



Modifying thought-action fusion via a single-session computerized interpretation training



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ABSTRACT

Thought-action fusion (TAF) is an important cognitive bias in various emotional disorders, especially, obsessive-compulsive disorder (OCD). TAF leads individuals to interpret the presence of unwanted mental intrusions as *morally* equivalent to acting on them, and/or increasing the *likelihood* of the feared consequence. We sought to test the feasibility of a brief computerized cognitive bias modification for interpretations (CBM-I) as a potential intervention to reduce TAF among undergraduates who reported obsessional intrusions. We also examined if the TAF-focused CBM-I can decrease participants' emotional reactions towards a variety of obsessional thoughts, including personally-relevant intrusions. Participants were randomized to (a) the TAF-incongruent condition (TAF-INC), designed to decrease TAF linked to obsessional thoughts, or (b) the TAF-congruent condition (TAF-CON), designed to render TAF-like interpretation of obsessional thoughts unchallenged. Results indicate the TAF-INC group displayed a significantly greater reduction in the severity of total TAF and TAF moral than the TAF-CON group. Reductions on TAF likelihood did not differ by group. Emotional reaction to personally-relevant obsessional intrusions was also shown to be lower after training in the TAF-INC group. Overall, this study presents preliminary data supporting the feasibility of CBM-I to be used as an effective intervention for TAF.

1. Introduction

Thought-Action Fusion (TAF) is an interpretation bias that leads individuals to place excessive significance to their thoughts, and believe their thoughts are equivalent to carrying out such actions (Salkovskis, 1985; Shafran & Rachman, 2004). There are two subtypes of TAF: Moral and Likelihood TAF (Rassin, Diepstraten, Merckelbach, & Muris, 2001a). TAF moral refers to the belief that merely having an unacceptable thought is comparable to carrying out the action (e.g. fantasizing about adultery is *as bad* as actually doing it). TAF likelihood refers to the belief that merely having a thought about a distressing event increases the likelihood that the event will occur (e.g. thinking about a house fire will actually increase the likelihood that it will come true). Research has demonstrated that TAF moral and TAF likelihood are moderately intercorrelated ($r=.44$ and $r=.32$ respectively) constructs (Rassin, Merckelbach, Muris, & Schmidt, 2001b; Shafran, Thordarson, & Rachman, 1996). TAF likelihood can be further broken down into thoughts concerning *oneself* and thoughts concerning *others*. Using non-clinical and student samples, a recent study supported a three factor structure (Bailey, Wu, Valentiner, & McGrath, 2014), incorporating TAF moral, TAF likelihood-self, and TAF like-

lihood-others. Research suggests that TAF may causally influence the development of intrusive thoughts (Rassin, Merckelbach, Muris, & Spaan, 1999). Increases in emotional distress, motivation to resist certain thoughts (i.e. thought suppression) and engagement in rituals to decrease distress (i.e. neutralization) have all been associated with holding TAF beliefs while experiencing intrusive thoughts (Abramowitz, Whiteside, Lynam, & Kalsy, 2003). The presence of strong TAF biases may predict an increase in obsessive compulsive symptoms (OC), even in undergraduate samples (Rassin, Muris, Schmidt, & Merckelbach, 2000). Even when TAF was broken down into TAF moral and TAF likelihood, these associations held, indicating that each subtype is significantly associated with OC symptoms.

In addition to the relevance of TAF for OC symptoms and obsessive compulsive disorder (OCD), TAF is a transdiagnostic cognitive error that has been observed across a number of emotional disorders characterized by distressing, unwanted, or uncontrolled intrusive cognitions, including generalized anxiety disorder (GAD; Muris, Meesters, Rassin, Merckelbach, & Campbell, 2001; Thompson-Hollands, Farchione, & Barlow, 2013), depression (Abramowitz et al., 2003; Rachman, Thordarson, Shafran, & Woody, 1995; Shafran & Rachman, 2004), disordered eating (Radomsky, De Silva,

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Todd, Treasure, & Murphy, 2002; Shafran & Robinson, 2004), schizotypy (Lee, Coughle, & Telch, 2005; Muris & Merckelbach, 2003), and schizophrenia (Kabakci, Demir, Demirel, & Sevik, 2008). Therefore, developing an effective intervention for TAF has clinical utility across a wide range of problems. This is also consistent with the recent NIH's emphasis on examining underlying transdiagnostic dimensions (the Research Domain Criteria initiative; Cuthbert, 2014).

Research evidence shows that TAF is modifiable cognitive bias. TAF was reduced among patients with OCD via cognitive behavioral therapy, even though the therapy did not directly target TAF (Rassin et al., 2001a). Experimentally inducing TAF has been demonstrated using a *sentence completion paradigm*, in which participants were asked to insert the name of a loved one into a sentence, wishing that person harm (Rachman, Shafran, Mitchell, Trant, & Teachman, 1996). This experimental manipulation resulted in participants with higher baseline TAF likelihood scores experiencing significant increases in anxiety, guilt, and feelings of responsibility, leading to neutralization behaviors. In another experimental study, undergraduates who scored highly on the TAF subscale of the Responsibility Appraisal Questionnaire (RAQ; Rachman et al., 1995), were provided a simple anti-TAF audio message: *...Often, when people have these bothersome thoughts they feel as though somehow, their thoughts will make the event more likely to happen. This way of thinking is wrong* (Zucker, Craske, Barrios, & Holguin, 2002, p. 656). This sentence completion paradigm significantly lowered TAF scores by approximately 20%, and also reduced their anxiety and their urges to neutralize, which likely occurred through disputing the erroneous nature of the cognitive bias. Additionally, Marino-Carper, Negy, Burns, and Lunt (2010) found in undergraduates with high TAF that those who had received psychoeducation regarding TAF reported at post-assessment significantly lower TAF moral scores, as well as mitigating increases in thought suppression. Altogether, experimental evidence supports that TAF is a modifiable interpretation bias.

