

The effects of training in concrete versus abstract thinking on imagery thinking, verbal thinking, despondency and metacognitions



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Abstract

The current study compares the effects of a training in concrete thinking versus a training in abstract thinking on the degrees of imagery thinking, verbal thinking, despondency, positive metacognitions and negative metacognitions. Participants (n=41) aged 18 to 29 received instructions to think about 8 hypothetical situations in a concrete or abstract style of thinking in an online training format. The training in thinking style was preceded and followed by a short stress task. Manipulation checks revealed that the training of the particular thinking styles (abstract and concrete) was unsuccessful. Results showed a significant increase in verbal thought following the training in the abstract condition; however, no other significant effects were found. Current findings add to a large body of evidence stating that RNT, characterised by an abstract thinking style, is mainly expressed in verbal thought. A limitation of the current study is that the experimental training version was shortened, which limited effectivity in altering thinking style. Future research should focus on the examination of the long-term effects of a 7-day training in concrete thinking, preferably in a clinical sample.

Keywords: Concrete thinking, Abstract thinking, Level of construal, Metacognitions, Mindfulness, Imagery thinking, Verbal thinking

Introduction

Repetitive negative thinking (RNT) occurs in a wide array of disorders, including affective disorders, anxiety disorders, insomnia and psychosis (Harvey & Watkins, 2004). Harvey and Watkins (2004) in their review proposed RNT as a transdiagnostic process as they found strong evidence for its role in the development and maintenance of multiple disorders. Ehring and Watkins (2008) further substantiated the proposal by finding evidence for heightened levels of RNT in as much as thirteen different disorders. They conclude based on their studies that RNT is characterized by the recurrence, the repetition and the unproductivity of the thoughts. RNT has been identified as a core process in the development and maintenance of symptoms of depression and anxiety (Nolen-Hoeksema, Wisco & Lyubomirsky, 2008; Watkins, 2008). Understanding how repetitive negative thinking plays a role in the development and maintenance of psychopathology and how it can potentially be influenced is of importance to shaping future interventions.

Studies suggest that mindfulness, intentionally bringing non-judgmental and non-reactive attention to one's present experiences (Kabat-Zinn, 1990), is inversely related to forms of RNT such as worry and rumination (Chambers, Lo, & Allen, 2008). Instead of being absorbed in ruminative, elaborative thoughts about the experience and its roots, implications and causes, mindfulness guides attention to the direct experience of events in mind and body (Teasdale, Segal, Williams, & Mark, 1995). Once thoughts and feelings have been acknowledged, attention is guided back to the breath, preventing elaborative processing of the thoughts and feelings (Bishop et al., 2004). Mindfulness-Based Cognitive Therapy has shown to significantly reduce relapse rates of patients with recurrent depressive episodes (Ma & Teasdale, 2004) and to reduce depressive rumination (Ramel, Goldin, Carmona, & McQuaid, 2004). The working mechanisms of mindfulness on RNT have been researched and there is preliminary evidence for multiple factors. The mindfulness facets of non-judging (Desrosiers, Vine, Klemanski, & Nolen-Hoeksema, 2013) and acting with awareness (Evans, & Segerstrom, 2011) were associated with reduced RNT. Another study found that mindfulness not only decreases maladaptive rumination but also increases "adaptive rumination", i.e., concrete thinking (Heeren, & Philippot, 2011).

An interesting theory on the function of RNT and how it is maintained suggests that repetitive negative thinking is a predominantly verbal abstraction process that facilitates regaining a sense of mental control and avoiding emotional mental imagery (Borkovec, Wilkinson, Folensbee, & Lerman, 1983). RNT in this theory serves as an avoidance process

that inhibits emotional processing, which in turn maintains negative affectivity and RNT. Various studies on the characteristics of RNT found that naturally occurring as well as induced RNT tends to manifest itself in the form of verbal thinking contrary to imagery thinking (Borkovec, & Inz, 1990; Watkins, & Baracaia, 2001; Watkins et al., 2005). Mindfulness is thought to reduce RNT by reducing the avoidance of imagery and negative emotions and improving the processing of these images and emotions (Fletcher, & Kabat-Zinn, 1995; Roemer, Salters-Pedneault, & Orsillo, 2006).

In an experimental study on different forms of RNT two levels of construal are described by Watkins, Moberly and Moulds (2008), a higher and lower level of construal. The higher level construals are abstract, over-general, superordinate and decontextualized mental representations that display the basic meaning of events and actions. On the other hand, low level construals are concrete mental representations including subordinate, contextual and incidental details of events and actions. Within the construal level analysis, higher level construals are consistent with the phenomenology of RNT and can be seen as ‘abstract thinking’. Abstract thinking is a verbal-analytical, evaluative approach to thinking about the causes, meanings and consequences of symptoms and feelings. For example, an individual may have had a conflict with their boss as a result of a mistake and proceed to think that the conflict was fully his/her own fault and says something about his/her character. Furthermore, the entire relationship with the boss is ruined and he/she will be fired and fail to find a new job. Lower level construals are inconsistent with the phenomenology of RNT and can be seen as a form of ‘concrete thinking’. Concrete thinking focusses on the factual and perceptual aspects of a situation/experience and directs attention to the experience of events and feelings, similarly to mindfulness. In the same example where an individual had a conflict with their boss as a result of a mistake, the individual may picture the conflict and realize the boss was already agitated over a matter with a different colleague, the individual was tired and distracted at the time of the argument and conclude that the conflict was more the result of the situation than the reaction to his/her mistake alone.

