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Does magical thinking produce neutralising behaviour? An experimental investigation

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Abstract

Magical thinking is of relevance to obsessive compulsive disorder (OCD), and has been most widely investigated in relation to the cognitive bias known as thought-action fusion (TAF). This is seen as playing a role in the formation of fears about responsibility for harm. We suggest that magical thinking may also characterise some types of neutralising behaviour, which arise in response to those fears, and are a hallmark of the disorder. In an experimental study of 51 undergraduate students, we assessed whether the use of neutralising behaviours in response to an induction of fears of increasing likelihood for harm is related to a propensity for magical thinking. The 75.5% of participants demonstrated at least one form of neutralising behaviour in response to a TAF-induction task. Neutralising was associated with stronger and more persistent responses to the task, and with questionnaire measures of magical ideation. Those who neutralised did not report higher levels of OCD symptoms. It appears that neutralising is a common response in circumstances that provoke a sense of responsibility for harm. Its occurrence may be linked to magical thinking, however, the results from this experimental investigation suggested that this process may not be specific to OCD.

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Introduction

One of the puzzles of obsessive-compulsive disorder (OCD) is the way that sufferers may focus on events that are not only improbable, but also implausible. Clients may have an impulse to check they have not run down a pedestrian whilst driving, even if they have not actually seen anyone walking at the side of the road, or they may fear an aircraft will crash merely because the thought of it has entered their head. The event is implausible, because no reasonable connection exists between the feared outcome and its supposed cause. Connections of this type, where thoughts and external events are linked in a way that cannot be rationally explained by physical laws or culturally acceptable explanations, are known as magical thinking.

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Furthermore, some common neutralising rituals also appear to have a symbolic or magical element. These include counting, repeating meaningless phrases, positioning objects, and completing actions with a particular gesture. Each may be believed to offer protection, despite an objective irrelevance to the feared event. Therefore, magical thinking is not only present on the ‘input’ side of OCD (i.e. in creating a sense of threat), but is even more widely seen in the ‘output’, namely the forms of neutralising behaviour which arise in response to that threat. This is supported by a number of recent questionnaire-based studies that have suggested that magical thinking may be related to both obsessions and harm avoidance behaviour in OCD (Einstein & Menzies, 2004a, 2004b, 2006; Amir et al., 2001). The present study uses an experimental paradigm to investigate links between magical thinking and responsibility for harm and consequent neutralising behaviour.

Neutralising behaviour in OCD

Freeston and Ladouceur (1997) define neutralising as “a voluntary, effortful cognitive or behavioural act that is directed at removing, preventing and attenuating the intrusive thought and the associated discomfort” (Freeston and Ladouceur, 1997, p. 344). There is a general consensus in cognitive theory that this behaviour plays an important role in maintaining intrusive thoughts in OCD, and it is hypothesised that neutralising activities are safety seeking behaviours that are connected to the subjective meaning of the intrusive thought. Thus, individuals with OCD engage in neutralising behaviour as they believe it to be able to prevent the consequence foreseen by the thought’s content in some causal way (Rachman and de Silva, 1978; Freeston and Ladouceur, 1997). Where those consequences related to the intrusive thought cannot be altered, it is suggested that neutralising is used to at least discharge what the person believes is their responsibility (Salkovskis et al., 2003). Neutralisation is distinguished from general coping responses to intrusive thoughts; general coping responses are considered to be less specific and concerned with addressing the thought’s presence and any associated discomfort rather than its actual content (Freeston and Ladouceur, 1997). In some cases neutralising may involve activity whose link to the consequences of the intrusion seems to operate at a symbolic level. For example, a fear of being responsible for harm to a child might be neutralised via counting in fixed sequences, rather than through any direct physical action to protect the child. A neutralising strategy that is not rationally connected to the consequence it aims to influence can be defined as magical thinking.

