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Worry and rumination : underlying processes and transdiagnostic characteristics

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Citation

Drost, J. (2014, June 10). *Worry and rumination : underlying processes and transdiagnostic characteristics*. Retrieved from <https://hdl.handle.net/1887/32032>

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Title: Worry and rumination : underlying processes and transdiagnostic characteristics

Issue Date: 2014-06-10

Chapter 5

**The influence of abstract/concrete thinking on social
problem solving in high and low worriers**

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Submitted for publication

Abstract

The reduced concreteness theory (Stöber, 1998) postulates that worry is characterized by an abstract, predominantly verbal, thinking style which interferes with successful emotional processing of threat-related material and impairs social problem solving (SPS). Experiment 1 investigated whether high trait worriers (N = 40) adopt a more abstract thinking style compared to low trait worriers (N = 40) during the phase of solution generation and whether concreteness training improves SPS. Experiment 2 was a replication of the first study (high trait worriers N = 49, low trait worriers N = 48) extended to examine other aspects of SPS related to worry: problem orientation, problem solving style and problem solving confidence. Results did not confirm the reduced concreteness hypothesis but did reveal differences in problem solving orientation, style, and confidence. These results, combined with results from previous studies showing reduced concreteness in the problem analysis phase, suggest that high trait worriers' SPS skills are intact and that impairments lie within the early stages of SPS.

Introduction

Worry, both pathological and non-pathological, has been subject to an extensive debate about its functions, dysfunctions, and underpinning mechanisms. One of the main theories in the field is the Avoidance Theory of worry (Borkovec, Ray, & Stöber, 1998). This theory postulates that worry is a form of cognitive avoidance, which operates via the reduction of aversive imagery with the purpose to avoid somatic anxiety reactions. This process of avoidance however interferes with successful emotional processing of threat related material (Foa & Kozak, 1986) and, thereby, inhibits closure on worry topics, maintaining anxiety/worry. The theory is based upon studies showing that worry is a predominantly verbal thought (rather than imagery-based) activity, and that the percentage of imagery is greatly reduced when engaging in worry instead of a relaxation condition (Borkovec & Inz, 1990; East & Watts, 1994; Freeston, Dugas, & Ladouceur, 1996). Moreover, individuals with Generalized Anxiety Disorder (GAD) report less imagery than non-psychiatric controls both during worry and relaxation (Borkovec & Inz, 1990). In turn, it has been found that verbal thought activity yields significantly less cardiovascular fear responses than imagery (Vrana, Cuthbert, & Lang, 1986) leading to the hypothesis that verbal worry might be an attempt to avoid the physiological sensations that accompany aversive imagery.

However, the avoidance theory does not address the question of how worrying leads to reduced imagery. A possible explanation comes from the Reduced Concreteness theory of worry (Stöber, 1998; Stöber & Borkovec, 2002). This theory posits that the mediator between worrying and reduced imagery is reduced concrete thinking (increased abstract thinking), which is presumed to be characteristic of worry. *Concrete thinking* is defined as "distinct, situationally specific, unequivocal, clear, singular" whereas *abstract thinking* is described as "indistinct, cross-situational, equivocal, unclear, aggregated" (Stöber & Borkovec, 2002, p. 92). Paivio and Marschark (1991) found that the concreteness of words and sentences is related to the quality of imagery and that abstract thinking not only evokes less imagery but also less vivid imagery. Hence, the Reduced Concreteness theory hypothesizes that it is the relatively abstract style of thinking during worry which is responsible for reduced aversive visual imagery, which in turn contributes to the maintenance of worry.

Empirical evidence for a relatively abstract thinking style during worry comes from a series of experiments by Stöber et al. (1996; 2000). These studies revealed that problem elaborations of worry-topics were less concrete than those of non-worry topics and that concreteness showed an inverse linear relation with the level of worry (Stöber, et al., 2000). These findings in nonclinical student samples were extended to a clinical GAD sample. Pre-treatment problem descriptions of GAD patients were less concrete than those of normal controls (Stöber & Borkovec, 2002), consistent with the Reduced Concreteness theory. However, all of these studies focussed on concreteness of problem elaboration or brief worry descriptions during the problem analysis phase. Two recent studies by Goldwin and Behar (2012) and Behar et al. (2012) focussed

on concreteness of thought during periods of idiographic worry. Results were mixed. Although findings confirmed the assertion that worry is characterized by reduced concreteness, only one of the studies found that level of concreteness was related to imagery-based activity.

The focus on concreteness during problem solving is also consistent with another putative function of worry – as an attempted social problem solving (SPS) strategy (e.g. Borkovec, Robinson, Pruzinsky, & Depree, 1983). In its pathological form, worry has been hypothesized to reflect thwarted problem solving (Davey, Hampton, Farrell, & Davidson, 1992; Davey, 1994). Successful problem solving is believed to require a number of elements including an accurate problem analysis, the generation, and then evaluation and implementation of accurate problem solving steps (D’Zurilla & Nezu, 1982). Concrete thinking is a prerequisite for these elements: Concrete problem definitions and well-tailored solutions are indispensable for problem solving success. Although the Reduced Concreteness theory was originally formulated in reference to worry, the considerable similarities and overlap between worry and rumination led Stöber and Borkovec (2002) to hypothesize that the theory also applied to depression. This view was shared by Watkins and Moulds (2005), who examined the effects of inducing abstract versus concrete ruminative thinking prior to solution generation in patients with depression versus never-depressed controls. Before the induction, depressed individuals provided more abstract and less effective solutions than never depressed individuals. Furthermore, relative to the abstract thinking style, the concrete thinking style enhanced problem solving in the depressed patients.

