simultaneous vs. serial) and speed of eye movements none (0 hertz), slow (0.8 hertz); avg (1.0 hertz), and fast (1.2 hertz), response times were measured for each task using the auditory and visual RIR task.

RESULTS

- Combining RIR tasks resulted in significantly increased working memory load for both visual and auditory modalities.
- When combining the RIR tasks, eye movements only led to further increased working memory load in the visual modality.
- Presenting the tasks in serial order resulted in higher response time averages than submitting the tasks simultaneously. An explanation for this may be that switching attention is more taxing than dividing attention among tasks.



STUDIE 6: EFFECTIVITY TO DESENSITIZE STRESSFUL MEMORIES WITH D-EMDR (SMARTPHONE)

Conducted with University of Twente

GOAL

Previous research showed that increasing working memory load is beneficial in the desensitization effect in EMDR; some tasks are more superior in load than others, and the complexity can be increased within a task. The present study examined the effects of combining multiple tasks (Visual RIR task + Auditory RIR task + eye movements) for the short- and long-term desensitization of negative memories.

METHOD

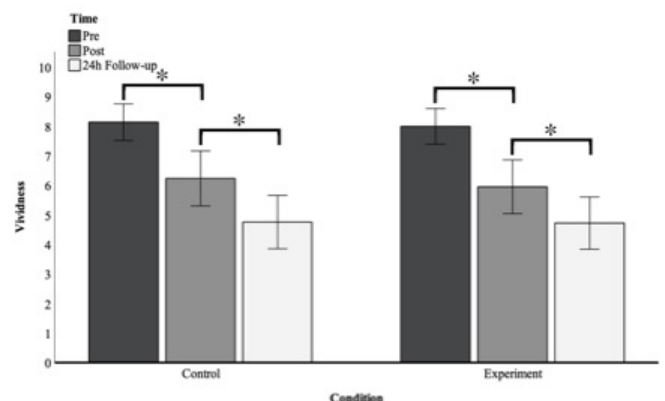
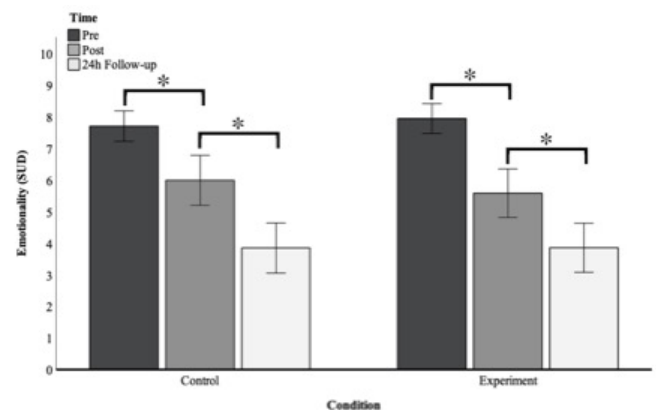
43 Psychology students watched a trauma video and were assigned to a Recall + Working Memory Load or Recall only condition. In the working memory load condition, 12 desensitization sets of 30 seconds were presented in which subjects performed an auditory and visual RIR task with eye movements, of which the speed of eye movements was titrated per individual based on their RIR tasks' performances. In the Recall condition, subjects only had to stare at a blank background. Before and after the experimental session, and after a week of follow-up, their subjective rating of emotionality and vividness were registered on the worst picture in the memory of the trauma video.

RESULTS

Both the Recall + Working Memory Load condition and the Recall condition showed significant SUD decreases for emotionality and vividness between time measurements.

- There were no significant differences between the conditions.
- The algorithm successfully titrated working memory load to subjects, a variety in RT and corresponding Eye movements speed was observed.
- There was no correlation between adjusting the working memory load of the algorithm with the desensitization effect.

The limitation was that there too few subjects and university subjects with possibly homogeneous working memory capacity for power analysis.