Abstract thinking is proposed to cause some of the negative consequences like impaired problem solving, reduced imagery, and limited emotional processing because it leads to increased levels of cognitive distortions and over-general autobiographical memories (Stöber, 1998; Rimes, & Watkins, 2005). In three subsequent studies Watkins and colleagues (2008) have demonstrated that non-clinical participants trained to acquire a concrete thinking style were less emotionally reactive following failure in an experiment than participants trained to

acquire an abstract thinking style. Emotional reactivity is defined as the change in intensity and quality of affect in reaction to an emotional event. For example, a shift in despondency following a failure (Wilson, MacLeod, Mathews, & Rutherford, 2006). Experimental studies found that the induction of rumination increases negative thinking, dysphoric mood and impairs problem solving skills, but has no effect when participants were not already dysphoric (Lyubomirsky, & Nolen-Hoeksema, 1995; Nolen-Hoeksema, & Morrow, 1993). These findings suggest that having a negative emotional response to a stressful situation further increases negative affect and negative thinking, whilst rumination will have no impact when having no negative emotional response to a situation. Another study by Watkins, Baeyens, and Read (2009) was conducted where dysphoric participants were trained in a one-week program to adopt a more concrete thinking style. It was found that the training significantly reduced emotional disturbance, rumination, and self-criticism and increased concreteness-of-problem descriptions. Results of several experimental studies showed voluntarily recalling emotional events in a concrete thinking style produces less emotional responses than in an abstract thinking style (Neumann, & Philippot, 2007; Philippot, Baeyens, & Douilliez, 2006).

In sum, studies have shown that RNT is a transdiagnostic process prevalent in many disorders. It is theorized to be a mechanism used to avoid emotional mental imagery through an abstract verbal loop. Research has found two thinking modes within RNT being an abstract thinking mode and a concrete thinking mode. Training participants to adopt the concrete thinking mode diminishes many negative consequences of RNT, like impaired problem solving, limited emotional processing and increased anxiety or depression symptoms. Mindfulness is known to reduce RNT and increase concrete thinking. It has been theorized that mindfulness reduces RNT through reducing the avoidance of mental imagery. Integrating the above it can be hypothesized that mindfulness stimulates the shift from an abstract processing mode to a concrete processing mode by stimulating thinking in imagery. The present study seeks to further elucidate this notion and through it potentially improve mindfulness interventions.

The study aims to further investigate the working mechanisms of the concrete processing mode of mindfulness in reducing RNT and will focus on the role of thinking in imagery. Therefore, the research question concerning the working mechanism of the concrete thinking mode of mindfulness in reducing RNT is: Does concrete thinking lead to an increase in thinking in images compared to abstract thinking? Complimentary to this question the role of verbal thinking will be investigated: Does abstract thinking lead to an increase in verbal thinking?

Adopting a concrete processing mode has been shown to reduce emotional reactivity in the form of despondency following failure. To broaden the understanding of the concrete thinking mode, the relationship between despondency and concrete thinking following stressful events will be investigated. The following research question will be investigated: Does a training in concrete thinking lead to a decrease in despondency following a stress task compared to a training in abstract thinking?

Furthermore, this study aims to explore the influence of thinking style on metacognitive beliefs of RNT. People that ruminate will often state that they are trying to understand or solve their feelings and problems (Papageorgiou & Wells, 2001). In the metacognitive model proposed by Wells (1995), RNT is instigated by positive metacognitive beliefs, such as RNT being beneficial to problem solving; whilst positive metacognitive beliefs on worrying can turn into negative metacognitive beliefs, for instance RNT being harmful and uncontrollable, which worsens the perceived threat of worrying and thereby increases RNT (McEvoy, Moulds, & Mahoney, 2013). Initially, RNT is utilized as a coping mechanism in order to regulate mood or emotions (Papageorgiou & Wells, 2001). The positive meta-beliefs substantiate the perception of RNT as an effective coping mechanism to solve problems. In the context of dysphoria however, rumination interferes with problem solving (Watkins et al., 2008). In cognitive behavior therapy (CBT) one of the ways to alter cognition and beliefs is implicitly through behavioral activation. Watkins (2008) in his review states that mindfulness may also implicitly alter cognitions and beliefs through changing mental behavior. In light of the present research, the effect of an abstract versus a concrete processing mode on metacognitions on RNT will be examined. Training participants to conduct a more concrete thinking style may implicitly alter their metacognitions on RNT to be more positive than training an abstract thinking style. To date, the influence of a training in concrete thinking on metabeliefs has not yet been examined which the present study seeks to pioneer.

Method

Participants

The study sample consisted of 41 non-clinical adolescents aged 18-29, of which 24 females and 17 males. All levels of education were present in the study: ranging from high school to university education. X²-tests showed that the abstract and concrete condition did not differ on demographic variables such as gender, age category and education. Table 1 displays descriptive data and test statistics. The present study was conducted in Dutch and therefore only included Dutch speaking participants. There was one exclusion criterium: participants could not have a

current diagnosis of any psychological disorder other than attention deficit hyperactivity disorder.

Recruitment procedure

Participant were recruited through an online study database of Utrecht University and word of mouth through two researchers. Recruitment lasted for a total of 45 days. There was no selection of participants (apart from the one exclusion criterion) and anyone that met the criteria and was willing to join was allowed to participate. Participants were not fully informed about the purpose; they were briefed online that the research focused on the effect of thinking styles on the processing of stressful events. Prior to the research, participants had to fill in an online written consent and declare to not have a current psychological disorder.

Table 1

Descriptive statistics and test statistics of demographic data of participants

Variables	Total sample n=41	Concrete n=23	Abstract n=18	X ² (df), <i>p</i>
Gender (%)	58.5% female. 41.5% male	46.5% female 43.5% male	46.5% female 43.5% male	0.09 (1) 0.77
Age (%)	18-19 – 2.4% 20-21 – 7.3% 22-23 – 14.6% 24-25 – 36.6% 26-27 – 26.8% 28-29 – 12.2%	18-19 – 4.3% 20-21 – 8.7% 22-23 – 17.4% 24-25 – 39.1% 26-27 – 17.4% 28-29 – 13.0%	18-19 – 0% 20-21 – 5.6% 22-23 – 11.1% 24-25 – 33.3% 26-27 – 38.9% 28-29 – 11.1%	3.05 (5), 0.69
Educational level (%)	HAVO – 14.6% VWO – 9.8% MBO – 12.2% HBO – 17.1% WO – 46.3%	HAVO – 5.6% VWO – 11.1% MBO – 5.6% HBO – 27.8% WO – 50.0%	HAVO – 21.7% VWO – 8.7% MBO – 17.4% HBO - 8.7% WO - 43.5%	5.27 (4), 0.26

Note. Concrete=concrete condition; Abstract=abstract condition; HAVO= Higher general secondary education, VWO=Pre-university education, MBO= Intermediate vocational education, HBO= Higher vocational education, WO= University

Experimental procedure

The study has a mixed design with two experimental conditions: the abstract training condition (ATC) and the concrete training condition (CTC). A repeated measures mixed approach was used to asses changes in verbal thinking, imagery thinking, despondency, positive metacognitions and negative metacognitions over four time points. The baseline measurement (T1) took place at the start of the experiment prior to stress induction; the second measurement (T2) was after the stress induction and before the training phase; the third measurement (T3)

was after the training and before the second stress induction; the final measurement was after the second stress induction (T4).