In light of the hypothesis that pathological worry is a thwarted problem solving attempt and the robust observation of reduced concreteness in the problem analysis phase in worriers (Stöber, 1996; Stöber et al., 2000; Stöber & Borkovec, 2002), a logical next step is to investigate the influence of reduced concreteness on the next phase within the problem solving process: i.e., the solution generation phase. Critically, although the reduced concreteness theory predicts that reduced concreteness of thinking during worry will impair problem-solving, this prediction has not yet been directly tested. To date, the only evidence that concreteness of thinking influences problem solving is in patients with depression (Watkins & Baracaia, 2002; Watkins & Moulds, 2005). The current study will therefore provide the first test of this key prediction of the reduced concreteness theory in worry. The present study has two main aims. Firstly, to investigate whether high and low trait worriers differ in the thinking style they adopt during the problem solving phase of solution generation. Secondly, to examine whether inducing a concrete thinking style results in improved problem solving skills relative to an abstract thinking style. Following Watkins and Moulds (2005), we hypothesize that high trait worriers will adopt a relatively abstract thinking style during solution generation and will produce relatively abstract and less effective solutions compared to low trait worriers. Furthermore, we hypothesize that the concreteness training will improve problem solving in high trait worriers relative to abstract thinking.

Experiment 1

Method

Participants and design

A total of 317 students were screened using the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) and the depression subscale of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). Those with a HADS-depression score of 8 or higher and those using anti-depressant medication were excluded. In order to compare a control group with low levels of worry with a group of high levels of worry similar to GAD patients, only students scoring at one of the extreme ends of the PSWQ (bottom/top quartiles) were invited to participate. In total 80 participants were included, 40 in each group. They were randomly allocated to one of the manipulation conditions (abstract versus concrete conditions), resulting in a 2 × 2 factorial between-subject design with 20 participants in each cell.

Materials

Questionnaires

PSWQ

The Penn State Worry Questionnaire (PSWQ; Meyer, et al., 1990) is a commonly used measure of trait worry consisting of 16-items rated on a 5 point Likert scale (1 = not at all typical of me, to 5 = very typical of me). The PSWQ has been proven to be a valid measure of trait worry unaffected by the content of the worry (Davey, 1993; Molina & Borkovec, 1994) with high internal consistency, good test-retest reliability, and unaffected by social desirability (Meyer, et al., 1990). Internal consistency in the present study was high, namely $\alpha = .96$ in the total sample.

HADS

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item self-report questionnaire consisting of two subscales measuring anxiety (7-items) and depression (7-items). Internal consistency, discriminant and concurrent validity, and test-retest reliability are satisfactory (Bjelland, Dahl, Haug, & Neckelmann, 2002; Spinhoven, et al., 1997). In the present study internal consistency (total sample) of HADS-A was $\alpha = .70$ and of HADS-D $\alpha = .69$.

Thinking style measures (VAS)

Visual Analogue Scales (VAS, 100 mm) were used to assess abstractness of thinking style before and after the experimental task (cp Watkins & Teasdale, 2001). One scale measured the *proportion of thoughts concerned with trying to understand, explain, or make sense of things* (not at all – extremely) and the other measured to what extent *thoughts were of a verbal form as opposed to visual images* (completely verbal/not at all visual – not at all verbal/completely visual). Assessment prior to the experimental task referred to thinking ‘right now’ and the second assessment to thinking ‘during the task’.

Manipulation

Unlike Watkins and Moulds (2005) who applied a depression-relevant manipulation that induced abstract/concrete ruminative thinking, the present study used a previously validated manipulation to induce an abstract/concrete thinking style (Watkins, Moberly, & Moulds, 2008). Training material consisted of 15 positive and 15 negatively valenced scenarios; each approximately three sentences in length. Scenarios were balanced for valence to ensure that the training condition was not a mood induction and more importantly, to train participants in applying the thinking style method in both positive and negative situations. Participants were instructed to spend one minute concentrating on each event. In line with Watkins et al. (2008), the order of the written scenarios was randomized with the constraint that there were no more than three scenarios of the same valence presented consecutively.

Participants in the abstract condition were instructed as follows for each scenario: "I would like you to think about why it happened, and to analyze the causes, meanings, and implications of this event." In the concrete condition, participants received the following instruction for each scenario: "I would like you to focus on how it happened, and to imagine in your mind as vividly and concretely as possible a 'movie' of how this event unfolded." Training conditions were not expected to differ in their influence on self-focus as conditions were matched for degree of self-reference.

The main training was preceded by a practice phase during which participants applied their assigned thinking style on the same (negative) practice scenario and described what they were thinking. Where necessary, further feedback and practice were given before the main training started.

Worry Domain – Means-Ends Problem Solving task (WD-MEPS)

The Means Ends Problem Solving task (MEPS) examines social problem solving skills by measuring the ability to conceptualize step-by-step means (strategies) when attempting to achieve a given goal. Participants are presented with a problem situation and asked to find the ideal strategy for overcoming the problem situation and thereby reach a given ending (Marx, Williams, & Claridge, 1992). The MEPS has shown satisfactory internal consistency (from .80 to .84) and construct validity (e.g. Platt & Spivack, 1972, 1975).

In the present study a modified version was used; the Worry Domain-MEPS (WD-MEPS). It is based on four worry domains common in GAD patients: rejection, responsibility, confrontation and relationships. The structure of the scenarios was kept as similar as possible to the original version. A pilot study showed that when conducted in a random student sample ($N = 20$) scores on the original MEPS and WD-MEPS did not differ significantly. To ensure personal relevance which is important for worry in GAD (Stöber, et al., 2000), each individual rated themes of twelve different scenarios (three in each domain) on relevance to their personal situation. The 7 point Likert rating scale ranged from 1 *completely irrelevant* to 7 *completely relevant*. The four scenarios with the highest scores were then selected for the experiment. An example scenario is:

“One day at work your boss announces that pretty soon you are going to take on a quite innovative project. You feel that this will be a rather challenging experience for you, as it concerns a field you are not familiar with. Furthermore, you will be in charge of a sizeable group of colleagues. The story ends with your boss being satisfied with your work. Begin the story after the announcement of the new project.”