Thought-action fusion and magical thinking

Thought-action fusion (TAF; Rachman, 1993) is a specific form of magical thinking (Amir et al., 2001, Einstein & Menzies, 2004a, 2004b, 2006) which has been suggested as a cognitive bias that could contribute to the catastrophic misinterpretation of intrusive thoughts in OCD. The most researched form is TAF-likelihood, which refers to the belief that having a thought about an unacceptable or disturbing event makes it more likely to happen in reality. TAF-likelihood has been demonstrated to relate to OCD (Amir et al., 2001; Shafran et al., 1996), exacerbate intrusive thoughts (Rassin et al., 1999), and may even be a precursor of OCD (Rassin et al., 2000).

Magical thinking is usually defined more broadly than TAF alone, being characterised by attributions about causality that defy either physical laws or culturally accepted explanations. Typically, real-life events are seen as being caused by a person’s thought, or by actions, which are physically unconnected to the events (Zusne and Jones, 1989). Research on magical thinking has mainly focused on links between OCD and schizotypy (Lee et al., 2005; Norman et al., 1996; Sobin et al., 2000; Tolin et al., 2001) though some studies directly explore its relevance in OCD (Bolton et al., 2002; Emmelkamp and Aardema, 1999; Muris and Merckelbach, 2003). Unlike TAF, magical thinking is not constrained to apply only to negative and untoward events but may also be involved in harm avoidance behaviour.

Investigating magical thinking in neutralising behaviour

The question of whether magical thinking generates neutralising behaviour is as yet unresolved. Data in this area is unconvincing, partly because the majority of research relies on self-report methods. It is difficult to

produce reliable and replicable demonstrations of unusual phenomena in experimental settings (de Silva et al., 2003), and this is particularly problematic with research into magical thinking, because even when magical beliefs are demonstrated in a participant's behaviour, they are seldom reported (Subbotsky, 2001). This may arise because participants feel they should show rational and logical thinking (Subbotsky, 2004).

Experimental studies that investigate participants' behaviour are therefore preferable to those that rely on verbal report when assessing the role of magical thinking. Such methodologies have been lacking, but Rachman and colleagues developed a paradigm to induce TAF-likelihood and enable the study of obsessive neutralising (Rachman et al., 1996). Participants write out and visualise the sentence "I hope X is in a car accident" where X refers to a close friend or relative. Using a high-TAF sample of non-clinical participants, Rachman et al. (1996) demonstrated that in response to this task, participant's anxiety increased and they reported an urge to neutralise. Those who were instructed to neutralise demonstrated an immediate decrease in anxiety, whereas anxiety in the control group reduced over a longer time course. The authors concluded that the results paralleled the experimental effect of exposure and response prevention with overt compulsive behaviour, and that the paradigm might provide a valid means of investigating OCD behaviour in an analogue population. Using the same paradigm in a high-TAF analogue sample, 63% of participants demonstrated at least one example of spontaneous neutralising behaviour in response to the induction (Zucker et al., 2002). The paradigm has also been used with an unselected sample, and a similar pattern for anxiety and urge to neutralise was demonstrated. It is unclear whether TAF questionnaire scores relate to TAF-induction effects, as contradictory results have been reported (van den Hout et al., 2002, van den Hout et al., 2001).

The Rachman et al. (1996) paradigm offers an opportunity to test whether neutralising behaviours, performed in response to fears of responsibility for harm, are associated with magical thinking and OCD symptoms. The present study hypothesises that in a non-clinical sample, some individuals will demonstrate neutralising behaviours in response to TAF-induction. We will explore the nature of these behaviours, and whether, during the task, the increase in anxiety and urge to neutralise is associated with the person's level of magical thinking, TAF-likelihood, and/or OCD symptoms. Furthermore, as magical strategies are thought to be associated with harm avoidance behaviour, we hypothesise that those people who use neutralising strategies will show more magical thinking, TAF-likelihood, and symptoms of OCD than those who do not neutralise. Finally, we will assess whether there is a difference between the task-specific beliefs of people who use neutralising strategies and those who do not.

Method

Participants

The 51 participants, 5 male and 46 female, completed the measures. All participants were undergraduate psychology students at the University of Southampton and received course credits in return for their participation in the study. Two participants were excluded from the study on the basis of exclusion criteria. Participants ranged in age from 18 to 38 years, the mean age of the sample was 20.7 years ($SD = 4.3$).