Materials

Metacognitions Questionnaire 30 (MCQ-30; Wells, & Cartwright-Hatton, 2004). To measure individual differences in metacognitive beliefs, judgements and monitoring tendencies the MCQ-30 was used. It is a 30 item, self-report questionnaire with a 4-point Likert scale ranging from 1 (do not agree), 2 (agree slightly), 3 (agree moderately), and 4 (agree very much). The MCQ-30 has a five-factor structure containing cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability of thoughts and danger, and beliefs about need to control thoughts. In the present study, positive beliefs about worry (example item: ‘worrying helps me to solve problems’) and negative beliefs about uncontrollability of thoughts and danger (example item: ‘I could make myself sick with worrying’) will be used. The MCQ-30 has good internal consistency and convergent validity, and acceptable to good test–retest reliability. See Appendix 1 for the full questionnaire.

Stress tasks. Two stress tasks were developed as mild stress inductors. The task comprises of a written text describing a stressful situation. The first stressful situation is getting a flat tire on a country road in the rain, whilst the second describes a situation where you are moving houses and accidentally lock yourself out the house. Instructions were kept simple and open. Participants were asked to think about the situations for one minute each. For the full texts see Appendix 2.

Verbal thinking measure. To measure the degree of verbal thinking, a visual analogue scale was used on which participants indicated their percentage of verbal thinking during the tasks from 0 (not at all) to 100 (completely). See Appendix 3.

Imagery thinking measure. To measure the degree of imagery-based thinking, a visual analogue scale was used on which participants indicated their percentage of imagery-based thinking during the tasks from 0 (not at all) to 100 (completely). See Appendix 3.

Mood measure. To measure despondency, a visual analogue scale was used on which participants rated their despondency at the moment from 0 (not at all) to 100 (completely). See Appendix 3.

Level-of-construal training conditions. This will include a selection of four positive and four negative written scenarios, each about 3 sentences long, from the training as developed by Watkins, Moberly and Moulds (2008). An example of a negative scenario is as follows:

You have arranged a weekend away with a group of four old school friends, and have been looking forward to it for several months. The day before you are due to leave, two of the friends suddenly cancel on you without giving a clear reason. On hearing this, the remaining friend then also tells you that she would prefer not to come along.

An example of a positive scenario is as follows:

Today is your graduation ceremony. You enjoyed your studies and did well at university, so you are looking forward to having your achievements recognized. You are also looking forward to celebrating your graduation with your classmates, who you felt very supported by throughout your time at university.

Participants performed the training phase online individually. In total eight scenarios were displayed. Participants were randomly allocated to either the concrete thinking condition (CTC) or abstract thinking condition (ATC). For the first six scenarios, participants were asked to simply read through the scenario given an instruction corresponding to their condition. In the CTC participants were instructed as follows for each scenario: “You have one minute to think about this 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.” In the ATC participants were instructed as follows for each situation: “You have one minute to think about this scenario. I would like you to think about why it happened, and to analyze the causes, meanings, and implications of this event.” Events of positive and negative valence alternated in both conditions. After the six scenarios, participants were shown two more scenarios. To the instructions of both conditions the following was added: ‘We ask you to describe your thought process in a maximum of 3/4 lines. You will have 2 minutes to do so.’ A text box was displayed below the scenarios for participants to write down their thoughts. The texts were used for the manipulation check. See Appendix 4 for the full training.

Qualitative Manipulation Check (Observer-Rated VAS)

Participants were asked to describe their thought process in accordance with their condition in 3-4 sentences for two of the situations of the level-of-construal training conditions. The resulting short texts were rated by two independent observers (acquaintances of the researcher)

who were blind to condition. The observers were briefed and rated the texts according to a short form (see Appendix 2). Observers rated the correspondence of the written text to the abstract and concrete condition by giving a 0-100 score in an excel document ('Indicate the extent to which you think the text fits the [abstract/concrete] condition'). Likewise, observers were asked to indicate the degree of imagery and verbal thinking by assigning a 0-100 score in an excel document ('To what extent do the subject's thoughts consist of [images/words]?'). It was noted that texts could reflect the abstract and concrete condition at the same time and observers were asked to rate the degrees independently. Lastly, a forced choice between either the abstract or concrete condition was included for observers to pick ('If I really have to choose one, this text belongs to the next condition: abstract/concrete'). See Appendix 5 for the qualitative manipulation check.

Procedure

The entire experiment was administered online, through the Qualtrics program. Participants received a link through email. First, participants filled in the MCQ-30. Then participants were asked to concentrate on the first stress task. After, they filled in the verbal thinking, imagery thinking and despondency scales. This way, the natural tendency to think in words and images is measured in response to a stressor. Participants were then randomly allocated to one of two conditions (abstract vs concrete thinking) of the level-of-construal training as developed by Watkins et al. (2008). There were six hypothetical situations where participants were instructed to reflect on a given situation for one minute. In the ATC participants were asked to think about the causes, meanings and consequences of their symptoms and feelings. In the CTC participants were asked to focus on the factual and perceptual aspects of a situation/experience and to direct their attention to the experience of symptoms and feelings. Then two more situations were given where participants had two minutes to reflect and write down their thoughts in a text box with instructions concordant with the training condition. After the eight hypothetical situations, participants filled