The experimental phase was preceded by a practice phase to ensure understanding of the task. Instructions and scenarios were presented in written format and participants were requested to provide written answers. These were scored for the *number of discrete steps* that are effective in enabling them to reach the goal and for *effectiveness of the strategy*. Effectiveness was rated on a 7-point Likert-type scale ranging from 1 (*not at all effective*) to 7 (*extremely effective*) (e.g. Marx, et al., 1992). A solution was considered effective if it maximized positive and minimized negative short- and long-term consequences, both personally and socially (D’Zurilla & Goldfried, 1971). In order to assess the thinking style applied during the task, answers were also rated for how abstract/concrete they were. This was rated on a 5-point Likert scale ranging from 1 (*abstract*) to 5 (*concrete*) (Stöber, et al., 2000). There was moderate to good inter-rater reliability with an independent second judge, both unaware of group or condition (ICC means: .902, ICC effectiveness: .830 and for abstract/concrete ratings the ICC was .687, based on agreement on a random selection of 10% of responses).

Procedure

Participants signed an informed consent and completed the HADS anxiety and depression scale. A practice item and two of the selected WD-MEPS-stories were completed at pre-manipulation followed by VASs measuring thinking style. Participants then received a practice phase of the manipulation task. Once an adequate level of understanding had been reached they worked through either the abstract or concrete thinking style manipulation (their allocated thinking style manipulation). Post- manipulation participants were again presented with VASs measuring thinking style followed by the two remaining WD-MEPS scenarios. The order of the WD-MEPS scenarios presented at pre and post manipulation was pseudo-random with the two most relevant scenarios always divided over pre and post. Participants were debriefed, thanked for their participation and received either course credits or a small payment.

Statistical Analyses

The main hypotheses were tested using: (1) ANCOVA to compare baseline abstract/concreteness scores between high and low worriers; (2) repeated measures ANOVAs investigating if alterations to the thinking style generated the expected changes in problem solving skills. An alpha level of .05 was used for all statistical tests and all analyses were corrected for gender differences (see below). Analyses were conducted using PASW Statistics package 17.0 (SPSS, INC, Chicago, Illinois, 2009).

Table 1: Experiment 1- Means and standard deviations for measures of abstract/concreteness and problem solving skills

Dependent Variable	Time	High trait worriers				Low trait worriers			
		Abstract		Concrete		Abstract		Concrete	
		M	SD	M	SD	M	SD	M	SD
VAS 1	Premanipulation	51.70	26.49	48.35	24.22	53.10	25.32	52.05	27.16
	Postmanipulation	44.30	30.46	59.75	22.75	39.60	25.87	67.40	22.11
VAS 2	Premanipulation	70.15	22.53	59.40	23.39	57.90	25.13	65.30	22.85
	Postmanipulation	79.95	12.54	48.05	20.10	78.45	13.02	57.85	22.38
Concreteness ^a	Premanipulation	2.38	0.58	2.50	0.65	2.28	0.97	2.60	0.62
	Postmanipulation	2.20	0.50	2.45	0.81	1.95	0.54	2.25	0.75
Number of Means ^a	Premanipulation	3.48	1.23	3.70	0.90	3.76	1.08	3.95	1.47
	Postmanipulation	3.05	1.28	3.25	1.19	2.89	0.63	3.24	1.38
Effectiveness ^a	Premanipulation	4.18	0.97	4.33	0.67	4.34	0.98	4.38	1.19
	Postmanipulation	3.79	1.16	3.85	0.99	3.71	0.68	3.81	1.32

VAS 1: *imagery/verbal thinking*; VAS 2: *“trying to understand, explain, or make sense of things”*
^a based on WD-MEPS ratings

Results

Sample Description

The 80 participants selected for participation (see above) consisted of 40 high (PSWQ: $M = 62.92$, $SD = 4.10$) and 40 low (PSWQ: $M = 30.86$, $SD = 4.80$) trait worriers. The scores of the high trait worriers are similar to those reported in clinical samples (e.g. Meyer, et al., 1990; Molina & Borkovec, 1994). As expected, the high trait worry group was characterized by higher scores on the HADS-anxiety, $t(78) = -9.33$, $p < .001$, $d = 2.11$, and HADS-depression scale $t(78) = -3.38$, $p < .01$, $d = .77$. The average age of the sample was 21.2 years ($SD = 3.4$) and 67.5 % was female. The high worry group contained more females than the low worry group ($\chi^2(1) = 5.70$, $p = .02$). No differences in age were found.

Thinking Style Differences Between High versus Low Worriers at Baseline

ANCOVA analyses revealed no significant differences between high and low trait worriers on the VASs "trying to understand, explain, or make sense of things" $F(1, 77) = .48$, $p = .49$ and "imagery vs verbal thinking" $F(1, 77) = .07$, $p = .80$. The WD-MEPS abstract-concrete ratings showed a similar pattern $F(1, 77) = .001$, $p = .97$. There were also no significant effects for Manipulation or the Manipulation \times Worry Group interaction.

Problem Solving Skills at Baseline

Contrary to expectations, the WD-MEPS ratings revealed no significant differences for number of means (low: 3.86 ± 1.28 , high: 3.59 ± 1.07) $F(1, 77) = 1.86$, $p = .177$, nor for effectiveness (low: 4.36 ± 1.07 , high: 4.25 ± 0.82) $F(1, 77) = .84$, $p = .364$. There were also no significant effects for Manipulation or the Manipulation \times Worry Group interaction.

