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Differential effects of word-repetition rate on cognitive defusion of believability and discomfort of negative self-referential thoughts post-intervention and at one-month follow-up.

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Abstract

Objective: The word repetition technique is used in Acceptance and Commitment Therapy as a method of facilitating cognitive defusion from distressing thoughts. The present study conducted a randomised trial to manipulate the rate of word repetition and evaluate its impact on the efficacy of cognitive defusion. Method: Thirty-two participants repeated a self-chosen negative self-evaluative word for 30 seconds at the rates of one word per 0.5-, 1-, or 2-seconds. Visual analogue scales were used to measure the associated levels of Believability and Discomfort at pre- and immediately post-repetition, and one month later. Results: Both Believability and Discomfort were significantly reduced immediately after word repetition in the 0.5-seconds and 1-second conditions. There was a significantly greater reduction in Discomfort in the 1-second condition in comparison to the 2-second condition. The 1-second condition alone maintained significant reductions in both Believability and Discomfort at one-month follow up. Conclusion: Differences in the cognitive defusion of distressing thoughts appear to be influenced by word repetition rate with repetition rates of one word per 0.5- and 1-seconds somewhat more effective for treating distressing private experiences associated with problem words.

Keywords: Acceptance and Commitment Therapy, Cognitive defusion, word-repetition technique, psychological flexibility.

Introduction

Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999; 2011) has quickly gained prominence as a progressive acceptance and mindfulness-oriented cognitive and behavioral therapy, with studies supporting its efficacy across a range of mental health problems including depressive and anxious symptomatology (Losada et al., 2015), mixed anxiety disorders (Arch et al., 2012), social phobia (Craske et al., 2014), and aggressive behaviour (Zarling, Lawrence, & Marchman, 2015). Rather than focusing on directly changing psychological events, ACT works with the function of those events to alter the individual's relationship to them (Hayes, Pistorello, & Levin, 2012). It integrates several psychotherapeutic techniques, some of which are borrowed from other approaches to psychotherapy, to combine practical behavioral techniques with experiential exercises, metaphors, and logical paradoxes to encourage and develop psychological flexibility in its users (Zettle, 2007). One such technique designed to increase psychological flexibility that is widely employed in ACT is the word-repetition exercise, initially developed by Titchener (1910), and it is the focus of the current paper. In the word-repetition exercise, a problematic or distressing word is repeated aloud for a period of time and is intended to lead to a process of cognitive defusion with that particular word, in that the client no longer believes the word to be literally true of him or her.

Psychological flexibility broadly refers to a state of being fully present in the moment (see Hayes, Luoma, Bond, Masuda, & Lillis, 2006). As an example, psychological flexibility involves the capacity to accept various states of unwanted or undesirable internal psychological distress (e.g., depressive symptomatology, feelings of anxiety). Gillanders et al. (2014) proposed that some people cognitively *fuse* with negative thoughts in that they

literally believe them to be true and are influenced by their constituent words regardless of how accurately they evaluate the object of their focus. This is a significant barrier to a state of psychological flexibility and is referred to as cognitive fusion. Indeed, Blackledge (2015) noted that distressing or counterproductive thoughts can be so compelling that we take them literally without even realising they are thoughts at all.

A potential solution that prevents individuals from rigidly adhering to these verbal beliefs and facilitates a state of psychological flexibility is *cognitive defusion*. Cognitive defusion, one of the six core processes of the ACT model, aims to establish awareness of thinking as an ongoing process and of the functions of the products of such thinking (Luoma & Hayes, 2009) by providing techniques to influence the effects of distressing or counterproductive thoughts by altering the context in which they are experienced (e.g., Deacon, Fawzy, Lickel, & Wolitzky-Taylor, 2011; Healy, Barnes-Holmes, Barnes-Holmes, Keogh, & Wilson, 2008; Hinton & Gaynor, 2010). Hooper and McHugh (2013) found that cognitive defusion techniques effectively reduced the negative psychological content associated with learned helplessness, and elicited superior outcomes in comparison to distraction techniques. Pilecki and McKay (2012) compared cognitive defusion techniques and distraction techniques in reducing the negative emotional arousal associated with a distressing stimulus. For this they employed an emotional Stroop task (Macleod, 1991), and similarly found that cognitive defusion techniques outperformed distraction techniques.