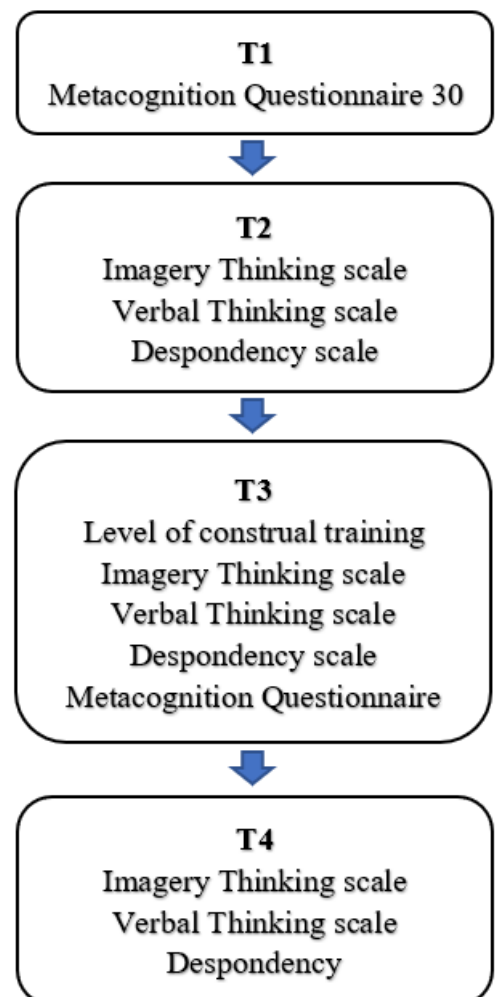


Figure 1. Experimental procedure

in the verbal thinking, imagery thinking and despondency scale. The MCQ-30 was then filled in for a second time. This was followed by the second stress task with no specific instructions on thinking style this time. Lastly, participants filled in the verbal thinking, imagery thinking and despondency scale one more time. For a concise overview of the procedure see Figure 1.

Design and statistical analysis

There was a considerable dropout rate during research. Out of 72 started surveys there were only 41 that completed the study. The far majority of the drop-out quit during the training phase; therefore, data of the drop-outs were not included in the analyses. There was missing data for one participant, though it is unclear why the data is missing as the forced answering option in Qualtrics was active. The data from this participant is included since only the MCQ-30 was missing from the file and the training was completed. All analyses were conducted in SPSS. To examine the effect of the training on the rates of imagery thinking, verbal thinking and despondency repeated measures GLM's were conducted with imagery thinking, verbal thinking and despondency as dependent variables and the condition as the independent variable. Post hoc testing was done using paired sample T-Tests. To explore the effect of the training on positive and negative metacognition repeated measures GLM's were used, with positive and negative metacognition as dependent variables and condition as independent variable. To test the hypotheses (i.e., changes between conditions over time), the interaction between condition and time was included in the models (note: main effects were not of interest and are therefore not reported). Regarding the manipulation check, to assess the level of correspondence between raters on degrees of verbal thinking, imagery thinking, abstractness and concreteness of thoughts in the texts, intraclass correlation coefficients were calculated. To assess inter-rater reliability concerning the recognizing of conditions between raters and correspondence of rated condition with actual condition for each rater individually, Cohen's kappa coefficients were manually calculated.

Results

Outliers and Normality

Outliers were checked through z-scores for all variables. No outliers ($z > 3.29$) were found in any of the variables. Skewness and kurtosis values were checked and values for all variables were within an acceptable range (-1.5 to $+1.5$).

Qualitative manipulation check (Observer-Rated)

Qualitative data shows that the manipulation has at least partly failed. In recognizing the actual condition both observers scored slightly above chance (54% and 56% correct). The concrete condition was seemingly easier to recognize (65% and 67% correct) than the abstract condition (39% and 44% correct). Inter-rater reliability was found to be substantial ($k=.78$). In rating the texts related to the abstract training, observers rated the texts to be corresponding more to the concrete condition ($M=56.7$, $SD=41.3$) than the abstract condition ($M= 43.3$, $SD= 41.5$) on a 100-point scale. In rating the texts related to the concrete training, observers rated the texts to be more resembling of the concrete condition ($M=63.9$, $SD=38.9$) than the abstract condition ($M=36.1$, $SD=34.7$) on a 100-point scale. The intraclass correlation coefficients were high for the degrees of texts belonging to either the concrete or abstract condition ($ICCs=0.85/0.87$), indicating excellent agreement between observers. In rating the degree of imagery thinking within a written text, observers noted no difference between the abstract ($M=50.4$, $SD=28.2$) and concrete condition ($M=50.4$, $SD=28.8$). Likewise, in rating the degree of verbal thinking no difference is no difference is reported between the abstract ($M=49.4$, $SD=28.5$) and concrete condition ($M=49.3$, $SD=29.0$). In the extent of the written texts consisting of imagery thinking or verbal thinking, agreement between observers was poor ($ICCs=0.41/0.46$).

Table 2. Group differences on imagery thinking, verbal thinking, despondency, positive metacognition and negative metacognition

Variable	Condition			t ² -(df), p
	Total (n=41) M (SD)	Concrete (n=23) M (SD)	Abstract (n=18) M (SD)	
Imagery Thinking T2	66.32 (22.81)	65.35 (5.05)	67.56 (5.06)	.30 (39), .76
Imagery Thinking T3	65.76 (22.45)	67.78 (3.78)	63.17 (6.45)	-.65 (39), .52
Imagery Thinking T4	66.05 (21.98)	66.35 (4.68)	65.67 (5.20)	-.10 (39), .92
Verbal Thinking T2	44.41 (24.32)	46.87 (4.80)	41.28 (6.18)	-.73 (39), .47
Verbal Thinking T3	57.00 (26.25)	51.96 (5.76)	63.44 (5.55)	1.41 (39), .17
Verbal Thinking T4	48.88 (25.29)	44.17 (5.76)	54.89 (5.00)	1.36 (39), .18
Despondency T2	23.20 (23.39)	21.52 (4.64)	25.33 (5.96)	.51 (39), .61
Despondency T3	25.80 (25.67)	26.35 (5.67)	25.11 (5.74)	-.15 (39), .88
Despondency T4	26.54 (23.77)	29.39 (5.27)	22.89 (5.16)	-.87 (39), .39
Pos. Metacognitions T1	10.23 (4.20) *	10.27 (0.89) **	10.17 (1.03)	-.08 (38), .94
Pos. Metacognitions T3	10.20 (3.88) *	10.22 (0.80) **	10.17 (0.97)	-.05 (38), .96
Neg. Metacognitions T1	12.98 (4.73) *	13.41 (1.00) **	12.44 (1.15)	-.64 (38), .53
Neg. Metacognitions T3	12.10 (4.73) *	12.32 (1.02) **	11.83 (1.13)	-.32 (38), .75

* n=40, ** n= 22. Raw untransformed means are reported. T1=baseline, T2=post stress task 1, T3=post-training, T4=post stress task 2, Concrete=concrete condition; Abstract=abstract condition

Randomization check

There were no significant differences between conditions on demographic variables (see Table 1) or T2 outcome variables (see Table 2).