Measures

Thought-action fusion scale-revised (TAFS; Shafran et al., 1996)

This 19-item self-report measure is reported to have good internal consistency for both student and 'obsessional' samples (with Chronbach's alpha co-efficients of .92 and .95–.96, respectively; Shafran et al., 1996; Rassin et al., 2001; Rassin et al., 2001; Yorulmaz et al., 2004). Each item is rated on a 5-point scale ranging from 0 (disagree strongly) to 4 (agree strongly). No items are reverse scored. Although it has three subscales (TAF-moral, TAF-likelihood pertaining to others, and TAF-likelihood for oneself) a principal components analysis has suggested a two-factor solution for the TAFS; the two factors being moral and likelihood TAF (a composite score of TAF-likelihood for self and for others subscales) (Shafran et al., 1996; Lee et al., 2005; Rassin, Diepstraten et al., 2001; Rassin, Merckelbach et al., 2001; Yorulmaz et al., 2004). This study bases analyses on the two-factor model.

Magical ideation scale (MIS; Eckblad & Chapman, 1983)

This consists of 30 dichotomous true-false items exploring magical beliefs based on a definition of magical thinking as 'belief in forms of causation that by conventional standards are invalid'. The scale was originally developed with a normative sample to assess magical ideation in schizotypy (Eckblad and Chapman, 1983) and has been demonstrated to show construct validity as a measure of schizotypy. It is reported to have good internal consistency with coefficients ranging from .82 to .87 (Tolin et al., 2001; Norman et al., 1996). With normal samples highly skewed scores on the MIS are reported (Eckblad and Chapman, 1983), and there are mixed findings on its ability to distinguish individuals with OCD from those with other anxiety disorders (Bentall et al., 1989; Enright and Beech, 1990; Enright et al., 1993), but it has been the most common measure in research on magical thinking in OCD to date (Einstein & Menzies, 2004a, 2004b).

State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983)

This 40 item self-report measure of state and trait anxiety has been demonstrated to show good internal consistency on student samples with a Cronbach's alpha coefficient of .92 (Ramaiah et al., 1983). This study employed only the trait version, which consists of 20 items assessing trait anxiety, on a 4-point likert scale ranging from 1 (not at all) to 4 (very much so).

Padua Inventory Washington State University revised edition (PI-R; Burns et al., 1996)

This revision of the original Padua Inventory (PI; Sanavio, 1988) was specifically selected as it is designed to reduce overlap with worry and organises 39 of the 60 items of the original PI into five content categories relevant to obsessions and compulsions, namely: (1) obsessional thoughts about harm to oneself or others; (2) obsessional impulses to harm oneself or others; (3) contamination obsessions and washing compulsions; (4) checking compulsions; and (5) dressing/grooming compulsions. The original validation of this revised scale on a non-clinical sample demonstrated a high level of internal consistency on the 5 subscales (Cronbach's alpha of .77–.88) with the alpha value for the total scale being .92.

Visual analogue scales (VAS)

In addition to questionnaire measures, 150 mm visual analogue Scales (VAS) were adopted to measure short-term fluctuations of mood and estimates of the nature and intensity of experienced mental states. Each VAS referred to a statement and participant's marked the degree they endorsed each statement by marking the line between the 0% and 100% 'anchors' at either end of the scale. Scores were converted into percentage ratings. The statements measured by the VAS referred to the following variables: (1) the sense of moral wrongness about writing out the sentence, (2) perceptions of likelihood of harm arising as a consequence of thoughts, (3) distress, (4) responsibility for consequences, (5) urge to cancel thoughts, and (6) state anxiety. All VAS were completed following TAF-induction task and following an opportunity to neutralise. A VAS measure of state anxiety was also taken prior to the TAF-induction task.

