

## ACUTE PSYCHOSOCIAL STRESS DOES NOT INCREASE DYSFUNCTIONAL ATTITUDES

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### SUMMARY

**Introduction:** Dysfunctional attitudes about oneself, the world and the future, measured quantitatively by Weissman's Dysfunctional Attitudes Scale (DAS), are thought to influence the onset and persistence of major depressive disorder. However, never-depressed individuals may also harbour latent negative schema which may become activated under stressful conditions, giving rise to dysfunctional negative cognitions.

**Objectives:** This study investigated whether everyday psychosocial stresses could be sufficient to activate dysfunctional self-schema and increase negative cognitions in a large group of healthy adolescents and a preliminary cohort of previously depressed adolescents.

**Methods:** 92 never-depressed adolescents aged 17-19 and 18 previously depressed adolescents, recruited from the Cambridge ROOTS cohort, took either version A or B of the DAS at rest on day 1. On day 2, they were subjected to the Trier Social Stress Test, a psychosocial stress paradigm, 22 minutes after which they took the other version of DAS.

**Results:** Stress did not affect the DAS score in either group.

**Conclusions:** Brief psychosocial stress does not appear to influence negative assumptions in healthy young adults with or without a past history of depression. It is possible that this is because dysfunctional assumptions, unlike self-schemas, are not latent. More long-term stresses may be needed to activate negative thoughts to a level where risk of depression is increased.

**Key words:** acute psychosocial stress - dysfunctional attitudes - negative schema - depressive disorder

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### INTRODUCTION

#### Negative Cognitions in Depression

Dysfunctional schema about the self, the world and the future are thought to be fundamental in major depressive disorder. According to Beck's Cognitive Model, the dominant psychological framework for depression, major depressive disorder occurs in individuals with pre-existing negative beliefs about the self, called negative self-schema (Beck 1967). Examples of negative self-schema may be 'I am not good' or 'I am unworthy'. The origins of these dysfunctional self-schemas are thought to lie in individuals' adverse early life experiences. In most people, these self-schemas persist in a latent state, inaccessible to conscious reflection (Beck 1967, Haaga & Beck 1992).

However, as these latent cognitions may become activated under certain conditions, they therefore constitute an intrinsic cognitive vulnerability to depression. Activated negative self-schemas give rise to dysfunctional conditional assumptions (e.g. 'If others get close to me, they will discover the real me and reject me').

These in turn lead to the generation of the negative automatic thoughts, which are believed to be responsible for the majority of depressive symptoms.

#### Activation of Latent Negative Self-Schemas

Which factors might influence the activation of latent dysfunctional attitudes? In his cognitive theory of depression, Beck proposed that in individuals at risk for depression, latent negative self-schemas could be activated by stressful or traumatic life events (Beck 1967).

However, it can be argued that for a proportion of individuals, there is no clear evidence of a distressing life event involved in precipitating their depression.

Miranda and Persons (1988) proposed the mood-state hypothesis, suggesting that dysphoric mood is instrumental in the activation of latent negative self-schema, in individuals with a cognitive vulnerability to depression. In line with this, Teasdale proposed the differential activation hypothesis, in which adverse life events cause transiently low mood in most individuals, which may activate negative attitudes. However, differences between individuals' patterns of thinking could play a role in determining whether they develop depression. Individuals whose unconscious negative attitudes are activated by a milder degree of dysphoria are thought to be at an elevated risk for depression (Teasdale et al. 1988).

Higher levels of such dysfunctional attitudes strongly correlate with greater severity and persistence of depression (Dent & Teasdale 1988), and may influence responses to psychotherapy and antidepressant pharmacotherapy (Shankman et al. 2013).

As the extent of dysfunctional attitudes may serve as a useful prognostic indicator in depression, their objective assessment is helpful not only in the psychiatric evaluation of depressed individuals, but also in risk stratification of normal people for depression, and previously depressed individuals for further depressive relapse.