Word Repetition

The most commonly cited cognitive defusion technique in the ACT literature is the word-repetition method. This exercise involves excessive repetition of a problem word that has accompanying distress (e.g., De Young, Lavender, Washington, Looby, & Anderson, 2010; Masuda, Hayes, Sackett, & Twohig, 2004; Masuda et al., 2010; Ritzert, Forsyth, Berghoff, Barnes-Holmes, & Nicholson, 2015). Indeed, within the ACT literature it is often

referred to colloquially as the *milk, milk, milk* exercise (e.g., Hayes et al., 1999). This word repetition technique builds upon early research by Titchener (1910), who observed that the excessive repetition of a word causes it to lose both its familiarity and its associated meaning – an effect known as semantic satiation. In other words, Titchener argued that when a word is said aloud over and over again the context required for the word to have literal meaning is removed. Blackledge (2015) proposed that the excessive repetition of a problem word contravenes a rule essential for the success of language in that by engaging in the abnormal linguistic act of continually repeating the same word the word becomes meaningless.

Masuda et al. (2004) first examined the word repetition technique as a defusion intervention. Participants generated one word that represented a negative self-referential thought, and using a between-groups design, they either repeated this word or distracted/suppressed thinking word for a set period of time. Of the three conditions, word repetition was the most effective in reducing the negative emotional impact and believability of thoughts to which each participant related personally. Further research also demonstrated the superiority of the word repetition technique to a thought distraction and a general distraction task in reducing both discomfort and believability of emotionally charged self-relevant negative thoughts (Masuda et al., 2010).

Studies researching the exact parameters of the word repetition technique that lead to maximal reductions in believability and distress of negative thoughts are rather limited. Such information will be useful in enhancing word-repetition techniques to optimise cognitive defusion related outcomes and psychological flexibility (Hayes, Levin, Plumb, Vilaridarga, & Pistorello, 2013). This critical issue was highlighted by Arch and Craske (2008) who acknowledged that the published manuals for ACT at the time (e.g., Eifert & Forsyth, 2005; Hayes et al., 1999; Luoma, Hayes, & Walser, 2007) were somewhat lacking in relevant procedural details for therapists to conduct interventions with a high degree of consistency

across clients. For instance, Masuda et al. (2009) examined whether durations of word repetition interventions were an important functional component. Consistent with previous research, word repetitions with single-word summaries of a negative self-referential thought reduced both believability and discomfort. Importantly, results also showed that levels of discomfort had significantly reduced after 3 seconds of repetition, but believability levels did not significantly reduce until 20 seconds of repetition. Masuda et al. concluded that the systematic manipulation of duration is evidence that word repetition is a functionally important component of cognitive defusion treatments as well as quantifiably specifiable. Moreover, their findings suggest that discomfort and believability are not functionally identical and should be measured separately.

However, published research to date has not explored the methodological manipulation of word repetition rate and its effect on cognitive defusion. Indeed, Blackledge (2015) stated that the words could be repeated as quickly as possible or even as slow as two seconds per word; this indicates that there is still a degree of uncertainty and vagueness around the administration details of the word-repetition cognitive defusion technique that is not helpful for clinicians looking for clear empirically-based guidelines. Such information first will be useful in enhancing word-repetition techniques to optimise cognitive defusion related outcomes and psychological flexibility. For instance, Masuda et al. (2009) examined whether durations of word repetition interventions were an important functional component but there is no information regarding the rate of repetition. A question remains: Is faster repetition better than slower repetition? An empirical investigation into the functional conditions underlying word repetition exercises might have important theoretical implications. Indeed, the question exists; Why are cognitive defusion effects observed? A differential impact of speed might shed light on this question. For example, fast repetition leads to more presentations and, thus, more exposure to extinction learning. Therefore,

without empirical research to inform otherwise, the convention of much of the literature on word repetition, such as that mentioned above, is to cite the early work on word repetition of (Titchener, 1910) before using a technique of rapid word repetition.