Manipulation Checks

Repeated measures ANOVAs showed a main effect for manipulation regards VAS 1 (imagery/verbal thinking: $F(1, 75) = 5.38$, $p = .023$, $d = 0.53$; VAS 2 (trying to understand, explain or make sense of things: $F(1, 75) = 16.13$, $p < .001$, $d = .91$; and WD-MEPS abstract/concrete: $F(1, 75) = 4.01$, $p = .049$, $d = 0.45$) with the group receiving the concrete training reporting more concrete thoughts than the group receiving the abstract training. In addition significant Time \times Manipulation interaction effects were found for VAS1: $F(1, 75) = 10.01$, $p = .002$ and for VAS 2: $F(1, 75) = 16.76$, $p < .001$. These interactions reflect increases in ratings for the abstract manipulation relative to the concrete manipulation (see Table 1 for details). This interaction effect was however, not found for the WD-MEPS abstract/concrete measure ($p = .652$). Closer inspection of the two manipulation groups using ANCOVA analyses revealed that pre-manipulation the abstract and concrete condition did not differ significantly $F(1, 77) = 1.95$, $p = .167$, whilst there was a trend in the expected direction for the post-manipulation $F(1, 77) = 3.85$, $p = .053$, $d = 0.45$.

Effects of Manipulation on Problem Solving Skills (WD-MEPS)

Repeated measures ANOVAs revealed significant main effects of Time for *Number of Means* $F(1, 75) = 7.94$, $p = .006$, $d = 0.76$ and for *Effectiveness of generated problem*

solutions $F(1, 75) = 7.91, p = .006, d = 0.72$, reflecting decreases on both measures. No other significant main effects or interaction effects were found for number of means (all p 's $> .08$) or effectiveness (all p 's $> .311$).

Discussion

The main focus of the first experiment was to examine the effect of thinking style on problem solving skills. Based on research conducted in the area of depression (Watkins & Moulds, 2005), combined with the predictions of the reduced concreteness theory of worry (e.g. Stöber & Borkovec, 2002), it was predicted that high trait worriers would display worse problem solving skills compared to low trait worriers as a result of their relatively abstract thinking style. Hence, one would expect that making the thinking style of high worriers more concrete would result in enhanced problem solving skills.

Contrary to expectations, baseline scores showed no differences in thinking style between high and low trait worriers. This is surprising considering previous studies revealed differences in thinking style between high-low worriers during the problem analysis phase (Stöber & Borkovec, 2002) and between previously-never depressed groups (Watkins & Moulds, 2005). Results are therefore in need of replication. Baseline problem solving skills did not differ between worry groups either. This would be in line with expectations assuming that the notion of abstract/concrete thinking influencing problem solving is correct. However, an alternative explanation could be that worriers do possess the skills to solve problems but are hindered in other ways such as through their lack of *confidence* in their own problem solving abilities. Although theoretically it is expected that high trait worriers/ persons with GAD possess poorer problem solving skills, actual evidence to support this is limited. Based on his findings, Davey (1994) hinted that the problem solving skills in high worriers appeared to be intact and that lack of confidence seemed to be a bigger problem. However, this was not followed by more elaborate studies confirming this view.

In addition to the non-significant baseline results on problem solving skills, altering the thinking style did not result in the predicted changes in problem solving. Closer examination of the manipulation showed that the effect of the induction was more pronounced in the explicit self-report measures (VASs) than the abstract/concrete ratings of the WD-MEPS task. Considering the latter is a more direct measure of concreteness, the success of the manipulation has to be questioned. The mixed results could be due to social desirability bias on the VASs or could mean that the induction was not strong enough to generate an effect on the WD-MEPS. The manipulation task was identical to the version which was successfully applied in participants with a depressive disorder by Watkins et al. (2008) and thus was a logical choice. However, scenarios referred to loss/reward as opposed to threat/safety themes which are characteristic of anxiety. In addition the WD-MEPS was conducted in a written as opposed to verbal format and this may have resulted in suboptimal task engagement. Furthermore, previous successful manipulations of social problem-solving in depression manipulated thinking style in the context of ruminative self-focus. The cumulative effect of these aspects might have contributed to the lack of results in the problem solving skills measures. Findings should therefore be interpreted with caution.

Experiment 2

Building on the results of the first experiment, the WD-MEPS task was adjusted from a written to a spoken format (in line with the original MEPS) to accommodate easier assessment for the participant. Furthermore the manipulation task which was originally geared towards depression was modified for anxiety themes and strengthened by intensifying the application of the task (see below). Using a similar design as in Experiment 1 we tried to replicate the results of the first experiment.

In addition, the second study expanded the focus from merely problem solving *skills* to other aspects involved in successful problem solving. More emphasis was put on three aspects which could influence successful problem solving and could be impaired by worry: problem orientation, problem solving confidence, and problem solving style. Problem orientation and problem solving style were measured by means of a questionnaire. Problem solving confidence was assessed using VASs at both pre and post manipulation allowing for insight into possible effects of the manipulation on confidence. We expected a positive association of worry with dysfunctional problem solving related measures (e.g., negative problem orientation and problem solving confidence). We further speculated that a concrete thinking style helping participants to clearly envision problem solutions would also make them more confident in the solutions generated.

Method

Participants

Selection criteria were the same as in experiment 1. A total of 400 students were screened. After applying exclusion criteria, the bottom and top quartiles were invited to participate, of which 100 participated: 50 high and 50 low trait worriers. They were randomly allocated to one of the manipulation conditions, resulting in a 2 × 2 factorial between subject design with 25 participants in each cell.

Materials

Questionnaires

PSWQ and HADS

For descriptions see experiment 1.