STUDIE 7: TIME-EFFECTIVITY OF D-EMDR VS. LIGHTBAR IN EMDR THERAPY IN A CLINICAL POPULATION

Conductors: CaleidoZorg & CZ

GOAL

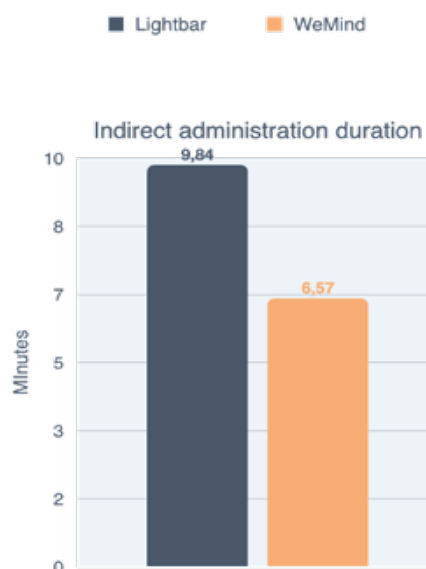
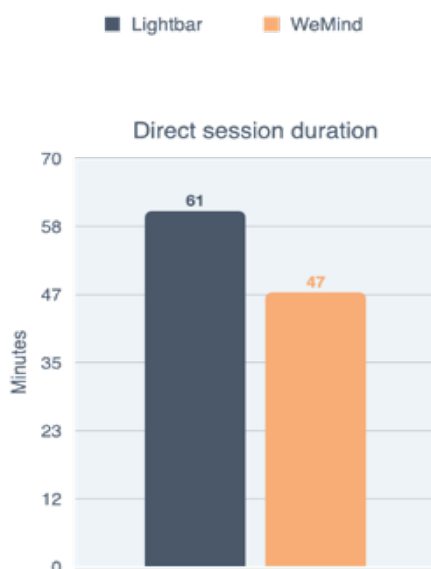
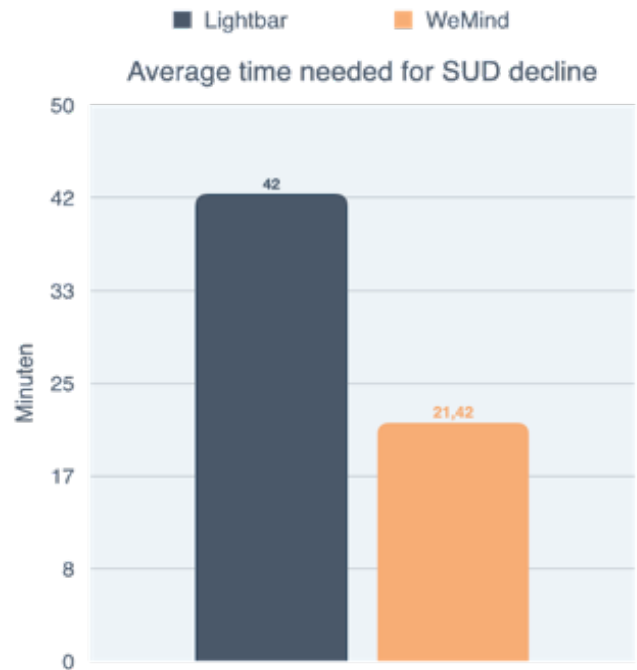
To compare the time effectiveness between D-EMDR and the lightbar methods during EMDR sessions.

METHOD

12 EMDR therapists provided 52 EMDR sessions (26 D-EMDR, 26 Lightbar) during their EMDR trajectories. The patient population consisted of 23 patients between the ages of 21 - 63, all with a psychiatric diagnosis, mainly PTSD and stressor-related disorders. Therapists administered the direct treatment time, administration time, desensitization time, and SUD registration during their sessions, for a period of three months.

RESULTS

The data showed that with digital EMDR, sessions were on average 14 minutes (23%) shorter compared to lightbar use. Also, for digitale EMDR, the administration time was 3.3 minutes (33%) shorter, which could be explained in that therapists could make session notes within the D-EMDR application during the session. The data showed that the gain in direct time was due to a time reduction during the EMDR desensitization phase, which for the same SUD decrease (Δ Sud: D-EMDR = 5.37, lightbar = 5.38) the desensitization time for digital EMDR was 21 minutes (49%) shorter than with the lightbar. This reduced time effectivity in desensitisation can be explained by a higher working memory load (see study 2 and 5).



STUDIE 8: EFFECTIVITY TO DESENSITIZE STRESSFUL MEMORIES WITH A-EMDR

Conducted with Maastricht University

GOAL

Autonomous self-help EMDR could be used to desensitize negatively charged memories and reduce trauma-related complaints. The aim of this study was to validate the use of self-help EMDR in healthy subjects in order to subsequently conduct research in patients.