However, an explicit rationale for word repetition at a *rapid* rate (e.g., Masuda et al., 2004) appears to be absent. If repeating a word causes it to lose its meaning, then perhaps repeating it faster provides greater facilitation of the experience required for disassociation through more frequent exposure to it. Whereas Masuda et al. (2004) have proposed that the word-repetition technique alters the functional context in which the negative thoughts or private events are experienced, it could, perhaps, be the case that the potency of the word-repetition technique may actually lie in more traditional and well-established extinction processes in psychotherapy. For example, Vervoort, Vervliet, Bennett, and Baeyens (2014) recently found that exposure techniques helped extinguish fear of a conditioned fear stimulus via an extinction process but that derived extinction processes which targeted stimuli that were related to the conditioned fear stimulus were not effective in extinguishing fear of the conditioned fear stimulus itself (also, see Roche, Kanter, Brown, Dymond, & Fogarty, 2008). Thus, repeated exposure to the stimulus inherent in the word-repetition technique may lead to extinction of the psychological responses previously associated with that stimulus, and may be more potent than an intervention that alters the functional context alone.

The dramatic rate of word repetition would also would appear to contravene the *rules* essential for the success of language (Blackledge, 2015) in two ways: i) the repetition of a single word and ii) speech at an abnormal rate. If all of these conclusions are accurate, then the repetition of a single word at a rapid rate could be expected to result in greater levels of disassociation of meaning than its repetition at a more natural rate. In turn, an extremely slow rate of word repetition should result in greater levels of disassociation than repetition at a rate in between, which represents a more natural rate of speech. Thus, a graph plotting the

reduction in associated word meaning against the rate of word repetition could be expected to form an inverted V-shape, with a more natural rate of speech at the top point of the inverted V indicating the least reduction.

The Present Study

The current pilot study aims to provide clinicians with exigent and pressing technical details for the parameters in conducting a key cognitive defusion intervention with clients based on empirical data. Thus, the aim of the present study is to methodically manipulate the rate of word repetition to assess its impact on the efficacy of cognitive defusion. It employs a randomised design in comparing the Believability and Discomfort associated with self-chosen negative self-evaluative words before and after their repetition for 30 seconds at the rates of one word every 0.5, 1, or 2 seconds. It is expected that word repetition at a rate of one word per 0.5 seconds will result in significantly greater reductions in Believability and Discomfort than word repetition at a rate of both 1-second and 2-seconds. Furthermore, it is predicted that word repetition every 2-seconds will result in significantly greater reductions in Believability and Discomfort than word repetition at one word per second. Finally, it is predicted that such reductions in Believability and Discomfort will be enduring at a one-month follow-up test.

Method

Participants

Thirty-two participants ($F = 24$) were recruited within the University of X's Department of Psychology (age range= 19 – 46 years; $M = 23.69$ years, $SD = 6.48$ years) and offered course credit for their participation. Ethical approval was obtained from the University of X Research Ethics Committee. Each participant provided written consent before proceeding and had the right to withdraw at any point without providing a reason for doing so. At Time 1 and Time 2, the 0.5-second Condition had 11 participants, the 1-second Condition had 11

participants, and the 2-second Condition had 10-participants. One participant did not complete the One-month Follow-Up stage, which reduced the 0.5-second condition to 10 participants.

Design

The study incorporated both laboratory-based research and an online questionnaire survey. It was a mixed-model design. Participants uttered a negative self-evaluative word at a rate of 2 words per second (level 1), 1 word per second (level 2) or 0.5 words per second (level 3). The impact of repetition rate on self-reported *believability* and *discomfort* was determined across *time*. This within-subject factor (time) had three levels: (T1) pre-intervention baseline, (T2) immediately post-intervention, and at one-month follow-up (FU). Believability was defined as the accuracy of a negative self-evaluative word's evaluation. Discomfort was defined as the amount of emotional discomfort associated with the word.