SPSI-R

The Social Problem-Solving Inventory – Revised (SPSI-R; D’Zurilla, Nezu, & Maydeu-Olivares, 2002) assesses individual’s strengths and weaknesses in their problem-solving abilities. It is a self-report measure consisting of 52 self-statements reflecting either a positive (facilitative) or negative (dysfunctional) cognitive, affective, or behavioural response to real-life problem solving situations. Each item is scored on a 5-point Likert scale ranging from ‘not at all true of me’ to ‘extremely true of me’. The SPSI-R contains five subscales: Positive Problem Orientation (PPO), Negative Problem Orientation (NPO), Rational Problem Solving (RPS), Impulsivity/Carelessness Style (IMP) and Avoidance Style

(AVO). Internal consistency in the present study was adequate: PPO $\alpha = .67$, NPO $\alpha = .93$, RPS $\alpha = .87$, IMP $\alpha = .83$, AVO $\alpha = .89$. Further evidence supporting the reliability and validity of the SPSI-R is reported in D’Zurilla, et al., (2002).

Problem solving confidence (VAS)

Each time after reading a WD-MEPS problem scenario (without end goal), participants were asked how confident they were that they could solve the situation (1), once completed they were asked how confident they were about their provided solution (2) and at the end of the pre and post WD-MEPS assessment their confidence concerning solving future problems (3) was measured. All ratings were done using 100mm VASs (not at all certain – very certain) and repeated before and after the manipulation task.

Experimental Task/Manipulation

Paralleling Experiment 1, the manipulation task by Watkins et al. (2008) was used. However, some alterations in the content and procedure were made to optimize its effect. Themes of the scenarios were modified from reward/loss to safety/threat. In addition, the practice phase was intensified and participants were asked to think out loud during the practice scenarios as well as during scenarios 1, 2, 15, 16, 29 and 30 of the manipulation task in order to check whether the thinking style was applied correctly.

Worry Domain – Means-Ends Problem Solving task (WD-MEPS)

Interrater reliability with an independent second judge was fair to good: ICC means: .705, ICC effectiveness: .794 and for abstract/concrete ratings the ICC was .470, based on agreement on a random selection of 10% of responses.

Procedure

After signing an informed consent participants completed the MCQ and SPSI-R. This was followed by the same procedure as in Experiment 1 with two exceptions: the HADS was now completed at the end of the experiment and problem solving confidence (VASs) was assessed both at the pre and post WD-MEPS task instead of once at the end of the experiment.

Statistical Analyses

Data analyses were similar to Experiment 1, including the application of a .05 alpha level for statistical significance and corrections for gender (see below).

Results

Sample Description

Following the screening of 400 students, 100 of them were selected and tested. Three of the participants were later excluded based on insufficient compliance with the manipulation task. Thus, the final sample consisted of 97 participants: 48 low (PSWQ: $M = 31.65$, $SD = 3.75$) and 49 high trait worriers (PSWQ: $M = 63.61$, $SD = 4.77$). Note

Table 2: Experiment 2 – Differences between high and low trait worriers in problem solving orientation, and style

Questionnaire	High Trait Worry Mean (sd) ^a	Low Trait Worry Mean (sd) ^a	F-value ^b (1, 94)	p-value ^b	Effectsize Cohen's <i>d</i> ^b
SPSI					
PPO	10.6 (3.1)	13.5 (2.2)	22.497	***	1.04
NPO	21.6 (7.3)	9.1 (4.9)	62.123	***	1.73
RPS	44.8 (9.5)	43.9 (10.3)	.304	.583	
IMP	14.6 (6.3)	15.7 (6.0)	.650	.422	
AVO	12.1 (6.0)	9.8 (4.8)	3.815	.054	0.43

ANCOVA's corrected for gender * $p < .05$, ** $p < .01$, *** $p < .001$

Social Problem-Solving Inventory - Revised (SPSI-R) PPO: Positive Problem Orientation, NPO: Negative Problem Orientation, RPS: Rational Problem Solving, IMP: Impulsivity/Carelessness Style, AVO: Avoidance Style

^a unadjusted scores

^b based on EMM + SE

that scores of the high trait worriers are similar to those reported in clinical samples (e.g. Meyer, et al., 1990; Molina & Borkovec, 1994). The average age of the sample was 20.4 years (SD = 2.6) and 71.1 % was female. The high worry group contained more females than the low worry group ($\chi^2(1) = 24.95, p < .001$). As expected the high trait worry group was characterized by higher scores on the HADS-anxiety, $t(95) = -9.02, p < .001, d = 1.85$, and HADS-depression scale $t(94) = -2.14, p = .035, d = .44$.

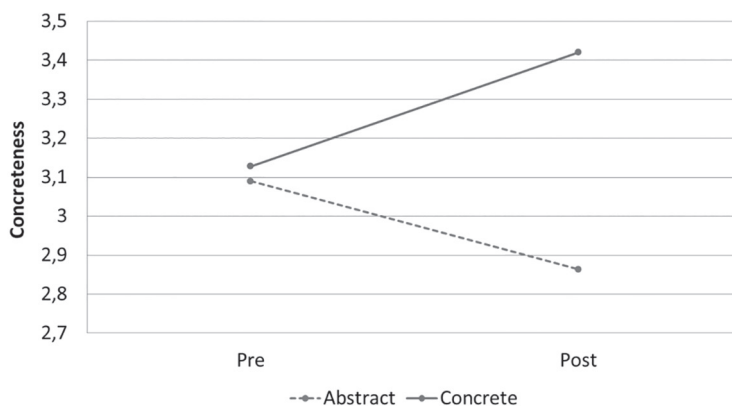
Problem Solving Orientation and Style

Results of the ANCOVA analyses reveal an overall less positive attitude towards problems and the application of a more avoidant problem solving style in high compared to low trait worriers (see Table 2 for details).