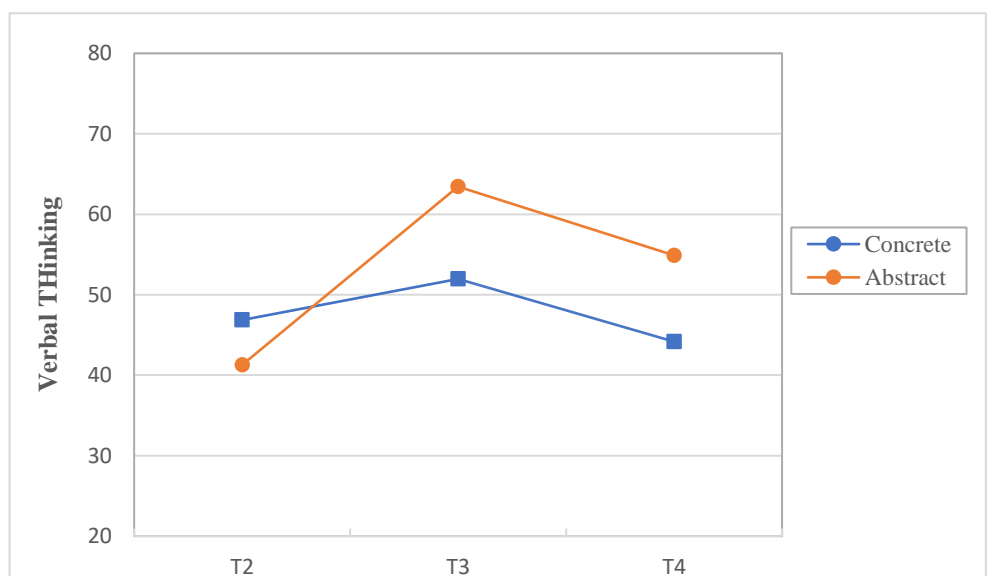
Changes in imagery thinking

Mauchly's test indicated that the assumption of sphericity had been violated $\chi^2(2) = 12.59, p = .00$, therefore Greenhouse-Geisser corrected tests are reported ($\epsilon = .78$). The results show that the level of imagery thinking did not differ between conditions over time significantly, $F(1.56, 60.84) = .63, p = .50$.

Increase in verbal thinking

The assumption of sphericity was not met through Mauchly's test $\chi^2(2) = 13.58, p = .00$, thus Greenhouse-Geisser corrected tests are reported ($\epsilon = .77$). The level of verbal thinking is significantly different between conditions over time, $F(1.54, 59.98) = 4.52, p = .02$. Post hoc within condition testing showed no significant difference between T2 and T3 verbal thinking in the abstract condition, $t(17) = -1.71, p = .11$ (2-tailed) or the concrete condition $t(22) = 1.37, p = .18$ (2-tailed). Between T2 and T4 a significant difference was found in the abstract condition on verbal thinking, $t(17) = -2.53, p = .02$ (2-tailed), but not in the concrete condition $t(22) = 1.52, p = .14$ (2-tailed). This indicates that in the abstract condition there is a significant increase in verbal thinking from baseline to the moment after the second stress task. See Figure 1 for a depiction of the results. There was no significant difference between T3 and T4 in the abstract, $t(17) = .06, p = .95$ (2-tailed) or concrete condition, $t(22) = -.05, p = .96$ (2-tailed).

Figure 1. Mean course of verbal thinking per condition. T2=post stress task 1, T3=post-training, T4=post stress task 2, Concrete=concrete thinking training, abstract= abstract thinking training.



Despondency

Mauchly's test indicated that the assumption of sphericity had been violated $\chi^2(2) = 21.45, p = .00$, therefore Greenhouse-Geisser corrected tests are reported ($\epsilon = .70$). The results show that the level of despondency was not significantly affected by condition over time, $F(1.40, 54.49) = 2.26, p = .13$.

Positive and negative metacognition

No significant effect of the condition over time was found on positive metacognition, $F(1, 38) = .00, p = .95$ or negative metacognition, $F(1, 38) = .67, p = .42$.

Discussion

The main aim of the present study was to investigate whether a shortened training in concrete thinking or abstract thinking would have an effect on imagery thinking, verbal thinking, despondency, positive metacognitions and negative metacognitions. The study can add to the knowledge of the working mechanisms of mindfulness interventions. Before discussing the results, it is important to note that whereas the randomisation check succeeded, there are some doubts on the effectivity of the training in inducing thinking styles. Although observers showed a relatively high degree of agreement, their forced choice rating showed a recognition of condition only slightly above chance. Also, they rated the abstract texts to be more concordant with the concrete condition and their ratings reflected no notable difference in imagery thinking or abstract thinking between conditions. However, this could also be due to the nature of the manipulation check using qualitative data of written texts, see limitations section in this discussion.

Results show that a short training in concrete thinking does not lead to an increase in imagery thinking relative to a training in abstract thinking. This is contrast with theory that hypothesizes that mindfulness diminishes RNT through reducing the avoidance of mental imagery (Fletcher, & Kabat-Zinn, 1995; Roemer et al. 2006). One possible explanation for the lack of effect may be that participants in this healthy sample had relatively low degrees of RNT and therefore were not prone to avoiding emotional mental imagery. A short training in concrete thinking may therefore not elicit more imagery thinking since little is avoided generally. Another explanation is that mindfulness works not through increasing the degree of imagery thinking but rather through improving the concreteness of thoughts. In a one-week training program where participants were stimulated to adopt a more concrete thinking style, it was found that participants had increased concreteness of problem descriptions (Watkins et al.,

2009). Low level construals focus on direct, concrete experience and more specific, detailed representations of the self and situations (Rimes & Watkins, 2005). There is empirical evidence that supports the notion that mindfulness promotes low level of construal processing and increases the capacity to recall emotional events in specific detail (Heeren et al. 2009). Future studies should focus on the role of imagery in low level construal processing.