Measures

Visual Analogue Scales (VAS; Wewers & Lowe, 1990). A 100mm horizontal line with anchoring descriptors at either end was used to measure Believability and Discomfort. These were completed via a computer screen, and anchoring descriptors were: "0 = Not at all believable" to "100 = Very believable" and "0 = Not at all uncomfortable" to "100 = Very uncomfortable," respectively. A question was presented above each VAS: i) "How believable is the word?", and ii) "How uncomfortable is the word for you?", respectively.

Optonome

The optonome employed was a metronome timer application for Android platforms on a Dell Inspiron laptop that provided a small click sound. This was set to a rate of one click every 0.5 secs, 1-sec, or 2-secs (according to the participant's assigned condition).

Procedure

Each research session took around 15-30 minutes, with participants completing an online visual analogue assessment follow-up after one month. After reading the information sheet and providing written consent participants completed a demographic questionnaire to record their age, gender, and occupational status. Participants picked a number out of a hat for random assignment into one of three groups defined by the operationalised independent variable: word repetition rate. Participants then generated a negative self-evaluative word specifically relating to themselves that had concordant distressing private experiences (e.g., *loser*). The following words were chosen, in no particular participant order: disappointing, awkward, stupid, weak, stupid, fat, fat, slut, psycho, over-thinker, fat, worthless, pessimistic, angry, stupid, useless, failure, anxious, selfish, greedy, weak, stupid, unworthy, lonely, idiot, failure, boring, fat; failure, procrastinator, failure, and short-tempered. Subsequently, participants completed the VAS to measure the Believability and Discomfort associated with their chosen word.

After participants selected self-evaluative words, a non-evaluative word comprising equal numbers of syllables (e.g., *table*) was agreed upon to use in the following practise phases. Participants repeated the non-evaluative words out loud for 30 seconds in time with the optonome, which provided a minimally-intrusive visual rhythmic reference. The researcher monitored and advised on their repetition rates and loudness as appropriate. Participants were provided with a visual focal point of an 'X' on a piece of card, and were encouraged to switch their concentration toward this as the required rhythm of their word repetition rates became more internalised and less dependent on the external optonome cue. The aim was for participants to dedicate their attention to the word and the act of repeating it, rather than expending their cognitive effort on keeping in time with the external source.

Once participants confirmed that they were familiar with what was required, and felt comfortable with their internal rhythm, they completed the following experimental phase.

This time participants repeated their chosen self-evaluative word out loud for 30 seconds, at the same word repetition rate and loudness as the practise phase. The optonome was again provided for participants but as a more peripheral visual reference in case they began to lose their rhythm. Upon completion participants were administered a new VAS to measure the Believability and Discomfort associated with their chosen word. After one month participants were emailed a link to an online Qualtrics (Qualtrics, Provo, UT, 2013) survey containing a VAS to assess for any long-term change in Believability and Discomfort, followed by a Debrief sheet and opportunity to email feedback comments/questions.

Data Management

Data analyses were planned as follows. A repeated measures MANOVA was conducted to examine differences in Believability and Discomfort across Time 1, Time 2, and One-Month Follow-up (i.e., Time 3), with follow-up mixed ANOVAs along with univariate between-and within subjects ANOVAs to examine main and interaction effects. Paired-samples t-tests were employed to further examine significant differences found in the ANOVAs, comparing Time 1 and Time 2, and Time 1 and One-month Follow-up across the three conditions, with appropriate Bonferroni corrected alpha levels. All assumptions for homogeneity of variance, sphericity, and covariance were met.

Results

The levels of Believability and Discomfort associated with self-chosen negative self-evaluative words were measured before and immediately after the words were repeated for 30 seconds at the rate of one word per 0.5, 1, or 2 seconds (see Table 1). A repeated-measures MANOVA using Pillai's Trace found there was no significant multivariate effect of word repetition rate, $V = .04$, $F(4, 58) = .28$, $p = .887$, $\eta^2 = .02$, $d = .14$, although there was a significant multivariate effect of time, $V = .60$, $F(2, 28) = 20.87$, $p < .001$, $\eta^2 = .60$, $d = 1.22$.