Problem Solving Confidence at Baseline (VAS)

Confidence levels just prior to completing the WD-MEPS scenarios showed a trend for a main effect of Group indicating higher confidence levels in low worriers relative to high worriers, $F(1, 94) = 3.31, p = .072$. No significant differences in confidence about provided solutions were found after completion of WD-MEPS scenarios, $F(1, 94) = .13, p = .720$. However when asked at the end of the task to rate their confidence levels concerning their ability to solve future problems, high worriers were significantly less confident than low worriers, $F(1, 94) = 10.10, p < .05$. It has to be noted that there was a significant effect ($p = .005$) of manipulation for 'confidence about provided solutions' indicating that the random allocation to the abstract-concrete training condition did

Figure 1: Experiment 2- Manipulation check based on the WD-MEPS abstract/concrete rating



Note: Scores are based on EMM

not result in comparable groups on this variable. Participants in the abstract condition had higher scores than those allocated to the concrete condition. There were no other significant effects for Manipulation or the Manipulation \times Worry Group interaction.

Thinking Style Differences Between High versus Low Worriers at Baseline

Pre-manipulation WD-MEPS stories were rated on abstractness-concreteness to establish thinking style at baseline. As in experiment 1, ANCOVA analyses revealed no significant differences between high and low trait worriers, $F(1, 94) = .01, p = .92$. There were also no significant effects for Manipulation or the Manipulation \times Worry Group interaction.

Problem Solving Skills at Baseline

Problem solving skills at baseline were examined using ANCOVA analyses. Similar to Experiment 1, the WD-MEPS ratings revealed no significant differences between high and low trait worriers for number of means, $F(1, 94) = .57, p = .452$, nor for effectiveness $F(1, 94) = .53, p = .467$. There were also no significant effects for Manipulation or the Manipulation \times Worry Group interaction.

Manipulation Checks

Repeated measures ANOVAs of scores for thinking style (abstract-concrete WD-MEPS scores) revealed a main effect for manipulation, $F(1, 92) = 9.12, p = .003, d = 0.63$ with the group receiving the concrete training reporting more concrete thoughts than the group receiving the abstract training. In addition there was a significant Time \times Manipulation interaction, $F(1, 92) = 8.13, p = .005$ (see Figure 1). Closer inspection of

the two manipulation groups using ANCOVA analyses revealed that pre-manipulation the abstract and concrete condition did not differ significantly, $F(1, 94) = .11, p = .746$, whilst post-manipulation there was a significant difference with the concrete group scoring higher on concreteness relative to the group receiving the abstract training, $F(1, 94) = 11.86, p < .001, d = 0.71$. These results indicate that the manipulation yielded the intended effect. See Table 3 for an overview of the abstract/concreteness rating scores.

Effects of Manipulation on Problem Solving Skills (WD-MEPS)

Repeated measures ANOVAs of scores for *number of means* revealed a significant main effect of Time $F(1, 92) = 5.70, p = .019, d = 0.39$, reflecting an overall decrease between pre and post manipulation. Further, a marginally significant Time \times Manipulation interaction was found, $F(1, 92) = 3.82, p = .054$. Closer inspection of the two manipulation groups using ANCOVA analyses revealed that pre-manipulation the abstract and concrete condition did not differ significantly, $F(1, 94) = .00, p = .987$. Across time there was a general reduction in problem solving –possibly reflecting boredom or fatigue- which was mitigated by processing style. Post manipulation scores revealed that more means were generated in the concrete versus abstract condition, $F(1, 94) = 4.47, p < .05, d = 0.44$.

For *effectiveness of generated problem solutions* there was a main effect of Time $F(1, 92) = 4.52, p = .036, d = 0.28$, and a marginally significant main effect for worry Group, $F(1, 92) = 3.84, p = .053, d = 0.43$. Contrary to our expectations, high worriers provided more effective solutions than low worriers.

No other significant main or interaction effects were found for number of means (all p 's $> .16$) or effectiveness (all p 's $> .13$).

Problem Solving Confidence (VAS)

Repeated measures ANOVAs showed that ratings for *confidence to solve the presented problem scenario* showed a main effect for Worry Group: low trait worriers were more certain than high trait worriers, $F(1, 92) = 4.51, p = .036, d = 0.47$. Confidence ratings regarding their *provided solutions* revealed a main effect for Manipulation with higher confidence levels in the abstract condition relative to the concrete condition, $F(1, 92) = 10.66, p = .002, d = 0.68$. However this effect was no longer significant ($p = .12$) when analyzing post measurement confidence ratings with baseline scores as a covariate. No main effect of Worry Group was found $F(1, 92) = 0.16, p = .692$. Confidence concerning ability to solve *future* problems demonstrated main effects of Time, $F(1, 92) = 13.883, p < .01, d = 0.35$, reflecting an increase in confidence over time and of Worry Group, $F(1, 92) = 4.67, p = .033, d = 0.48$, with low trait worriers being more confident than high trait worriers. These main effects were secondary to a Time \times Worry Group interaction, $F(1, 92) = 4.88, p = .030$, which reflected confidence levels for low worriers staying stable over time, but confidence increasing over time in the high worry group. See Table 3 for an overview of the problem solving confidence scores.