Manipulation checks were used to ensure that participants engaged in the TAF induction. These checks were used where individuals rated their distress score on the VAS measure post-TAF induction as less than 50%. Such individuals were excluded if they then gave VAS ratings for 'seriousness of accident imagined' as less than 50%, as it was assumed that they had not fully engaged with the paradigm if they were not distressed and had also not imagined a serious accident. A threshold value on 50% was adopted on the VAS, following the suggestion of Rachman et al. (1996). One participant was excluded from the analysis of the results for this reason.

Procedure

The experimental protocol was ratified by the University of Southampton ethics committee, and was conducted in small groups (mode = 3 participants). Participants first completed the questionnaire measures: TAFS, MIS, PI-R, STAI. The experimenter then read the instructions for the experimental procedure from a script. This procedure used was based on the original paradigm of Rachman et al. (1996). Participants were first asked to rate their initial level of state anxiety on a VAS before being provided with a single written sentence intended to evoke TAF-likelihood that read 'I hope _____ is in a car accident'. They were

instructed to write the name of someone close to them into the sentence and then copy out the sentence before visualising the situation depicted in the sentence. Detailed modifications were made to the original procedure, including verbal prompts to encourage clear and vivid visualisation of the scene over a period of 30 s. As in the original experiment a 2-minute period followed the visualisation of the sentence and completion of VAS. Here, however, participants were told that they did not have to do anything during that time, but if they did wish to do something, it could be anything, and could involve the sheet of paper. This was intended to ensure only spontaneous reactions were elicited. Finally, participants recorded any coping behaviour they had used within that 2 min period. Participants were debriefed at the end of the experiment as to the nature of the experiment and were provided with information about TAF-likelihood. Following the debrief each participant was checked for the levels of distress about the experimental procedure, and time was provided by the experimenter to discuss any remaining concerns that participants held about the experimental procedure on an individual basis. The experimenter also provided contact details should participants encounter any future distress related to the experimental protocol. No participants reported elevated levels of distress following debrief and none used the telephone contact.

Results

Statistical analyses

SPSS version 12 was used for all quantitative analysis. Data from questionnaire measures were tested for normality with the Kolmogorov–Smirnov statistic. The scores for the MIS, PI-total score, STAI-trait were not normally distributed, however, square-root transformations normalised the data for all scores. The normal distribution of the TAF-likelihood scores allowed for parametric analysis. The majority of VAS scores were not normally distributed and transformations to the data did not restore normality, so non-parametric statistics were applied with the VAS data throughout. The means and standard deviations for the raw and transformed questionnaire data are shown in Table 1.

Effects of the TAF paradigm

Subjective effects

The first analysis tested out the hypothesis that the TAF-induction paradigm would model the level of anxiety and urge to neutralise that is seen in OCD within the non-selected sample. A Friedman's test indicated that there were significant differences between the level of anxiety at baseline, post-TAF induction and post-neutralisation opportunity ($\chi^2_F = 78.533$, $df = 2$, $p = .000$, $n = 49$) for all participants. Post-hoc Wilcoxon Signed Ranks tests, with Bonferroni corrected alpha level .01 indicated that anxiety significantly increased from baseline to post-TAF induction ($Z = -6.083$, $p = .000$, two-tailed test, $n = 49$), and then significantly decreased after an opportunity to neutralise ($Z = -5.322$, $p = .000$, $n = 49$). However, the level of anxiety remained significantly greater post-neutralising opportunity than at baseline ($Z = -5.360$, $p = .000$, two-tailed test, $n = 49$). A Wilcoxon Signed Ranks test also indicated that there was a significant decline in the urge to neutralise following the neutralising opportunity ($Z = 5.695$, $p = .000$, two-tailed test, $n = 49$).