### **Experimentally Accessing Latent Negative Self-Schema**

A variety of mood-induction procedures have been exploited in order to gain access to latent dysfunctional attitudes and study negative cognitions.

Teasdale and Dent (1987) utilised a musical mood induction technique, in which subjects were exposed to sad music designed to induce dysphoria. Their piece of choice was 'Russia under the Mongolian yoke' by Prokofiev, played at half speed. They reported that after dysphoric mood induction, previously depressed subjects had increased recall of negative self-descriptors – supporting the notion of that negative mood caused activation of previously latent negative self-schemas (Teasdale & Dent 1987). Segal et al. (1999) extended this procedure by asking participants to listen to dysphoric music, whilst focusing intently on a traumatic personal life event.

Another mood-induction technique used to induce dysphoric mood was viewing of a brief fragment of the movie 'The Champ', in which a young boy learns that his father was killed in a fight (Brosse et al. 1999). The ethical concerns about experimental induction of negative mood in individuals at risk for depression led to Teasdale & Cox (2001) devising the Depressed States Checklist to access latent negative self-schemas. This was a questionnaire subjects answer about what they think when their mood goes down, and hence assesses the extent of their negative self-schemas.

However, in spite of mood-induction techniques enabling successful access to latent negative self-schema, it can be argued that they do not reflect realistic everyday stressors that people are exposed to on a daily basis, and consequently, conclusions reached from these studies may only be of limited clinical value. Additionally, studies to date have not examined the effects of negative mood induction on dysfunctional attitudes.

Could the toll of everyday stressors be sufficient in activating latent negative self-schemas and dysfunctional negative attitudes? We investigated the impact of the Trier Social Stress Test (TSST), a frequently used psychosocial stress paradigm developed by Kirschbaum et al. (1993), on the extent of dysfunctional negative assumptions, as measured by Weissman's Dysfunctional Attitudes Scale (DAS). The primary analysis was conducted on a large (n=92) group of young adults with no history of mental illness. We also conducted a preliminary analysis with 18 young adults who were presently well, but with a past history of unipolar depression, to investigate whether these effects may be

different in these groups. Our rationale for using the TSST is that unlike other mood-induction procedures, its central focus on social evaluation and performance under pressure more accurately mimics the psychosocial stressors people are exposed to on a daily basis.

We predicted that the DAS score prior to the TSST will be slightly higher in previously depressed individuals than normal controls. After stress, we predict that the DAS scores will increase in both groups, with the previously depressed group demonstrating a significantly greater increase in dysfunctional attitudes than normal individuals.

### **Impact of long-term stress on dysfunctional assumptions**

A growing body of evidence suggests that long-term stresses may be important in the development of dysfunctional assumptions. Harter & Vanecek (2000) found that in a cohort of 650 university students majoring in Psychology, a dysfunctional family environment as measured by the Family Functioning Scales (Bloom 1985) was related to negative assumptions about the self and the benevolence of the world. They proposed a model in which negative self-assumptions could be a result of symptom distress, rather than mediating it. Another study carried out by Otani et al (2013) demonstrated that in a healthy population of Japanese adults, maternal over-protection in childhood engendered dysfunctional attitudes concerning achievement and dependency, and correlated with a higher score on an abbreviated version of the DAS (DAS-24). This gives rise to the question whether long-term stresses experienced in the family environment or with friends can lead to dysfunctional assumptions.

We investigated the impact of family discord/a dysfunctional family environment and problems with friends/lack of friends on individuals' dysfunctional assumptions. We predicted that individuals with a greater burden of long-term stresses originating from family or friendship difficulties would have an elevated DAS at rest compared with those who have not experienced such stresses.

## **SUBJECTS, MATERIALS AND METHODS**

### **Subject selection**

18 previously depressed adolescents aged 17-19, who had experienced at least 1 episode of major depressive disorder, were selected from the Cambridge Roots project cohort. Recovery from depression was defined as having at least 8 weeks of 2 or less depressive symptoms, and not currently on antidepressants. Clinical recovery was confirmed by a recently completed K-SADS-PL assessment, designed by Kaufman et al. (1997) to screen for adolescent affective disorders and schizophrenia.