It was found that a short training in abstract thinking increases verbal thinking relative to a training in concrete thinking. This means that whilst thinking about a stressor, adults trained to analyse the causes, meanings, and implications of an event report a higher degree of verbally worded thoughts. This finding was expected and adds to a large body of research supporting this notion (e.g. Borkovec & Inz, 1990; Watkins & Baracaia, 2001; Watkins et al., 2005). Indirectly, this is also evidence for the avoidance hypothesis and the role of emotional imagery.

There were no changes in despondency over time between the two conditions, indicating that a short training in abstract or concrete thinking does not impact emotional reactivity following a stressful event. This is in contrast with the study conducted by Watkins, et al (2008) who did find an effect of condition on emotional reactivity following a stress task. However, the stress task employed in the Watkins et al (2008) study included an experience of failure contrary to the present study which focused on a hypothetical situation. The lack of effect may be due to the stress inductor not being stressful to all participants. A conscious decision was made to use a standardized mild stressful situation instead of participants thinking of a personal stressful situation. In case of a personal stressful situation, it would have been likely for participants to have already formulated a style of processing the situation. Hence, an enduring effect of the training would have been less detectable. Furthermore, personal stressful situations may stir up heavy emotions and since the study was conducted online researchers would not have been there to safeguard any participant's wellbeing when necessary. The use of a stress task that also includes failure may find reduced emotional reactivity following a training in concrete thinking, as failure is known to induce RNT (Wilson et al., 2006). Furthermore, previous studies found RNT to only increase negative thinking and dysphoric mood when participants were already dysphoric prior to induction. In the present sample despondency scores were relatively low for all participants and the measurement scale that was used has been previously found to be a reliable and sensitive self-report measure of negative mood (Watkins & Teasdale, 2001, 2004). If the study was conducted in a more dysphoric sample, an effect of RNT might be found on despondency.

No effects of the training on positive or negative metacognitions concerning RNT were found. This may be explained by the duration of the training: it was shortened for feasibility purposes and a short training may not be long enough to cause changes in metacognition. Targeting metacognitions in therapy is normally a goal for multiple sessions. Another explanation is that the manipulation failed in the concrete condition. Since mental activity did not change, it is unlikely that the metacognitions altered. Whilst this was too ambitious for the present study it may still prove interesting for future studies in the effects of a 7-day training in CT (Watkins et al. 2009).

There are also some limitations of the study to be noted. The *level of construal training* as developed by Watkins et al. (2008) was altered in the present study. The training is supposed to be partly given by a qualified psychologist in a lab setting. Upon personally asking the original authors to use the training with students, they stated it was not allowed for untrained psychologists to deploy the original training. To use an altered version of the training, it was explicitly stated that the training should be transformed into a written text that participants would read through individually. Thus, there was no way of checking whether participants understood the instructions correctly prior to training. Feedback given by some of the participants was that the instructions were hard to follow and they were unsure of what to do throughout the research. The instructions being ambiguous to participants clearly does not support a successful manipulation. Also, the original training consists of 30 scenarios whereas the present study only uses eight. The choice was made to use only eight scenarios to prevent participants from becoming bored with the research and drifting off in their thoughts. An initial trial was run with sixteen scenarios, but this seemed like too long of a time to stay focused. The present study used qualitative data of written texts as a manipulation check. Despite substantial inter-reliability and high intraclass correlation coefficients, no effects were found. These results may indicate that the natural tendency for people to think abstractly or concretely is stronger than the training they received. However, it could also mean that written texts may not capture the thinking process entirely and using texts as a manipulation check is more prone to not finding an effect. In future research it is recommended to use quantitative self-report measures as a more objective means to establish the manipulation check.

Summarizing, this study contributes to the notion that engaging in RNT increases verbal thinking. Inducing RNT in participants has effects that will remain at least over a short period of time on verbal thinking, however, not in mood or metacognitions. Current results may partly and indirectly support the avoidance hypothesis, however, clearly more research should be

conducted on this topic. The shortened training may not have been effective in inducing thinking style; this shortened experimental format should therefore be abandoned. Future research should focus on using a multiday training in concrete thinking, preferably using trained psychologists to deploy it, to further investigate the role of imagery thinking, verbal thinking and metacognitions in concrete thinking. Using a clinical sample where levels of RNT are heightened can augment the understanding of the avoidance of emotional mental imagery function of RNT as described by Borkovec and colleagues (1983). It is recommended that future studies also use a control condition to better distinguish the effects of the training. Implementing all of the above may yield different results with regard to the degree of imagery, concreteness of thoughts and metacognitions on RNT.

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Appendix 1. MCQ-30 (Wells, & Cartwright-Hatton, 2004)

	Disagree	Slightly agree	Moderately agree	Strongly agree
I do not trust my memory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a poor memory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have little confidence in my memory for actions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have little confidence in my memory for places	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have little confidence in my memory for words and names	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My memory can mislead me sometimes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying helps me to get things sorted in my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying helps me cope	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to worry in order to work well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying helps me to solve problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to worry in order to remain organised	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying helps me to avoid problems in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am constantly aware of my thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I pay close attention to how my mind works	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think a lot about my thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Disagree	Slightly agree	Moderately agree	Strongly agree
I constantly examine my thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I monitor my thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am aware of the way that my mind works when I am thinking through a problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My worrying thoughts persist, no matter how I try to stop them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I start worrying I cannot stop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could make myself sick with worrying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I cannot ignore my worrying thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My worrying could make me go mad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My worrying is dangerous for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could not control my thoughts, I would not be able to function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not being able to control my thoughts is a sign of weakness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I should be in control of my thoughts all of the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is bad to think certain thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I did not control a worrying thought and then it happened, it would be my fault	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be punished for not controlling certain thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix 2. Stress task 1 and 2.

Stress task 1

Imagine riding your bicycle on a long country road several kilometres from the nearest town. It is pouring rain as you're trying to get home as quickly as possible. As you're cycling along you hear a loud bang and notice that your front tire exploded. You won't be able to continue riding your bike and will have to walk a couple of kilometres home.

Stress task 2

You are moving all your belongings from one house to the next. A couple of your friends took free off work for you. Whilst carrying stuff to the car the front door locks behind you and you realise your housekeys are still inside the house. You don't have any spare keys and the landlord is on a two-hour drive from your house. You can't continue moving until the situation is resolved.