Given that the paradigm produced an increase in anxiety and an urge to neutralise, we next tested the hypothesis that the anxiety level and change in the urge to neutralise were associated with levels of magical thinking, TAF or OCD-symptoms. Using a less conservative uncorrected alpha .05 there were no significant correlations between any of the questionnaire measures of magical thinking, TAF-likelihood, or OCD symptoms and the increase in anxiety from baseline to immediately after writing and visualising the sentence (TAFS-moral: $r_s = .07$; TAFS-likelihood: $r_s = -.12$; MIS: $r_s = -.04$; PI: $r_s = -.06$). Following the opportunity to neutralise, there were no significant correlations between any of the questionnaire scores and the drop in anxiety (TAFS-moral: $r_s = .07$; TAFS-likelihood: $r_s = .02$; MIS: $r_s = .07$; PI: $r_s = -.11$) or the drop in the urge to neutralise (TAFS-moral: $r_s = -.15$; TAFS-likelihood: $r_s = .10$; MIS: $r_s = .22$; PI: $r_s = -.15$).

Table 1
Mean and standard deviation for raw and transformed scores for measures

| Measure ($n = 49$) | M (raw) | SD (raw) | M (transformed) | SD (transformed) |
|--------------------------------------|-----------|----------|-------------------|------------------|
| MIS ^a | 6.73 | 4.67 | 2.40 | 1.0 |
| TAFS-moral | 20.86 | 8.22 | 4.44 | 1.07 |
| TAFS-likelihood | 6.34 | 5.60 | 2.31 | 1.53 |
| PI-R-total | 17.67 | 11.49 | 3.98 | 1.36 |
| STAI trait | 42.33 | 10.50 | 6.16 | .96 |
| <i>VAS measures (%)</i> | | | | |
| VAS anxiety prior to experiment | 24.06 | 20.43 | | |
| <i>Post-TAF induction</i> | | | | |
| VAS1 anxiety | 59.71 | 20.68 | | |
| VAS1 wrongness | 81.78 | 22.03 | | |
| VAS1 likelihood | 24.14 | 24.25 | | |
| VAS1 distress | 82.75 | 18.08 | | |
| VAS1 responsibility | 63.61 | 31.05 | | |
| VAS1 cancelling urge | 72.10 | 27.86 | | |
| <i>Post-neutralising opportunity</i> | | | | |
| VAS2 anxiety | 43.61 | 17.81 | | |
| VAS2 wrongness | 76.18 | 27.68 | | |
| VAS2 likelihood | 20.62 | 19.26 | | |
| VAS2 distress | 72.56 | 21.38 | | |
| VAS2 responsibility | 51.74 | 32.68 | | |
| VAS2 cancelling urge | 47.48 | 33.61 | | |
| VAS2 reduction in likelihood | 31.99 | 24.10 | | |

Note: MIS: magical ideation scale; TAFS-moral: thought-action fusion scale (TAFS)-moral subscale; TAFS-likelihood: TAFS-likelihood subscale; PI-R: Padua Inventory revised; STAI-trait: State Trait Anxiety Inventory- trait version; VAS: visual analogue scale.

^aDue to missing data $n = 48$ for this scale.

Behavioural effects (neutralising)

The experimenters hypothesised that in a non-clinical sample some individuals will demonstrate neutralising behaviours in response to the TAF-induction. In this sample only one participant did not do anything in response to the TAF induction. The 48 participants who engaged in neutralising and/or coping behaviours reported a total of 129 different neutralising and coping strategies. The modal number of strategies used by the participants was 3. Participants described a range of overt and covert strategies that were used in response to the TAF-induction, and a simple thematic analysis was applied to these idiosyncratic descriptions as outlined by Boyatzis (1998). From this analysis 13 classes of strategies emerged and a code for classifying the strategies was developed. An independent rater then classified the participant's responses on the basis of these codes. This procedure demonstrated an inter-rater reliability of 92.4% for the codes.

To test the hypotheses that individuals who neutralise will show more magical thinking, TAF-likelihood, and symptoms of OCD than those who do not neutralise, individuals were first identified as 'neutralisers' or 'non-neutralisers' according to Freeston and Ladouceur's (1997) definition of neutralising behaviour. This definition was applied to the overt and covert strategies that were recorded by participants, and the strategies were considered to be spontaneous neutralising behaviour if the behaviour (1) did not connect to the intrusive thought in a manner explained by normal causation and (2) could not be accounted for by a normal coping response (Freeston and Ladouceur, 1997). This definition was applied to the classification categories by the experimenters (Table 2). Several strategies were classified as ambiguous as the experimenters were unsure of the motivations underpinning them (strategies 10–14).