92 never-depressed individuals aged 17-19 with no lifetime history of major depressive disorder or any other mental illness were selected; the groups were balanced for gender, as effects of gender on dysfunctional attitudes would be investigated.

### Exclusion criteria

This study initially planned to investigate the role of the stress hormone cortisol in mediating the effects of stress on cognitions, therefore we needed to ensure that we removed potential confounds to stress-induced salivary cortisol levels. We also needed to ensure that participants were safe to take part in the TSST. Participants in both groups were excluded on the basis of the following criteria:

- Take regular steroid medication (oral or inhaled) or take hormonal contraceptives containing oestrogens (combined pill, injection, implant or patch);
- Smoke daily; no smoking on day of assessment;
- Females will be excluded if they are or think they might be pregnant, are lactating, or their menstrual cycle has not returned to being regular after pregnancy.;
- At least one biological grandparent known to be non-white European (due to a genetic component of the main study);
- At least one of the following psychiatric disorders at time of interview: anxiety disorder, OCD, oppositional defiant disorder, PTSD, conduct disorder, bipolar disorder;
- Alcohol or illicit drug use on the day of or the day before research assessment;
- Caffeine use since breakfast on the day of research assessment;
- Consume large amounts of caffeinated drinks on a regular basis (>6 cups of coffee per day or drinks containing methylxanthines such as Pepsi or red bull);
- Current severe cold or flu;
- Current heart disease;
- Severe high blood pressure at time of testing (systolic BP>160 or resting pulse>100);
- Vigorous exercise for 2 hours before testing.

### Experimental procedure

On day 1 of testing, the extent of dysfunctional attitudes in both groups was tested at rest using the Dysfunctional Attitudes Scale (DAS). Subjective ratings of emotions were assessed using a Visual Analogue Scale (VAS).

On day 2 of testing, participants underwent the Trier Social Stress test (TSST), which has been shown to increase stress, anxiety and emotional insecurity in participants (Hellhammer & Schubert 2012).

Dysfunctional attitudes were assessed again using the DAS 22 minutes after the end of the TSST, to

coincide with a peak in cortisol (Dickerson et al. 2004). Participants recorded their subjective mood using a visual analogue scale (VAS) 20 minutes before the TSST, just after the TSST (to describe their peak feelings during the TSST) and 15 minutes after the end of the TSST.

### *The Dysfunctional Attitudes Scale (DAS)*

The extent of dysfunctional negative attitudes can be measured quantitatively by Weissman's Dysfunctional Attitudes Scale (DAS), originally a 100-item questionnaire measuring the degree of negativity and rigidity of an individual's ideas about themselves, the world and the future (Weissman & Beck 1978). Participants are given a statement such as 'If I do well, it is probably by chance, but if I do badly, it is my fault' – and are asked to rate the extent to which they agree with the statement on a 7 point Likert scale.

The DAS has since been refined to two parallel 40-item questionnaires, termed DAS-A and -B. Studies suggest that the two versions of the DAS do not yield significantly different scores (Vazquez & Ring 1993, Power et al. 1994) and current opinion is that they are equivalent abbreviated forms of the original DAS.

### *The Trier Social Stress Test (TSST)*

The experimenter leads the participant to the experimental room at time 0, where they are introduced to 2 people (the 'committee'), a microphone and a video camera. The experimenter tells the participant that they will have to deliver a speech for a job application to the committee, followed by a numerical task. They are given instructions by the committee, then prepare their speech until T+3min. They are asked to deliver the speech. If they stop before 5 minutes, or their speech is not relevant, there are standard questions and prompts. Then they are asked to do the second task, where they must serially subtract 17 from 2023 as quickly and accurately as possible. After mistakes, they are asked return to 2023 and re-start. This lasts 5 minutes, and then the task ends.

