Preliminary findings from virtual reality and eye tracking-based training to modify body-related attentional bias in anorexia nervosa

Ascione M.1, Carulla-Roig M.2, Miquel-Nabau H.1, Meschberger-Annweiler F.A.1, Serrano-Troncoso E.2, Porras-Garcia B.3, Ferrer-Garcia M.1, Gutierrez-Maldonado J.1

1Department of Clinical Psychology and Psychobiology, University of Barcelona, Barcelona, Spain.
2Department of Child and Adolescent Psychiatry and Psychology, Hospital Sant Joan de Déu, Barcelona, Spain.
3Department of Population Health Science - School of Medicine, University of Utah, Utah, United States.
Patients with anorexia nervosa show dysfunctional body-related attentional bias. Body-related attentional bias is associated with higher levels of body dissatisfaction. This interference with the effectiveness of body exposure-based treatments can be assessed using the Physical Appearance State and Trait Anxiety Scale (PASTAS; Thompson, 1999).
ATTENTIONAL BIAS MODIFICATION TRAINING can reduce attentional biases
ATTENTIONAL BIAS MODIFICATION TRAINING - ABMT

Eye-tracking + Virtual reality
To assess the usefulness of a single session of a body-related attentional bias modification training based on virtual reality and eye-tracking in anorexia nervosa patients.

Will the AMBT reduce body-related attentional bias and body dissatisfaction levels?
Sample

23 adolescent patients with anorexia nervosa diagnosis

<table>
<thead>
<tr>
<th>AGE</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>15.30 (1.29)</td>
<td>18.28 (1.62)</td>
</tr>
</tbody>
</table>

Procedure

1. Creating a personalised avatar
2. Pre-treatment assessment
3. Immersion in the virtual environment
4. Full body ownership illusion
5. Attentional bias modification training
6. Post-treatment assessment
The virtual avatar was created by taking a patient’s frontal photo which was manually overlapped on the silhouette of the virtual body by adapting the avatar’s body parts to the patient's silhouette.
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Procedure

1. Creating a personalised avatar
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Virtual reality environment

Full Body Motion Tracking
Procedure

1. Creating a personalised avatar
2. Pre-treatment assessment
3. Immersion in the virtual environment
4. Full body ownership illusion
5. Attentional bias modification training
6. Post-treatment assessment
synchronizing the movements of the participant with the movements of the avatar using motion capture sensors placed on the hands and feet → participants could see how the virtual body was doing the same movements as the real body.

synchronizing the participant’s visual and tactile stimulation using a tactile controller → participants could see how their virtual body was touched by a virtual controller on the same areas of the real body touched by a real controller.
Procedure

1. Creating a personalised avatar
2. Pre-treatment assessment
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4. Full body ownership illusion
5. Attentional bias modification training
6. Post-treatment assessment
The attentional bias modification training goal was to balance the attention between weight and non-weight-related body parts.

Patients were asked to be staring for 4 seconds at the figures that appeared on a specific body part of the avatar, while it was progressively illuminated until the end of the 4 seconds, and then to move on to the next figure presentation.

150 figures divided into two blocks of 75 figure 10-15 minutes task.
Procedure

1. Creating a personalised avatar
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Areas Of Interest*

Body dissatisfaction

Body Image Assessment Scale-Body Dimensions; Gardner et al., 2009

Body-related attentional bias

1. Visual fixation
   - Complete fixation time
   - Fixations number

2. An involuntary act of maintaining the gaze on a specific location, at least, for 100-200 ms.

* Physical Appearance State and Trait Anxiety Scale (PASTAS; Thompson, 1999)
Body-related Attentional Bias Assessment
## Descriptive and analytic results

<table>
<thead>
<tr>
<th></th>
<th>Pre-Assessment Time</th>
<th>Post-Assessment Time</th>
<th>Paired sample t-test</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Fixation Time</td>
<td>3269.88 (5837.05)</td>
<td>-94.88 (7988.81)</td>
<td>1.863</td>
<td>.040* .452</td>
</tr>
<tr>
<td>Number of Fixations</td>
<td>2.00 (20.80)</td>
<td>-3.41 (18.56)</td>
<td>.835</td>
<td>.208 .203</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>42.83 (26.14)</td>
<td>33.26 (32.14)</td>
<td>1.880</td>
<td>.037* .392</td>
</tr>
</tbody>
</table>

*Significant differences. *p < .05; Cohen’s d effect sizes: small (≥0.20), medium (≥0.50), and large (≥0.80)
**Results:** complete fixation time - CFT

**Statistically significant reduction in CFT on the W-AOIs**

\[ t(16) = 1.8, p = .040 \]

**positive scores**
more attention at weight-related body parts

**negative scores**
more attention at no weight-related body parts

**close to 0 score**
balanced attention between weight and non-weight related body parts

**Patients showed at baseline a longer CFT on weight-related body parts**

**PRESENCE OF BODY-RELATED ATTENTIONAL BIAS**

The ABMT restored balanced attention between weight and non-weight-related body areas reducing the time spent looking at weight-related body parts.

**Complete fixation time (W vs NW AOIs)**
Results: fixations number - FN

No statistically significant reduction in FN on the W-AOIs

Patients showed at baseline a balanced FN between weight and non-weight-related body parts.

ABSENCE OF BODY-RELATED ATTENTIONAL BIAS

The balanced attention between weight and non-weight-related body areas reported at baseline was maintained after the training.

The ABMT did not affect the FN because there was no bias to be corrected.

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<th>positive scores</th>
<th>negative scores</th>
<th>close to 0 score</th>
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<tr>
<td>more attention at weight-related body parts</td>
<td>more attention at no weight-related body parts</td>
<td>balanced attention between weight and non-weight related body parts</td>
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Number of fixations (W vs NW A0Is)

The graph shows the number of fixations before and after the training, indicating a decrease in FN.
Results: body dissatisfaction

Statistically significant reduction in body dissatisfaction

\[ t(22) = 1.88, p = .037 \]

After the ABMT, body dissatisfaction levels decreased.
Patients may have at baseline longer CFT on weight-related body parts because these could have greater emotional relevance and complexity and could therefore be associated with deeper processing of information.

Patients may have at baseline a distributed FN between weight and non-weight-related body parts because both belong to the semantic category of the body that is clinically significant for patients with anorexia nervosa.

The change in CFT may be the result of learning to control the attention to body parts or the effect of a change in the emotional and cognitive relevance of non-weight-related body areas, or the latter could be the consequence of the former.
ABMT goal: to direct attention to both negative and positive/neutral stimuli

Measures of gaze behaviour with good psychometric properties

ABMT based on a virtual representation of the patient's real body in a highly ecological situation

Traditional ABMTs divert attention away from disorder-related stimuli

Visual Fixation: CFT & FN
Stand-alone or combined treatment?

Preventive function?

Future research
Conclusions

VR-ET based ABMT

new effective clinical intervention
for anorexia nervosa patients

body-related attentional bias
&
body dissatisfaction
Thank you!

Contacts
Mariarca Ascione: ascione.m@ub.edu
José Gutiérrez-Maldonado: jgutierrezrm@ub.edu