75.5% of participants used at least one strategy in response to writing out and visualising the sentence that could be classified as neutralising. These individuals were ascribed to a neutralising group, and individuals using other coping responses (including ambiguous responses) or no response were ascribed to a non-neutralising group. The modal number of strategies used by the neutralising and non-neutralising groups was 3 and 1, respectively.

Table 2
Strategies used post-TAF induction in response to the TAF induction stimulus

| Strategy | Proportion of overall strategies used (%) | No. of participants using this strategy ($n = 49$) |
|--|---|--|
| <i>(a) Spontaneous neutralising strategies</i> | | |
| 1. Do something to destroy the sentence on the paper | 25.6 | 26 |
| 2. Alter the sentence to change the meaning | 10.9 | 13 |
| 3. Visualise the/an accident, but with a less serious/positive outcome | 7.0 | 8 |
| 4. Do something to destroy the visualised image | 2.3 | 3 |
| 5. Superstitious act | 1.6 | 2 |
| <i>(b) Other coping strategies</i> | | |
| 6. Rationalise about writing out the sentence | 9.3 | 10 |
| 7. Clear minding mind/distraction | 3.9 | 5 |
| 8. Relaxation techniques | 0.8 | 1 |
| 9. Plan to do something following experiment for reassurance | 0.8 | 1 |
| <i>(c) Ambiguous strategies</i> | | |
| 10. Imagine the person involved in the accident as okay | 16.3 | 20 |
| 11. Unclassifiable | 15.5 | 14 |
| 12. Do something so no longer look at the sentence without destroying the sentence | 3.9 | 5 |
| 13. Religious strategy | 1.5 | 2 |
| 14. Do nothing | 0.8 | 1 |

Table 3
Comparison of the raw and transformed scores for the neutralising and non-neutralising groups on all measures prior to neutralisation

| | Neutralisers ($n = 37$) | | | | Non-neutralisers ($n = 12$) | | | |
|------------------------------|---------------------------|-----------|-------------|-----------|-------------------------------|-----------|-------------|-----------|
| | Raw scores | | Transformed | | Raw scores | | Transformed | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| MIS ^{a**} | 7.7 | 4.7 | 2.6 | 1.0 | 3.9 | 3.5 | 1.8 | .9 |
| TAFS-moral | 22.0 | 7.2 | 4.6 | .8 | 17.4 | 10.4 | 3.9 | 1.5 |
| TAFS-likelihood ^b | 8.8 | 7.2 | 2.6 | 1.5 | 2.9 | 2.6 | 1.5 | 1.4 |
| STAI-trait | 43.3 | 10.9 | 6.5 | .8 | 39.4 | 8.8 | 6.1 | .9 |
| PI-R total | 18.8 | 11.7 | 4.1 | 1.4 | 14.1 | 10.6 | 3.5 | 1.3 |

Note: MIS: magical ideation scale; TAFS-moral: thought-action fusion scale (TAFS)-moral subscale; TAFS-likelihood: TAFS-likelihood subscale; STAI trait: State-Trait Anxiety Inventory-trait version; PI-R: revised Padua Inventory.

^aDue to missing data, $n = 36$ in the non-neutralising group.

^bApproaching significance at $p < .05$.

** $p < .01$.

It was predicted that participants who showed spontaneous neutralising would demonstrate more magical thinking, TAF-likelihood and OCD symptoms than those who do not neutralise. The mean and standard deviations for the scores on these measures for each group are shown in Table 3.

T-tests were used to examine for significant differences between the two groups. The neutralising group demonstrated significantly greater scores on the MIS, $t(46) = 2.63$, $p = .011$ (two-tailed test), and TAFS-Likelihood, $t(47) = 2.12$, $p = .039$ (two-tailed test). No significant differences were found between the two groups for OCD symptoms, nor for TAFS-moral, depression, or trait anxiety.