Table 3: Experiment 2- Means and standard deviations of the WD-MEPS measuring abstract/concreteness and problem solving skills

Dependent Variable	Time	High trait worriers				Low trait worriers			
		Abstract		Concrete		Abstract		Concrete	
		M	SD	M	SD	M	SD	M	SD
Concreteness ^a	Premanipulation	3.27	0.44	3.14	0.55	2.98	0.40	3.04	0.59
	Postmanipulation	2.94	0.58	3.54	1.07	2.90	0.78	3.19	0.73
Number of Means ^a	Premanipulation	3.56	1.19	3.80	1.63	3.69	1.49	3.50	1.27
	Postmanipulation	2.96	1.07	3.70	1.52	2.75	0.91	3.06	1.45
Effectiveness ^a	Premanipulation	4.40	1.02	4.38	1.04	4.42	1.34	4.38	1.11
	Postmanipulation	4.21	1.02	4.58	1.22	3.65	0.90	3.88	1.44
<i>Problem solving confidence:</i>									
Before completion	Premanipulation	62.83	13.98	61.90	13.65	69.50	12.21	68.52	14.20
	Postmanipulation	63.29	13.89	60.08	14.19	69.46	14.21	65.58	12.76
After completion	Premanipulation	75.44	12.51	69.84	12.67	76.13	11.37	67.94	13.23
	Postmanipulation	76.65	9.78	71.00	11.37	78.33	10.55	74.52	13.57
Future problems	Premanipulation	67.08	11.07	67.92	12.61	77.58	9.14	72.13	10.83
	Postmanipulation	74.42	8.46	70.96	14.31	78.54	8.57	76.42	12.18

^a based on WD-MEPS ratings

Discussion

In line with the first experiment, we predicted that (1) high trait worriers would display worse problem solving skills compared to low trait worriers as a result of their relatively abstract thinking style and (2) that making the thinking style of high worriers more concrete would result in enhanced problem solving skills. In addition to examining problem solving skills the second experiment also focussed on other aspects of successful problem solving: problem orientation, problem solving confidence, and problem solving style.

Similar to the first experiment and in contrast with our predictions, there were no differences in thinking style or problem solving skills between high and low trait worriers at baseline. The thinking style manipulation was however successful this time as reflected in the manipulation check. Whilst in the first experiment, changes in thinking style were only evident on self-report measures, the current paradigm was able to transfer the effect onto a more objective measure, namely, the WD-MEPS abstract-concreteness ratings. As expected, the concreteness training had a positive effect on problem solving (number of means) relative to the abstract training, supporting the claim that level of concreteness has a causal effect on problem solving. Effectiveness scores showed a similar pattern but this did not reach significance.

Problem solving confidence baseline scores revealed a general tendency for high trait worriers to be less confident when anticipating problem solving situations. Interestingly, this difference was not observed immediately after completion of the problem solving task. This could imply that low problem solving confidence is a hindrance mainly prior to the generation of a problem solving strategy perhaps resulting in avoidance or termination of dealing with the situation. Once solutions are completed however, their 'normal' confidence levels suggest that they do not dwell on the solutions provided. Whether these confidence levels drop again over time causing high trait worriers to revisit their solutions or reactivate their worry strategy remains to be seen. In general it seems that problem solving skills of high trait worriers are not impaired but that they have other problem solving related aspects which are suboptimal. Besides low problem solving confidence, high worriers possess an overall avoidant problem solving style characterized by passivity and inaction as reflected in their scores on the Avoidance Style subscale of the SPSP-R.

An even more pronounced obstacle to successful problem solving is the dysfunctional problem orientation deployed by high trait worriers. Their relatively low positive problem orientation (PPO) and, in particular, their high negative problem orientation (NPO) scores indicate an overall tendency to appraise problems as threatening as opposed to challenging. This perception of problems might affect problem solving in different ways, such as discouraging the initiation of problem-solving attempts or by increasing anxiety levels and decreasing concentration.

General discussion

These two experiments were designed to address the question of whether thinking style (abstract-concrete) influences problem solving skills in high trait worriers. In line with the reduced concreteness theory (Stöber, 1998; Stöber & Borkovec, 2002), problem solving skills were expected to be impaired in the high trait worry group relative to the low trait worry group, due to the deployment of a relatively abstract thinking style. Amelioration of the latter would therefore logically, and in accordance with results from Watkins and Moulds (2005) in depression, improve problem solving success. Results partially confirmed these expectations.

High trait worriers did *not* report a more abstract thinking style than low trait worriers *nor* poorer problem solving skills. These findings were replicated in the second experiment. Hence, *both* studies failed to replicate Stöber's findings of a more abstract thinking style in high trait worriers compared to low trait worriers (Stöber & Borkovec, 2002). Abstract-concreteness was rated using the same criteria and scale as applied by Stöber and colleagues (Stöber & Borkovec, 2002; Stöber, et al., 2000). The focus lay however on different phases of the problem solving process. Stöber focussed in his series of experiments on the phase of problem analysis. In contrast to Stöber's experiments, the present studies focussed on the step following problem analysis: the generation of solutions. Hence, the conflicting results could be explained by the positioning within the problem solving process. It is possible that worriers adopt a more abstract style of thinking when assessing a problem situation but that they possess the mental flexibility to shift to a more concrete level when explicitly instructed to actively address the problem at hand. Although a plausible option we cannot disregard the possibility that the different results could also be related to the fact that we used different problem scenarios and had a non-clinical sample.

The current results on thinking style and problem solving skills are in contrast with findings in depressed subjects who showed both a more abstract thinking style and poorer problem solving skills than a never-depressed group (Watkins & Moulds, 2005). When comparing the results in depressed subjects to the present findings it appears that the process of abstract ruminative thinking in depression might interfere more with the generation of solutions than inducing an abstract thinking style in anxiety. This methodological difference between inducing a processing style versus manipulating processing style during self-focused rumination may be important in influencing the distinct findings. An alternative explanation could be that depressive rumination interferes more with laboratory studies than does worry. Andrews and Thomson (2009) claim that during laboratory tasks depressive rumination on issues other than those central to the particular study interfere with the ability to perform well on the task at hand. This could lead to the possible premature conclusion that depressed subjects lack problem solving skills. Considering that problem solving skills in high trait worriers seem to be intact this interference does not seem to occur in the present sample.