### *The Visual Analogue Scale (VAS)*

The VAS is a psychometric response scale for subjective characteristics or attitudes that cannot be measured directly. Participants specify their degree of agreement with a statement by indicating a position along a continuous line between two extremes. The characteristics measured by the VAS in this study were happiness, alertness, fearfulness, feeling of being relaxed, anxiety, how much the subject felt like leaving, stress levels, tension, nervousness, irritability and level of worry.

### *Statistical Analysis*

Data was analysed using the statistics package Stata-11. Two-way repeated measures analyses of variance (ANOVA) were used to compare the DAS in both

**Table 1.** Demographics and DAS results for 18 previously depressed and 92 healthy individuals, at rest and after the TSST

Measure	Never depressed (n=92)		Past depression (n=18)	
	Mean	S.D.	Mean	S.D.
Age (yrs)	19.20	0.83	19.67	0.84
Gender	M=65, f=27		M=12, f=6	
Mean IQ	107.50	12.70	105.70	12.03
Mean depressive symptoms (MFQ)	10.80	6.54	13.39	6.95
Mean anxiety	28.71	5.39	30.46	6.24

**Table 2.** Dysfunctional attitude scale (DAS) scores for never depressed and previously depressed subjects at rest and 22 minutes after the TSST

Cohort	n	DAS Version at Rest	DAS at rest	DAS Version after TSST	DAS after TSST	Time Effect
Never depressed	36	A	211.8	B	203.1	F=1.72 (df=1) P=0.1924 Eta squared =0.0015
	56	B	197.6	A	208.3	
Past depressed	11	A	202.5	B	210.3	F=1.37 (df=1) P=0.2592 Eta squared =0.0052
	7	B	198.1	A	194.1	

**Table 3.** TSST

Emotion	Rest Day	20 mins before TSST	Peak of TSST	30 mins after
Happiness (Controls)	65.4	64.5	34.8	57.3
Happiness (Past dep)	68.6	74.4	31.1	59.3
Anxiety (Controls)	20.1	11.4	54.4	18.3
Anxiety (Past dep)	23.9	10.3	64.0	21.8

groups before and after the TSST. This procedure controls for which version of the DAS was used on day 1. T-tests were used to compare versions A and B of the DAS. Participants' subjective ratings of anxiety and mood on the VAS at different time points in the study were compared using a paired t-test.

## RESULTS

The mean age, IQ, baseline mean depressive symptoms and baseline mean anxiety levels of never-depressed and previously depressed subjects are presented in Table 1. Two-way repeated analysis of variance (ANOVA) indicated that in both groups, there was no significant difference in DAS before and after the TSST (never-depressed  $p=0.1924$ , past depression  $p=0.2592$ ).

T-tests demonstrated that both depressed and control participants scored higher in DAS version A than version B, at rest (control,  $t(df)=95$ ,  $p=0.0024$ ; depressed,  $t(df)=19$ ,  $p=0.4069$ ) and after TSST, (control,  $t(df)=90$ ,  $p=0.2563$ ; depressed,  $t(df)=16$ ,  $p=0.2834$ ) (Table 2).

In both groups, the TSST was associated with a statistically significant rise in anxiety ( $p=0.00$ ) and decline in happiness ( $p=0.00$ ), validating its use as a mood-induction technique. 30 minutes after the TSST anxiety and happiness returned towards baseline levels (Table 3).

As there were no effects of stress on the DAS, we are not presenting the effects of stress on cortisol, as there is no main effect on DAS to be mediated.

## DISCUSSION

In this study, we sought to investigate the effects of experimentally-induced psychosocial stress on dysfunctional negative attitudes. However, contrary to these predictions, we found that exposure to acute psychosocial stress in the form of the TSST did not have a significant effect on the DAS score, a measure of the extent of dysfunctional assumptions, in either group.