Appendix 3. VAS of imagery thinking, verbal thinking and despondency

Imagery thinking VAS.

When you were thinking just now, how much were you thinking in imagery (like seeing what you think)?

0% _____ 100%
Never All the time

Verbal thinking VAS.

When you were thinking just now, how much were you thinking in words, so that your thoughts consist of sentences and words (as if you were talking to yourself)?

0% _____ 100%
Never All the time

Despondency VAS.

To what extent do you feel hopeless right now?

0% _____ 100%
Not at all Very much

Appendix 4. *Level of construal training, Watkins et al. (2009).*

*Note. All training scenarios used in the present study are written in cursive and displayed in the same sequence as the experiment. Scenarios with an * were used for the written text analysis.*

Practise task – ‘Let’s start with a practise of the task we’ll be doing today.’

- describe one practise scenario (read to participant)
- give instructions
- participant imagines scenario for 1 minute
- clarify adherence to instructions and check that in right mode
- if not in right mode, review practise scenario task instructions and repeat

Practise scenario:

“The last two weeks you notice that you have been feeling tired and worn out. It seems as though you always have too much to do, leaving little time to relax and unwind. Today, you struggle to get out of bed and get to work and find it really hard to concentrate. Your boss asks you a question and you just go blank.”

Abstract:

‘I would now like you to spend a minute concentrating on this event. Specifically, I would like you to think about why it happened, and to analyse the causes, meanings and implications of this event.’ ‘I would now like you to tell me what went through your mind during that minute.’

Check whether verbal, why questions, meaning, implications. If not then go over the example of the friend and questions, then repeat the boss scenario. Wait for initial response and if necessary, prompt with: Were you thinking about the causes and implications of the event? Can you tell me about those?’

Concrete:

‘I would now like you to spend a minute concentrating on this event. Specifically, 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.’ ‘I would now like you to tell me what went through your mind during that minute.’ Wait for initial response and if necessary, prompt with: ‘Were you picturing a scene? Can you describe it to me?’

Training task

Abstract:

‘We will now begin today’s task. I am going to describe to you a number of scenarios. As with the practise item, throughout this task I would like you to spend a minute concentrating on each scenario. Specifically, I would like you to think about why the event happened, and to analyse the causes, meanings and implications of each event.’

Concrete:

‘We will now begin today’s task. I am going to describe to you a number of scenarios. As with the practise item, throughout this task I would like you to spend a minute concentrating on each scenario. Specifically, I would like you to focus on how the event happened, and to imagine in your mind as vividly and concretely as possible a ‘movie’ of how each event unfolded.’

- 30 scenarios (15 negative, 15 positive) presented
- one minute thinking about each
- repeat instructions with each scenario – as for practise instructions
- no more than 3 of one valence presented consecutively

Abstract:

‘I would now like you to spend a minute concentrating on this event. Specifically, I would like you to think about why it happened, and to analyse the causes, meanings and implications of this event.’

Concrete:

‘I would now like you to spend a minute concentrating on this event. Specifically, 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.’

Set of scenarios

Today you celebrated your birthday. Your best friend surprises you by arranging and preparing a surprise dinner for your close friends. You are touched by their effort in going to so much trouble on your behalf, and feel that they must truly value your friendship.

You have arranged a weekend away with a group of four old school friends, and have been looking forward to it for several months. The day before you are due to leave, two of the friends suddenly cancel on you without giving a clear reason. On hearing this, the remaining friend then also tells you that she would prefer not to come along.

A few months ago, you bought some raffle tickets to help raise funds for local services in your community. Today you receive an unexpected phone call, in which a lady informs you that you had won first prize in the raffle, which was a week's holiday to Spain for you and a friend.

Some new neighbours have moved in next door. Every night since they arrived, they have had people around visiting and have been playing loud music until the early hours of the morning. During the day they have frequent arguments, and generally make lots of noise. This morning, at 3am, they have a loud argument with lots of shouting which wakes you up. You have had enough. You tell them to be quiet. They get abusive towards you.

Today is your graduation ceremony. You enjoyed your studies and did well at university, so you are looking forward to having your achievements recognised. You are also looking forward to celebrating your graduation with your classmates, who you felt very supported by throughout your time at university.

Last week you arrived home from holidays to find that your house had been burgled. After reporting the break-in to the police, you rang your insurer to inform them of the incident and to discuss lodging a claim. You were told that your insurance policy had lapsed, so you were not covered for damages to your property, or for any of your stolen possessions.

**You have an 8am appointment in the city for a job interview. You wake up an hour late and despite getting dressed frantically and rushing to the bus stop, you miss the bus. You will almost certainly be late for the interview.*

**You have decided to go travelling through Asia for six months. You are due to leave today, and have finished packing and making all of your preparations. You have always wanted to visit that part of the world, and feel very excited in anticipation of all of the experiences you will have.*

Over the past few months, you have barely been able to meet your household expenses, as well as make regular mortgage payments. Today you receive your credit card bill including your expenses over Christmas, which are much larger than you planned for.

You go for a job interview. You are well prepared and able to answer the questions competently. The interview panel are friendly and encouraging, and you leave feeling very confident that you had performed well enough to secure the position.

You are about to give an important presentation at work that will summarise the project you have been running for the past 12 months. It is very important that you make a good impression, as a number of senior staff are present. You feel quite nervous, and you notice that as the presentation continues, the audience are reacting negatively towards what you are saying.

You have an argument with your best friend. You have only had a few minor disagreements in the past, but this argument becomes heated and she tells you that she feels that she will never be able to trust you again. You are shocked and hurt.

You and your sister decided to take a course of sailing lessons. Today you had your first lesson. You really enjoyed the chance to learn something new, as well as spend some quality time outdoors with your sister.

You and your partner have spent the past year renovating your apartment. Today you finished the last job of painting the sitting room. The changes you have made look just the way you envisaged, and you are really pleased with the result. You are confident that you will stand to make a significant profit when you sell the property.

Two of your closest friends have been abroad travelling over the past 12 months. You have really missed their company, and they are due to arrive home today. You are going to pick them up from the airport, and are feeling very excited about seeing them after such a long time.

