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## Refilling the half-empty glass – Investigating the potential role of the Interpretation Modification Paradigm for Depression (IMP-D)



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### ABSTRACT

**Background and objectives:** Cognitive biases are known to cause and maintain depression. However, little research has been done on techniques targeting interpretation tendencies found in depression, despite the promising findings of anxiety studies. This paper presents two experiments, investigating the suitability of an Interpretation Modification Paradigm for Depression (IMP-D) in healthy individuals, which has already proven its effectiveness in anxiety (Beard & Amir, 2008). Different from other paradigms, the IMP-D aims at modifying an interpretation bias on response- and on a more implicit reaction time-level, making this task less susceptible to demand effects.

**Methods:** The Word–Sentence Association Paradigm for Depression (Hindash & Amir, 2011) was modified and administered in healthy volunteers (experiment I:  $N = 81$ ; experiment II:  $N = 105$ ). To enhance a positive interpretation bias, endorsing benign and rejecting negative interpretations of ambiguous scenarios was reinforced through feedback. This intervention was compared to the opposite training (both experiments) and a control training (experiment II only).

**Results:** Both experiments revealed a significant increase in bias towards benign interpretations on the level of overt decisions, while only in the first experiment a change was found on a reaction time level. These modifications are not reflected in group-differences in emotional vulnerability.

**Limitations:** Possible limitations regarding the reliability of inter-dependent response and reaction time measures are discussed.

**Conclusions:** The IMP-D is able to modify interpretation biases, but adaptations are required to maximize its beneficial effects.

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Seeing a glass as half empty instead of half-full is one of the most popular examples of a negative interpretation of an ambiguous scenario. This bias towards negative interpretations is a characteristic cognitive marker often found in depression (e.g., Blackwell & Holmes, 2010; Hindash & Amir, 2011). This and other cognitive biases in the domain of memory and attention processing (e.g., Tran, Hertel, & Joormann, 2011; Vrijssen et al., 2014; Wells & Beevers, 2010) are not merely a symptom of depression, but appear to play a causal role in the onset and maintenance of

depression (De Raedt & Koster, 2010). In the light of limited treatment options, techniques that are able to modify interpretation biases and the related depressive symptoms are therefore essential.

Recently two meta-analytical reviews have been published, investigating the possibility to modify cognitive biases for interpretation (CBM-I) in anxiety and depression (Hallion & Ruscio, 2011; Menne-Lothmann et al., 2014). Menne-Lothmann and colleagues thereby distinguished between three CBM-I techniques: 1) homograph paradigms, 2) ambiguous situation paradigms (AS), and 3) word–sentence association paradigms (WSAP). However, the WSAP has so far only been applied to anxious individuals (Amir, Bomyea, & Beard, 2010; Amir & Taylor, 2012; Beard & Amir, 2008). In the following paragraphs we introduce the homograph paradigm and the AS to highlight methodological differences to the

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WSAP, which we propose as an alternative technique to modify biases in depression.

In a homograph paradigm, single words comprising a benign and a negative meaning (e.g., stroke) are used to assess the strength of associations individuals have with their respective meaning (e.g., Grey & Mathews, 2000). However, as homographs are less frequent in other languages different from English, this paradigm is less suitable in other languages as Dutch or German.

In the AS, developed by Mathews and Mackintosh (2000), initially ambiguous scenarios are described of which the meaning can only be resolved by the last word. Several sentences provide participants with a detailed context to develop an interpretation. This paradigm has been used to alter interpretation biases in anxiety (Salemink, van den Hout, & Kindt, 2007; Yiend, Mackintosh, & Mathews, 2005) and depression (Micco, Henin, & Hirshfeld-Becker, 2014). Holmes, Mathews, Dalgleish, and Mackintosh (2006) further modified this technique, by presenting scenarios on audio recordings and asking participants to imagine the described scenarios. This mental imagery training has been shown to be able to reduce depressive symptoms compared to a control training (Blackwell & Holmes, 2010; Holmes, Lang, & Shah, 2009).

In a Word–Sentence Association Paradigm (WSAP; Beard & Amir, 2009) a negative word (e.g., “threatening”) or a benign word (e.g., “funny”) is presented, followed by an ambiguous sentence (e.g., “People laugh after something you said.”). Participants indicate as fast as possible whether the word matches the sentence. Response choices and reaction times supply information about interpretation biases. In order to modify a pre-existing interpretation bias, Beard and Amir (2008) provided feedback on the performed reactions, reinforcing the acceptance of benign interpretations and the rejection of negative interpretations (i.e., “You are correct”), while punishing all other decisions (i.e., “You are incorrect”). This modification of the paradigm was sufficient to re-train initial interpretation tendencies in socially anxious individuals. Moreover these effects transferred to other modalities of information processing as attention (Amir et al., 2010), and reduced levels of social anxiety (Amir & Taylor, 2012; Beard & Amir, 2008).