Finally, group differences were examined in respect of task specific beliefs, elicited by the TAF-induction task. Using Mann Whitney *U*-tests of differences in the ratings on the VAS prior to neutralisation, we found that significantly greater scores were reported by the neutralising group for ratings of likelihood ($U = 105.0$, $p = .006$, two-tailed, $n = 49$), distress ($U = 115.0$, $p = .012$, two-tailed, $n = 49$), responsibility ($U = 97.0$,

$p = .004$, two-tailed, $n = 49$) and urge to cancel ($U = 100.0$, $p = .002$, two-tailed, $N = 50$). At an alpha level of .05 no significant differences were found between the ratings for anxiety or the wrongness of writing the sentence.

Two-tailed Wilcoxon tests demonstrated that following the neutralising opportunity both the neutralising and non-neutralising group demonstrated a significant reduction in anxiety (neutralising: $Z = -4.798$, $p = .000$, $n = 37$; non-neutralising: $Z = -2.510$, $p = .012$, $n = 13$; two-tailed tests). Both groups also demonstrated a significant reduction in the urge to do something to cancel out the effect of the sentence (neutralising: $Z = -4.994$, $p = .000$, $n = 37$; non-neutralising: $Z = -2.756$, $p = .006$, $n = 12$).

However, even after the opportunity to neutralise, the neutralising group continued to demonstrate a significantly greater urge to cancel ($U = 122.0$, $p = .02$, two-tailed, $n = 49$) and a greater feeling of responsibility should an accident occur ($U = 112.5$, $p = .011$, two-tailed, $n = 49$). The neutralising group continued to rate the likelihood of an accident occurring as greater ($U = 107.0$, $p = .007$, two-tailed, $n = 49$). There was no significant difference on any of the remaining VAS measures.

Discussion

The TAF-induction task appears to have been effective as an experimental manipulation, producing effects in an unselected group of participants, which were similar to the high TAF sample of [Rachman et al. \(1996\)](#). Participants demonstrated an increase in anxiety in response to writing out and visualising the sentence, and the anxiety and urge to cancel out the effect of the sentence reduced after a 2-minute opportunity to engage in neutralising behaviour or other coping response. TAF-type responses therefore appear to occur in the normal population. The increase in anxiety and urge to neutralise was not correlated with measures of TAF, OCD or magical thinking.

The behavioural response data suggests that neutralising is also common within the general population. A natural tendency to use neutralisation strategies without instruction was demonstrated by 75.5% of the sample. The majority of participants used neutralising strategies in conjunction with other coping responses with only three participants using solely neutralising strategies. The remaining participants used either other coping responses or no response to the induction. A large proportion of the normal sample therefore demonstrated neutralising behaviour in response to TAF-like phenomena, a finding which is at odds with the prevailing view ([Salkovskis et al., 2003](#)) that neutralising is relatively uncommon except in OCD.

The people who do neutralise in response to the task show interesting characteristics in contrast to those who do not. Those who neutralise demonstrate greater ratings for distress, responsibility, urge to cancel the effects of the sentence, and a greater likelihood of an accident occurring following the TAF-induction. This would suggest that people who demonstrate more characteristics of 'fusion' between thoughts and their content are more prone to neutralise. The two groups did not differ in the perceived moral wrongness of writing out the sentence, or levels of anxiety induced by the experimental procedure.

The neutralising group also seem to have a greater duration of response to the TAF induction, despite (or perhaps even because of) the chance to neutralise, though the groups did not differ with respect to initial levels of anxiety. After the opportunity to neutralise, both the neutralising and non-neutralising groups demonstrated significant reductions in the ratings for anxiety and urge to cancel the effects of the sentence, but the neutralising group continued to report a higher likelihood of an accident occurring, increased responsibility and an increased urge to cancel out the effects of the sentence. The data could be interpreted as merely showing that neutralising behaviour was ineffective in compensating for writing the sentence, but it would also support current cognitive theory and clinical investigation ([Salkovskis et al., 2003](#)) which suggests that neutralising functions to increase the persistence of distress. It could be that neutralising increases preoccupation with the thought, by focussing on the idea of harm and the person's responsibility for trying to prevent it. It is interesting that we have been able to demonstrate this effect in a group who do not show intrusive thoughts, or symptoms of OCD, suggesting that it is neutralising itself that makes this distress persist, rather than it being a specific feature of OCD.