You are attending a series of evening pottery classes. You were surprised and pleased when the class instructor tells you that you have a natural flair, and encourages you to enter some of your pieces in a competition at the local fair. In tonight's class it is announced that you received first prize in the competition for a vase that you made.

You have recently started a new job. Although you have tried very hard to be friendly and polite to your new colleagues, they do not make any effort to include you in conversation. Today you overhear them making arrangements to socialise after work, but they do not invite you along.

You have recently applied for a promotion. It is your annual appraisal. You are called into your boss' office. He looks at your file for a few moments and then tells you that your request for a promotion has been turned down.

You have recently started dating someone new. Today you went for a long walk together, and spent several hours talking about the things that are important to you both. You feel a very strong connection with this person, and enjoy discussing your many shared values and beliefs.

Your yearly exams are scheduled for next week. You have been studying hard over the past three months, and have prepared lots of revision notes on your computer. Today you logged on to your computer to find that the hard drive had crashed, and all of your work is lost.

Your brother and sister recently had a serious argument over money. The situation remains unresolved, and now other family members, including extended family, have become involved and taken sides in their disagreement. Today, your sister phones you up and is very distressed and angry. She has a go at your brother and tries to find out whose side you are on. She wants you to support her side of the argument. You feel trapped and in conflict.

The company you work for has recently experienced financial difficulties. Yesterday five of your co-workers were unexpectedly sacked. Today, your boss has called a sudden meeting with you and your other team members. When you are all in his office, he begins to talk about how your team needs to be streamlined and downgraded. You now feel that your own position is not secure.

You have been in a long-term relationship for some time. Increasingly it has become clear that it was not working and that your partner and you had different goals and plans for the future. You have decided to end the relationship. Today, you sit down with your partner to tell them that it is over. Your partner is upset and protests. It is very difficult for you, as you still have strong feelings for your former partner.

On the weekend you went on a long hike in the local national park. You had never hiked in this park before, and found the scenery quite spectacular. You were particularly impressed with the view from the top of the lookout, from where you could see the surrounding countryside for miles.

You have a good relationship with your roommate at college. One day, unexpectedly, they tell you that they have requested to switch to another room in the hall, but they do not give you a reason for their decision. You feel puzzled and confused.

A cousin of yours is getting married today. Many of your relatives have travelled long distances to come to the wedding, including some that you have not seen for many years. It will be great to see your family together again to celebrate the occasion.

Today you bought a new car – a very attractive convertible. You've worked hard to save over the past five years in order to afford it, and you were able to buy a 2003 model. You see this purchase as a significant achievement, and feel very proud as you drive the car home today.

You are in a road traffic accident. As you pull out into a junction, a van smashes into the side of your car, shunting you along the road. Your car is a write-off. You are badly bruised and your chest hurts. The fire brigade cut you out of the car and an ambulance takes you to hospital. The doctor says that you have bad whiplash and several broken ribs.

Today you finished a project that you have been directing at work for the past year. Your team celebrated over a lunch that was arranged by your boss. Your boss also gave a speech thanking you for your commitment and praising the performance of the team. You feel satisfied and valued by your boss.

Yesterday you were informed that you have been promoted at work. Although you have been working hard and hoped that this would be acknowledged and rewarded in the long-term, you are nevertheless a reasonably new member of staff, so you are surprised and delighted to be promoted so soon.

Appendix 5. *Qualitative observer form*

Short form qualitative check

Binnen het onderzoek zijn er twee condities te onderscheiden.

1. Abstracte conditie: Dit bestaat uit repetitief negatief denken over oorzaken, implicaties en gevolgen van een stressvolle gebeurtenis. De gedachten zijn gedachten zijn analytisch, vaag, op meerdere manieren uitlegbaar, gegeneraliseerd. Bevat gedachten over het 'waarom' van de gebeurtenis. Het denken aan eigen schuld. Veelal negatief van inhoud. De gedachten zijn niet-productieve gedachten en passief (het anders hadden gewild, wat als...)

Voorbeeld situatie abstracte gedachtegang:

Een individu heeft een conflict gehad met zijn baas als gevolg van een fout en vervolgens denken dat het conflict volledig zijn/haar eigen schuld was en het conflict iets zegt over zijn of haar karakter. Bovendien is de hele relatie met de baas geruïneerd en zal hij/zij ontslagen worden en er niet in slagen een nieuwe baan te vinden.

2. Concreet: Gedachten over de gebeurtenis zijn specifiek, situatie specifiek, eenduidig, duidelijk ('wat', 'hoe' gedachten). Beschrijft iemand precies de gang van zaken: concreet. Vooral beeldende gedachten over een gebeurtenis, als een filmrol die afspeelt. Aandacht voor de details die de situatie volledig maken.

Voorbeeld concrete gedachtegang:

In hetzelfde voorbeeld waar een individu een conflict had met zijn of haar baas als gevolg van een fout, kan hij/zij zich het conflict voorstellen en zich realiseren dat de baas al geïrriteerd was over een kwestie met een andere collega. Tijdens het conflict was hij/zij moe en afgeleid omdat het dicht bij het einde van de werkdag was. Zo kan hij/zij concluderen dat het conflict meer het gevolg was van de omstandigheden dan de reactie op zijn of haar fout alleen.

Ik wil jullie vragen bij de volgende teksten op een aantal schalen aan te geven bij welke conditie het tekstje het meest passend is. Het onderscheid tussen de condities zal niet bij elk tekstje even gemakkelijk te zien zijn, probeer het zo objectief mogelijk te beoordelen.

Belangrijk: als concreet denken 100% is, niet automatisch abstract denken 0% scoren! Soms zijn teksten zowel abstract als concreet.

Geef de mate aan waarin de tekst volgens jou past bij de abstracte conditie

0% _____ 100%

Geef de mate aan waarin de tekst volgens jou past bij de concrete conditie

0% _____ 100%

In hoeverre bestaan de gedachten van de proefpersoon uit *beelden*?

Neutraal _____ Helemaal

0% _____ 100%

In hoeverre bestaan de gedachten van de proefpersoon uit *woorden*?

Neutraal _____ Helemaal

0% _____ 100%

Als ik er echt één moet kiezen, dan hoort deze tekst bij de volgende conditie:

1. Abstracte

2. Concrete