Cognitive bias modification for interpretation training (CBM-I) has been developed to directly modify biased cognitive appraisals underlying psychopathology (Williams, Blackwell, Mackenzie, Holmes, & Andrews, 2013). Typically, CBM-I presents participants with ambiguous information, and then participants are trained to consistently endorse the designated interpretation (i.e. positive, neutral, negative). CBM-I not only has been shown to be efficacious in changing interpretation bias, but has also been well accepted by patients and reports of participant attrition are low (Clerkin & Teachman, 2011; Hayes, Hirsch, Krebs, & Mathews, 2010; Murphy, Hirsch, Mathews, Smith, & Clark, 2007; Rapee et al., 2013).

CBM-I research for OCD has used a *word completion task* in which participants imagine themselves in triggering scenarios, and then fill-in missing letters to solve a key word in the relevant scenario (Beadel, Smyth, & Teachman, 2014; Clerkin & Teachman, 2011). For example, participants in active CBM-I training are presented with an obsessional thought, and then presented with a sentence embedded with an incomplete keyword, with the purpose of normalizing the obsessional thought. An example scenario: "You and a friend are having a personal discussion. You tell her that you sometimes have bizarre thoughts about hurting people you care about; thoughts you don't really want to have. Your friend tells you this is really *nor_al*." In contrast, participants in the control condition are asked to complete the key word in-line with a TAF-consistent interpretation (i.e. the word "*we_rd*" is used instead of "*nor_al*"). This procedure has been successful in non-clinical participants with high OC symptoms in producing positive valence interpretations in active training groups, or no interpretation change in control training groups (Clerkin & Teachman, 2011; Mathews & Mackintosh, 2000; Williams & Grisham, 2013). In existing studies, CBM-I utilizing the sentence paradigm has broadly targeted OCD belief domains (i.e. perfectionism, uncertainty, responsibility, threat estimation, importance of thoughts, and control of thoughts), of which, the importance of thoughts domain is related to TAF (Beadel et al., 2014;

Clerkin & Teachman, 2011; Williams & Grisham, 2013). Yet, these studies did not measure TAF change directly, as their focus was on the change of OC symptoms. Thus, it is yet to be shown whether CBM-I can specifically reduce TAF.

Given the clinical and theoretical significance of TAF in OCD, testing CBM-I aimed at modifying TAF biases is an important preliminary step to develop an effective intervention among individuals with OC symptoms. To date, the CBM-I paradigm has not been specifically applied to target TAF. Further, there have not been any studies examining changes in TAF linked to the idiographic obsessions of participants, which could produce a more personally relevant index of change in this cognitive bias. The current study sought to examine if a brief session of computerized CBM-I can directly target and reduce TAF, and also decrease participants' emotional reactions towards obsessional intrusions. As a preliminary study, examining the impact of CBM-I on TAF modification via a minimal dose of training (a single 20-min session) would provide useful feasibility data for the development of an efficient cognitive intervention for TAF and its related psychopathologies. To this end, we randomized participants to either the TAF incongruent condition (TAF-INC), designed to decrease TAF linked to obsessional thoughts, or a TAF congruent condition (TAF-CON), designed to leave TAF-like interpretations of obsessional thoughts unchallenged. In line with findings from a recent meta-analysis (Hallion & Ruscio, 2011), we chose "negative training" as a comparison condition (TAF-CON), which is the most frequently adopted control group in CBM-I research. This approach is also likely to produce larger effect sizes (Hallion & Ruscio, 2011), which is important given the early stage of current CBM-I research on TAF, in order to sensitively detect a therapeutic signal of the novel TAF-focused training. We hypothesized that after training the TAF-INC group would display a significantly lower level of (1) TAF severity and (2) emotional distress associated with obsessional intrusions, compared to the TAF-CON group.

2. Method

2.1. Participants

The study recruited undergraduates (aged 18 or older) who reported the presence of obsessional intrusions on the Obsessing Subscale (scoring 1 or higher) of the Obsessive-Compulsive Inventory – Revised (OCI-R; Foa et al., 2002). Three hundred and eighty undergraduates completed an online prescreen containing the OCI-R, 133 were eligible and invited to participate, and 69 consented. Two participants withdrew before finishing the pre-training assessment (one for lack of time and interest, and the other requested to stop because she became too distressed during the semi-structured diagnostic interview while discussing a past depressive episode). Of the 67 who completed a pre-training assessment, 33 were allocated to the TAF-INC group and 34 to the TAF-CON group. The mean age of participants was 23 years (SD=6.94), and participants were predominately female (75%). Further participant details are provided in Table 1.

2.2. Measures

The *Thought-Action Fusion Scale (TAFS; Shafran et al., 1996)* is a widely-used 19-item self-report measure designed to assess TAF severity on a 5-point scale, from 0 (*Disagree strongly*) to 4 (*Agree strongly*), consisting of 12 moral (TAFS-M) and 7 TAF likelihood questions. The content of the 7 TAFS likelihood items contain 3 likelihood-self (TAFS-LS) and 4 likelihood-other (TAFS-LO) items. Higher TAFS scores are indicative of higher levels of TAF biases (Shafran et al., 1996). The TAFS total and its three subscale scores were used as primary outcome indices in the current study.

The *Yale-Brown Obsessive Compulsive Scale Checklist (Y-BOCS*

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