The relationship between neutralising behaviour and anxiety was less clear, as the two groups showed no difference in their level of state anxiety over the course of the experiment. This may be because all the

strategies used by participants represent coping strategies in response to anxiety. The type of strategy used may be a result of a participant's preference to either use magical strategies to attempt to undo the content of the TAF thought and thereby restore a sense of control over the situation, or it might be a strategy to ameliorate the emotional response to the TAF, in other words an attempt to use rationalising, distraction or other coping techniques to reduce their distress associated with TAF. Both would reduce anxiety, whether or not the magical strategies were akin to neutralising behaviour seen in OCD (Zucker et al., 2002) and had a restorative or ameliorative function in response to the content of TAF-induction.

Magical thinking appears to be associated with neutralising behaviour. Spontaneous neutralisers demonstrated a significantly greater endorsement of magical thinking. This supports the reported association between neutralising and TAF-likelihood reported previously (van den Hout et al., 2002). However, there was no difference on the scores of the PI-R suggesting that the neutralisers and non-neutralisers did not differ in OCD symptomatology. The two groups also did not differ in their level of TAF-moral, or trait anxiety. It would appear then that magical thinking alone is associated with the use of a neutralising behaviour in response to intrusive thoughts. This supports Amir et al.'s (2001) conclusion that the fusion of thoughts and actions may be more general and not only associated with cognitive biases in OCD.

A limitation of the experimental design was the failure to record details of participant's motivations for using specific strategies in response to the induction, which was a particular problem with the 'ambiguous' strategies. The classification system had a high inter-rater reliability but was simply a topographical description of the behaviours demonstrated. An improved experimental design would record the participant's motivation for the behaviours performed. In view of the difficulties of self report of magical thinking (Subbotsky, 2001, 2004) this may be problematic, but without fuller knowledge of the motivations involved, the classification of 'neutralising' and 'non-neutralising' strategies based upon the Freeston and Ladouceur (1997) definition involves some assumptions being made. There could be errors in assuming that behaviours classified as 'neutralising' were either (1) not connected to the intrusive thought in a manner explicable by normal causation, and/or (2) could not be accounted for by a normal coping response. Further, independent raters were not used at this stage, which is a methodological shortcoming. The materials involved in the experiment were also limited, so it is possible that participants felt that there were few potential ways of responding to the TAF induction sentence, and engaged in neutralising type actions in response to the perceived demand characteristics of the experiment. Further research is necessary to determine whether different motivations underpin neutralising and other coping strategies.

Conclusion

We have argued that thought-action fusion and neutralising, which are central to cognitive models of the development and maintenance of OCD, are both related to a tendency to think magically. Our data supports a relationship between neutralising behaviour and a tendency to magical thinking. However, we have shown this phenomenon occurs in an unselected group of participants, and that those who neutralise are no higher than others in obsessive-compulsive symptoms.

One interpretation is that we should not think of magical thinking and its consequences as a stable characteristic that makes people vulnerable to OCD. Rather, it may be a relatively normal phenomenon that arises in specific situations. As TAF and neutralising occur frequently in OCD, one explanation might be that they follow from the content of obsessions, which often focus on situations involving uncontrollable threat. This type of content would tend to elicit magical thinking, which is liable to occur when we face a threat which is unpredictable, poorly understood, and uncontrollable (Zusne and Jones, 1989). In OCD it may serve to provide an illusion of control over otherwise uncontrollable events (Bolton et al., 2002).

The main caveat is that we are not sure that the neutralising seen here is actually an attempt to influence future events, rather than simply a means of managing anxiety associated with writing out a threatening sentence. It is therefore not yet clear that this paradigm is fully modelling the effects seen in OCD, and further research that focuses on the control of future consequences will be required.

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