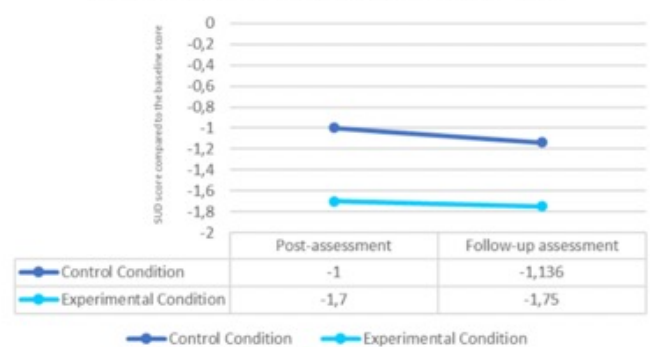
METHODS

42 healthy psychology student subjects were assigned to two conditions: (self-help EMDR; control). All subjects were required to select a mild negative autobiographical memory (SUD 3 < 7) and report the emotionality and vividness of the worst image of the memory on a 10-point scale. In the self-help condition, participants used the self-help EMDR smartphone application that's an English translation of the 2021 Dutch EMDR Standard Protocol. The control condition viewed a neutral video on YouTube without a high working memory load. Subjects had to report emotionality and vividness scores again after the intervention, as well as after one day of follow-up.

RESULTATEN

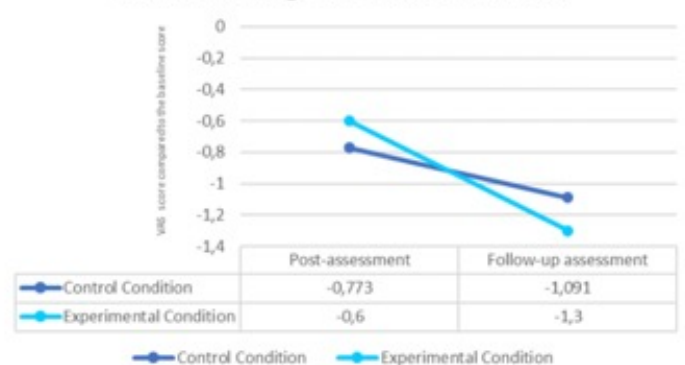
- Both the Self-help EMDR and the control conditions showed SUD, although observable, not significant decreases for emotionality and vividness between time measurements.
 - Also there were observable, but no significant differences between the conditions.
 - No subjects reported negative complaints/experience with using the Self-help EMDR app.
- Limitations: too few subjects and too mild negative memories.

Estimated Marginal Means of Emotionality



	Post-assesment	Follow-up assesment
Control condition	-1	-1,136
Experimental Condition	-1,7	-1,75

Estimated Marginal Means of Vividness



	Post-assesment	Follow-up assesment
Control condition	-0,773	-1,091
Experimental Condition	-0,6	-1,3

ATTACHMENT: CLIENT/USER STATEMENTS

VIRTUAL REALITY:

- *The VR is good, I like it, it closes me off to everything except your voice.*
- *The VR feels more immersive*
- *The EMDR- VR gets to the root of the problem better, my tension level and frustration level. I don't feel judged because there is no army association or rank difference. Being in a non-army virtual environment helps.*
- *I think it was better compared to finger movements, it felt easier and I don't feel the therapist's near presence which is not comfortable*
- *Full attention. Feels more private and more secure. Using the Room felt somewhat normal"*
- *The VR feels more real, you can fully immerse yourself in it; being in the virtual reality environment is an easier connection with your thought. I don't have to try the lightbar and fingers to know what method I prefer; the VR makes it a lot easier"*
- *I get more out of it. I'm in and out of focus.*
- *The VR takes away the external distraction + 3D movements tax working memory more."*
- *The finger movements takes a lot more work. The VR is really cool and pretty neat, but the finger movements seem harder, I don't know why.*
- *The VR brings in a whole other element. With the lightbar there's more distraction. With the changing of the shap, the VR felt as more effective in a shorter period of time."*
- *In VR the stress- drops are much more significant, the magnitude of the change is much harder. The fingers are not as effective as the VR, it takes longer and the change in tension each time is quite small. I want to redo the session with VR. The total immersion in the virtual environment makes the experience deeper. The VR is more efficient and felt stronger compared to the finger movements."*
- *The goggles are more effective, more measurable and more effective in a short period of time. The finger method is ineffective for me: the stimulation is ineffective for me; I didn't feel sufficiently distracted. I didn't feel so much of an effect with the lightbar or the fingers. I think it's easier to connect with the emotions and to drop that armor if I'm wearing those goggles. The virtual room doesn't have the clinical feeling to it, it looks like a hotel room with nice view, it has a sense of safety. The VR creates that fatigue with greater intensity: high intensity workout vs lower intensity for a longer period of time."*
- *With the lightbar my eyes start to hurt more, however I'm still with you, and you're here with me. With the VR I feel more alone. I feel safer, with the therapist being here, I feel more comfortable visiting the thoughts. In VR I can go deeper into my thoughts though. The lightbar helps me to hold on to reality better. In VR the room is smaller, and I know it's not closing in on me."*
- *The lightbar is a downgrade to the VR. I like the VR, I think it's cool. I hope that everyone can use the VR in the future, I mean come on, it is the 21 century.*
- *I think I prefer the hand movements. The VR made me a bit nervous. The feeling being confined to the contraction, like being stuck inside it and wanting to get out. I don't know yet which one is more effective. ▪ I like the VR better to the lightbar, instead left-right it goes all the way. The color changing taxes WM better, it was pretty cool. It really feels in the mind. It felt more interesting. I have no feedback for improvement.*
- *VR is a whole different experience but getting the same as the lightbar. The pattern of movement is random, so that makes it harder/having to go deeper. Because it was harder you have to be on your toes more, feels harder and deeper. I felt like my thoughts were more intense.*

