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Review of „Attention biases in depression. Attention bias modification training as therapeutic intervention".

Doctoral thesis submitted by Marzena Rusanowska

Description of the work

The present work reports two comprehensive studies addressing attentional phenomena in subclinical and clinical depression, and their therapeutic malleability by attentional training programmes. The studies work with large samples and involve complex diagnostic steps in establishing the eligibility of individuals to participate. The theoretical framework starts out from the debate about differences between anxiety and depression with respect to their implications for attentional behaviour, that is, anxiety being associated with attentional biases towards threatening information in early stages of processing, versus depression being associated with semantic biases at later stages of processing. The methods used involve standard techniques such as *Emotional Stroop* or *Face in the Crowd* as well as advanced methodologies, in particular, eye-tracking and visual search paradigms. A newly developed and modified "Attention Bias Modification Training" (ABMT) is used in a quasi-experimental intervention process, at the end of which not only attentional biases are re-tested but also depression and anxiety symptoms and data on changes in well-being are collected and compared to pre-intervention measures.

As main results for study 1, differences in attention biases were found between healthy controls and depressed participants. In the *Face in the Crowd* paradigm depressed individuals exhibited a lack of positive bias, and eye-tracking also revealed that they were quicker in finding, and had longer first fixations onto angry faces as compared to non-depressed individuals (negativity bias).

Using the ABMT, Study 2 found that both groups, one that had received ABMT (experimental group) as well as one that had received a training programme designed as neutral, showed significant improvements after two weeks of using the method, in terms of depression symptomatology. Interestingly, only the experimental group showed improvements in anxiety measures as well, which was unexpected since the training was not designed to specifically address anxiety. Furthermore, both groups improved in the Emotional Stroop paradigm and when freely viewing four faces (eye-tracking results).

Evaluation of the work

The theoretical introductions to both main parts, studies 1 and 2, are comprehensive and cover the relevant literature well. As a special methodological merit must count that the candidate reviews and explains the toolbox of eye-tracking methods in its many varieties, discussing the use and external validity of various metrics and dependent variables within this methodology, such as first

fixation analysis in search paradigms, gaze length, glance counts, or dwell duration (Introduction to Study 1). This is a very useful methodological discussion since eye-tracking methods recently have started to develop broader popularity amongst psychological researchers in many places. Summarising the literature by saying that anxiety goes with orientation biases at the beginning , while depression with more downstream processing towards the end of a perceptive episode is adequate. At places, one would have wished for a still clearer distinction between what would count, in this context, as "long" vs. "short" presentation times (ranges from 250ms to 3 seconds represent a pretty wide range in terms of cognitive processes).

The methodology of Study 1 is carefully chosen and executed. It deserves merits that the samples were carefully made representative (cross-cutting layers of age, social status and education), and that the study ended up with relatively high N's, compared to the mainstream research in this field. This strengthens our belief in the validity of results, and their representativeness. Note also that the work incorporates current hypotheses about cognitive factors interfering with performance in depression: The "switching conditions", as introduced in Study 1, allow for an assessment of resource limitation under different processing loads in states of depression. It needs to be acknowledged, however, that not all the results involving the switching conditions are easily understood, see e.g., p.63, second paragraph. In this respect, a bit more of theoretical speculation or integration could have been applied, particularly concerning the result of a mediator role of switching in the interference from negatively valenced words (sensitivity to negative words was only present in switching, but not in non-switching).

(as a minor remark: sometimes within Study 1, "ABMT" is mentioned but has not been introduced at that stage yet, see e.g., p. 59)

In Study 1, I'd like to give an extra credit for the interesting results on pre-attention (p. 78-79). Here, the hypothesis is that emotion (as represented in certain target types) can influence pre-attentive guidance of the visual search even before a particular target is seized with full attention. This certainly deserves replication and more experimental exploration.

I also want to highlight the replication, in the present work, of a classical minority finding: depressed participants turned their attention to threatening faces *faster* than non-depressed participants, thus showing negativity bias in the initial stage of processing, contrary to what is mostly upheld in the literature (no such bias for depressed!). Such a finding, again, is of high interest and deserves to be addressed in the future in order to determine its boundary conditions, specifically in the light of the high standard of participant selection, and the large N, in the present study.

In Study 2, when evaluating the effect of the ABMT training routine, I want to first acknowledge the long interval of six months to test for more long-term effects of the intervention, which is desirable, but seldom done. However in this context, statistically, one would have liked to see not only t-Test comparisons between the immediate pre-post measurements plus the comparison between immediate post-intervention and six months after, but maybe, rather than that, just the first of the above, and secondly, instead of the latter of the above, the comparison between pre-intervention and six months after. The means across the three measuring times, however, do speak a clear language; and so in this case it would not have made a big difference, I guess.

The author has to be commended to have addressed and integrated, into the current design of Study 2, some of the shortcomings and criticisms provided by recent reviews about the implementation

efficacy of ABMT. It is also innovative to use, as the author does, eye-tracking methods as a tool to evaluate the success of intervention procedures such as ABMT.
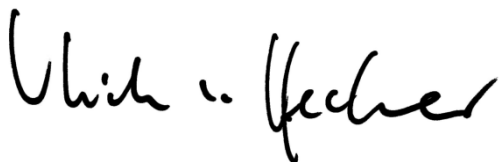
(In the Method section of Study 2, p. 107, please amend the figure. The superimposition of frames to symbolize the temporal sequence of presentation in Figure 12 is, as I stands, just reverse in order. It must be the other way round!)

In terms of results, the author discusses the possibility that the fact that *both* AT and NT groups benefited from the training might be due to an unspecific effect: just being engaged in some sort of cognitive training would have an improving effect, as discussed on p. 164. Here, the author might want to integrate the literature on "absorption effects" as proposed by Ralph Erber and Abraham Tesser (e.g., JESP 1992, Volume 28). The finding here is that participants in whom a negative mood had been induced reported feeling better after having engaged in some cognitive effort than subjects who had not done so. Although, I find the author's (preferred?) interpretation equally plausible (and interesting) which is that even the NT procedure did involve some positive stimuli, such that these could have had an effect, anyway.

The discussion is thoroughly critical and nicely puts the results in perspective. The author also considers the possibility of artefacts in connection with the target-searching paradigms (p. 161). In the end, it might also be the case, as the author argues (p. 165), that symptoms of anxiety would respond easier to interventions of the ABMT type, hence why anxiety was selectively modified whereas depression was not.

All in all, I am convinced that the submitted work conforms to internationally required scientific standards. It presents an original research question and methodological solution in that it tests ABMT for use in depressed populations, by developing an intervention method. Overall, the submitted work clearly displays the ability of the candidate, it displays wide theoretical knowledge, as well as the ability to independently conduct scientific work. I therefore recommend acceptance of the submitted manuscript as work that represents the standard of PhD.

Cardiff, 10 July 2017,

(Dr. Ulrich von Hecker, Reader in Psychology)