Compared to AS paradigms (e.g., Mathews & Mackintosh, 2000), in the WSAP ambiguous stimuli are presented briefly as they consist of shorter sentences. This reduction of presentation time requires participants to rely on their associations to evaluate the scenarios. Compared to the mental imagery training (e.g., Blackwell & Holmes, 2010) the WSAP asks participants to actively perform an action, which has been suggested to be a critical component of a cognitive training targeting interpretation tendencies (Hoppitt, Mathews, Yiend, & Mackintosh, 2010). Moreover, next to measures of response choices, reaction times of the WSAP provide a more implicit assessment of this associative processing.

A modification of the WSAP has been used to assess interpretation biases in dysphoric individuals (WSAP-D; Hindash & Amir, 2011). Dysphoric participants tended to more often and more quickly endorse negative interpretations of ambiguous self-referential sentences compared to non-dysphoric individuals. However, no study has been published on the modification of these tendencies in the field of depression by means of this paradigm so far.

The aim of the current study was to investigate the efficacy of an Interpretation Modification Paradigm for Depression (IMP-D) by providing feedback on the WSAP-D, as in Beard and Amir (2008). In two experiments we investigated the efficacy of the IMP-D in modifying initial interpretation tendencies within an unselected sample. In addition we were interested in how far this modification of interpretation tendencies affects emotional vulnerability in response to a subsequent laboratory stressor. As this is the first study investigating the potential of modifying

depressive interpretation tendencies by means of a modified WSAP, we decided to investigate this paradigm in an unselected sample as a proof-of-principle study first, before testing it in clinical samples. Hence, the aim of the first experiment was to investigate whether initial interpretation tendencies can be modified by means of the IMP-D. Therefore, we compared two training conditions, one reinforcing healthy interpretation tendencies and the other reinforcing maladaptive interpretation tendencies. These two training conditions were contrasted, as the strengthening of a healthy bias in an unselected sample might result only in small changes, which are difficult to detect. The second experiment aimed at investigating whether we can strengthen an adaptive interpretation bias. Both training conditions from the first study were compared to a neutral control condition, wherein no interpretation tendencies were strengthened at all.

## 1. Experiment I

A group of unselected participants received either a positivity training (PT), involving reinforcement of the rejection of negative interpretations and the acceptance of benign interpretations, or a negativity training (NT), in which the opposite pattern was reinforced. Participants were expected to more often and more quickly execute the reinforced response pattern after the training. The PT group was further expected to show attenuated levels of emotional vulnerability in response to a subsequent stress task, compared to the NT group.

### 1.1. Method

#### 1.1.1. Participants

81 Dutch and German speaking students participated in return for course credits or a payment of €10. All participants were randomly assigned to the PT group ( $n = 40$ ) or the NT group ( $n = 41$ ). Groups did not differ on age, gender, nationality or any trait questionnaires (see Table 1).

#### 1.1.2. Materials

**1.1.2.1. Zung self-rating depression scale (SDS).** The SDS was administered to investigate differences in depressive symptoms (Zung, 1965, 1973). Scores range from 20 to 80, with higher scores reflecting more depressive symptoms.

**Table 1**  
Descriptive statistics of both groups in experiment I.

Name	PT	NT	Range	$t$ ( $df = 79$ )	$\chi^2$	$p$
	Mean (SD)	Mean (SD)				
N	40	41				
Gender	25 female	19 female			2.13	.144
	15 male	22 male				
Nationality	21 Dutch	24 Dutch			.3	.585
	19 German	17 German				
Age	22.6 (2.35)	23.49 (6.45)		.82		.416
SDS	36.23 (6.96)	35.49 (9.01)	23–55	.41		.682
STAI	37.18 (9.17)	37.8 (12.15)	20–69	.26		.793
NEO-FFI	6.3 (3.16)	6.71 (4.03)	0–16	.51		.615
PA	33.8 (5.29)	34.37 (6.26)	18–47	.44		.662
NA	18.6 (7.33)	19 (7.7)	10–42	.24		.811
Mood Scales	35.87 (6.52)	36.17 (8.47)	12–48	.18		.861

Note. PT: positivity training; NT: negativity training; SDS: Zung Self-Rating Depression Scale; STAI: Trait measure of the Spielberger State Trait Anxiety Inventory; NEO-FFI: neuroticism scale of the NEO; PA: positive affect scale of the Positive Affect Negative Affect Schedule; NA: negative affect scale of the Positive Affect Negative Affect Schedule; Mood Scales before the training.

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