Our study is not the first to find worriers' problem solving skills to be intact (e.g.

Davey, 1994; Ladouceur, Blais, Freeston, & Dugas, 1998; Marx, et al., 1992). Marx et al. (1992) reported that patients with anxiety disorders were able to produce problem solving strategies which were equally effective as those produced by non-clinical subjects. This idea was further explored in relation to worry by Davey (1994) who, in an analogue student sample, found no relationship between worrying and problem solving ability as assessed on a standard MEPS task. However, although worry level was taken into account, GAD symptomatology was not. Ladouceur et al. (1998) addressed this issue in a questionnaire based assessment revealing that self reported problem solving skills did not vary with either level of GAD symptoms or clinical status. These studies however, used either self-report measures of problem solving ability (questionnaires) or a standard/uniform problem solving task (MEPS) even though personal relevance is believed to be of particular importance in worriers/GAD (Stöber, et al., 2000). The present findings confirm and extend the previous findings by showing that problem solving skills did not differ between high and low trait worriers even when the problem-solving task contained personally relevant topics. Considering these results it is no surprise that the concreteness training task –although successful- did not result in the hypothesized Time × Group × Manipulation interaction.

On the other hand, the second prediction of the current studies –that concreteness training would positively affect problem solving- can largely be confirmed. The concreteness training had a positive effect on problem solving (number of means) relative to the abstract training. This supports the idea that level of concreteness has a causal effect on problem solving. Ratings of effectiveness showed a similar pattern but this did not reach significance. Overall the scores on means and effectiveness as well as the general tendency for scores to drop over time appear to best resemble the pattern found by Watkins and Moulds (2005) in never depressed individuals. With problem solving skills seemingly intact it seems only logical to move away from attempts to further improve these skills and to shift attention to other more promising avenues to improve problem solving success rates.

The second study additionally focused on problem solving confidence, problem solving style and problem orientation. Results showed that high trait worriers tend to appraise problems as threatening as opposed to challenging as reflected in the large effect sizes for differences on both PPO and NPO between groups. These results are in line with previous research on problem orientation in non-clinical populations (e.g. Dugas, Freeston, & Ladouceur, 1997; Dugas, Letarte, Rheaume, Freeston, & Ladouceur, 1995) and in a clinical GAD sample (Ladouceur, et al., 1998). Besides a poor problem orientation compared to low trait worriers, high trait worriers also deploy a dysfunctional problem solving style as indicated by the (near) significant ($p = 0.54$, $d = .43$) differences on the SPSI-R-avoidance subscale. This style is characterized by passivity (waiting for problems to resolve by themselves), procrastination (putting off dealing with problems) and dependency (attempting to shift responsibility for problem-solving to others). Lack of problem solving confidence is an aspect related to poor problem orientation. In the second experiment extra attention was given to this aspect by directly measuring

confidence levels (as opposed to general attitude) at different stages during the problem solving task. The results confirmed a lack of problem solving confidence in high worriers at the time of confrontation with a problem. This is in line with previous studies showing lower problem solving confidence (e.g. Davey, 1994) and poorer problem orientation in high compared to low worriers. Surprisingly, confidence levels normalized straight after the generation of solutions, suggesting it is mainly the phase of anticipation hindering problem solving success. Once participants do overcome the obstacle of perceived threat and low confidence in their own abilities, a subsequent successful problem solving attempt still does not lead to 'normal' confidence levels with regard to solving *future* problems. The latter suggests that their confidence does not generalize easily.

These results are in need of replication. Future research should focus on how confidence levels change, or do not change, in the aftermath of solving a problem: do confidence levels remain similar to those of low trait worriers enabling participants to move on, or do confidence levels drop again possibly motivating participants to revisit the problem and question the solutions they previously provided? Another aspect of social problem solving not addressed by this study is whether worriers experience difficulties at the implementation phase. It is one thing generating solutions but another to actually execute them. In addition to the possible rising anxiety levels during the implementation phase, it also remains to be seen whether high trait worriers are successful executors: Can they transfer their ideas into actions?

The present studies have several limitations. Firstly, these studies are conducted using non-clinical samples. Although PSWQ scores were in the clinical range, it is possible that a clinical GAD status is accompanied by characteristics which are not captured when merely measuring worry levels. On the other hand, as mentioned above, previous research has shown that knowledge of problem solving skills does not vary with GAD symptomatology and clinical GAD status (Ladouceur, et al., 1998). Although this research was questionnaire based, it gives grounds to believe that the current research based on worry levels does resemble results in clinical GAD populations.

Secondly, although scenario selection for the WD-MEPS was based on personal relevance to the participant, they were still hypothetical situations. It is possible that worriers adopt their more abstract way of thinking only when in the midst of an actual real-life personally relevant situation, leaving impaired problem solving undetected in laboratory studies. Inconsistent with this idea are results from a study by Anderson et al. (2009). They found differences between real-life problem solving behaviour and hypothetical MEPS situations to be specific to depressed but not anxious individuals.

Finally, it needs to be noted that inter-rater agreement (ICC) on the abstract/concrete WD-MEPS ratings was moderate especially in the second study. However, there was little variation between the scores of both raters and 2-point differences on the 5-point Likert scale of thinking style were rare (3.1% experiment 1; 2.5% experiment 2).

Overall the results of the present studies were partly in line with the reduced concreteness hypothesis of worry. High trait worriers did not possess more abstract thinking styles when generating solutions; however, increasing levels of concreteness did

improve problem solving. Moreover from the perspective of the impaired social problem solving account of worry results were mixed. Problem solving *skills* were intact, however problem solving confidence, style and orientation revealed patterns characteristic of high trait worriers which could affect the problem solving process. These obstacles appear to lie in the anticipation-analysis phase and not in the phase of solution generation.

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