- *I loved it, it's much better because you're really isolated from other stimuli to concentrate. You feel much more safe. I really enjoyed it and felt much more comfortable. In VR you can really focus better. When the ball goes very fast, the quality of the image seems to go down. In real life I have the nonverbal communication falls away, which gives me more freedom in my brain to focus on the content.*
- *The lightbar makes me feel more dizzy. The VR is nice, it was more calming. Focusing more on clicking the button when changing shape was better than the vibrating pulsators, I hated those things. The setting was very calming, it would be nice to connect to the webcam, maybe display it on the TV. It would be helpful to see you in VR, it felt like god was talking. Sometimes it was hard to see the difference. Maybe black out during the ball session. The TV is a perfect placement.*
- *It would have been bad to start with VR from the start, not seeing you makes me feel more uncomfortable. When the ball gets really fast I see 2 balls, don't synchronize enough. In a bad mood I want to be able to see my surroundings. Feels uncomfortable with not seeing you.*
- *I like the VR better, because you're not just moving back and forth, but move the eyes everywhere. It's not predictable so you can't think about it; sometimes when it gets too fast you can't see it change, but i guess that's probably the point of it. Some of the lighter colors were harder to see (grey and yellow). Overall, I liked it; the sounds were enough to distract and not do occupy; I liked the vibration pulsators of the lightbar, that would help in adding another aspect. Preference VR over lightbar. It took me to a neutral place, a room with no feelings associated with it. Feedback for improvement: having more neutral rooms to not have associations with it. Not seeing therapist is relaxing, and hearing your voice. Seeing you in VR would creep me out."*
- *VR is definitely more overwhelming, a lot more going on. Mind is racing less, it's harder to focus with everything that's going on. Slight preference for the VR. I liked the experience of not being trapped in my thoughts the whole time. Words could trigger a thought.*
- *The apartment room was too distracting; Dark VR room was better. The VR is more taxing, I had to work harder to concentrate. It's more distraction which is better because it really works you. With the lightbar I also get distracted with other things in the room. It made me more focus on the exercise. Not seeing the therapist was helpful, less distraction.*
- *I'm more tired now which maybe is good, because I'm too tired I don't feel emotion. The VR was comfortable with my glasses. The ghosting-delay was a little distracting.*
- *The VR I prefer because I focus more on what's in front of me. It forces me to focus. The VR exhausts my brain more because the ball is going all over the space.*
- *The VR is a lot better because I can focus on the ball without getting dizzy, like with the lightbar. The auditory beeps help focus too. It's really nice. Maybe make the background a bit darker. When the color is white or too light it's more difficult to focus. I definitely prefer the VR.*
- *I like the VR better over the fingers and lightbar because I get less distracted, making the sessions more intense, which I'm fine with. The emotions are more intense. My personal opinion is that it is more effective.*
- *VR helped with avoiding crying. You can't see my cry. With EMDR I was more able to identify emotions. It was the first time I was able to pick out and label the emotion.*