Why may stress not have had an impact on the extent of dysfunctional thinking?

Other studies have demonstrated effects of negative mood induction on negative self-schemas (ref). Our experimental paradigm had several important differences to these studies. Firstly, we used the Trier Social Stress Test rather than a sad mood induction. The main aim of the TSST is to induce stress, mainly in the form of anxiety. It could therefore be argued that experimental paradigms designed to induce sadness are needed to activate latent negative thoughts. However, the TSST did lead to sadness as well as anxiety, making this less likely to be the explanation. But it is possible that the intensity of sadness is not as strong after the TSST than other sad mood induction paradigms.

Secondly, we tested assumptions 22 minutes after the end of the TSST, when negative emotions had nearly returned to normal. This timing was deliberate: we initially wanted to test the effects of the stress hormone cortisol on negative cognitions, and so we tested cognitions at the time of peak cortisol (around 30 minutes after the start of the TSST). Clearly, there was no difference between DAS at this time compared to at rest, and so cortisol would not be affecting negative assumptions. Other studies have measured negative self-schemas when mood is actually low. It is possible that it is the low mood (and not the cortisol) which makes assumptions more negative; therefore if the DAS were administered just after the TSST, when negative emotions were higher, that the DAS could be higher than at rest. If so, this would demonstrate that stress would have transient effects on negative assumptions. However, even if this were the case, assumptions soon return to normal after stress, and so transient stress would not serve to increase risk of depression onset by this mechanism.

Thirdly, the DAS tests negative assumptions (e.g. I have to impress new acquaintances with my intelligence, wit or charm or they won't like me) as opposed to self-schemas (eg I am a bad person). Self-schemas are seen as a deeper level of thinking, which themselves influence negative assumptions (find a reference from Beck which states this – it is a basic tenet of CBT so should not be hard to find). It is therefore possible that while negative schemas are latent, and hence can be activated by dysphoric mood induction, negative assumptions are not latent, are always present, and hence cannot be activated further by a stress test. However, if this were the case, we would expect that resting non-latent assumptions would be more negative in participants with a past history of depression than those with no psychiatric history; and in fact, we found the converse. It is possible that treatment of the depressive episodes led to a reduction in dysfunctional assumptions. It may also be the case that such negative assumptions do not operate so much in people with transient depression that leads to full recovery as in people with a more chronic course of depression or a pattern of relapses/partial remissions. In addition, the finding may have been a chance finding due to the small sample size, and assumptions may be more negative in a larger sample.

Fourthly, our sample was predominantly free of history of mental illness. It may be the case that the TSST only activates negative assumptions in people at risk of depression. However, we did have such a group of participants at risk for depression, as indexed by a past episode, and again we saw no effects of stress on negative assumptions in this group.

In summary, we found no effect of induced-psychosocial stress on dysfunctional negative assumptions. This may have been because the intensity of low mood was not adequate, or because effects of negative emo-

tions are only transient and hence no longer operated x minutes after the end of the TSST.

### Other Limitations

Scores on the two forms of the DAS were significantly different. This makes it more difficult to interpret results. While this can be statistically controlled for, and there was random allocation to which version was administered first, balancing out effects, this is a possible explanation for null results. The initial validity study suggested that people score similarly on both forms (Weissman & Beck 1978), and this disparity needs further investigation in independent samples.

Our sample size of individuals with past depression was relatively small, making it hard to draw firm conclusions in this group, in particular the null effect of stress on dysfunctional assumptions may have been a type 2 error. This is made less likely by the fact that effect size was very similar for the past depression group to the group with no history of depression.

### CONCLUSIONS

Acute stress from the Trier Stress Test is too mild/too transient to lead to persistently elevated negative assumptions in people with no past history of depression. Therefore similar mild real-life stresses are not likely to lead to risk of a depressive disorder. It is possible that more long-term stresses are needed to activate latent negative assumptions enough to trigger an episode of depression.

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