There was no significant multivariate interaction between word repetition rate and time, $V = .23$, $F(4, 58) = 1.92$, $p = .119$, $\eta p^2 = .12$, $d = .36$.

Believability

There was no significant interaction between word repetition rate and time on Believability, $F(2, 29) = .50$, $p = .612$, $\eta p^2 = .03$, $d = .19$. A univariate between-groups ANOVA found no significant effect of word repetition rate on Believability, $F(2, 29) = .422$, $p = .660$, $\eta p^2 = .03$, $d = .17$. A further univariate within-groups ANOVA found a significant effect of time on Believability, $F(1, 29) = 24.15$, $p < .001$, $\eta p^2 = .45$, $d = .91$. Paired-samples t -tests using a Bonferroni corrected alpha of .017 were conducted to compare Believability between Time 1 and Time 2 within each word repetition rate condition. Believability was significantly reduced from Time 1 to Time 2 (see Figure 1) across all three conditions: 0.5-second Condition $t(10) = 2.53$, $p = .015$, $d = 1.46$, -10.05 , 95% CI [-18.89 to -1.20]; 1-second Condition $t(10) = 3.32$, $p = .004$, $d = 1.09$, -16.23 , 95% CI [-27.12 to -5.34]; and 2-second Condition $t(9) = 2.62$, $p = .014$, $d = 0.84$, -12.15 , 95% CI [-22.63 to -1.67].

Paired-samples t -tests using a Bonferroni corrected alpha of .017 were conducted to compare Believability at Time 1 and one-month Follow-up within each word repetition rate group. Believability was significantly reduced between Time 1 and One-month Follow-up (see Figures 1 and 3) for the 1-second Condition, $t(10) = 3.80$, $p = .002$, $d = 1.17$, -23.00 , 95% CI [-36.49 to -9.51], and for the 2-second Condition, $t(9) = 3.58$, $p = .003$, $d = 1.16$, -20.30 , 95% CI [-33.11 to -7.49], but was not significantly reduced for the 0.5-second Condition $t(9) = 1.37$, $p = .102$.

Discomfort

There was a significant interaction between word repetition rate and time on Discomfort, $F(2, 29) = 3.59$, $p = .042$, $\eta p^2 = .20$, $d = .50$. A one-way between-subjects ANOVA found no significant between-subjects effect of word repetition rate on Discomfort,

$F(2, 29) = .002, p = .998, \eta p^2 = .00, d = .01$, but there was a significant one-way within-groups ANOVA effect of time on Discomfort, $F(1, 29) = 39.29, p < .001, \eta p^2 = .58, d = 1.16$. Bonferroni post-hoc analysis revealed that word repetition at one word per 1-second elicited significantly greater reductions in Discomfort ($M = -35.82, SD = 19.88$) than word repetition at one word per 2-seconds ($M = -11.35, SD = 21.53, p = .038$).

Paired-samples *t*-tests using a Bonferroni corrected alpha of .017 were conducted to compare Discomfort at Time 1 and Time 2 within each word repetition rate condition. Both the 0.5-second, $t(10) = 3.49, p = .003, d = 1.08, -22.91, 95\% \text{ CI } [-37.53 \text{ to } -8.29]$, and 1-second, $t(10) = 5.97, p < .001, d = 2.00, -35.82, 95\% \text{ CI } [-49.18 \text{ to } -22.46]$, word-repetition rates significantly reduced Discomfort from Time 1 to Time 2. However, the reduction in Discomfort in the 2-second Condition from Time 1 to Time 2 (see Figure 2 and Figure 4) was not significant, $t(9) = 1.67, p = .065, d = 0.53, -11.35, 95\% \text{ CI } [-26.75 \text{ to } 4.05]$.

Paired-samples *t*-tests using a Bonferroni corrected alpha of .017 were conducted to compare Discomfort at Time 1 and One-month Follow-up within each word repetition rate group. Word repetition at rates of both 0.5-seconds, $t(9) = 2.89, p = .009, d = 0.91, 26.25, 95\% \text{ CI } [-46.80 \text{ to } -5.70]$, and 1-second, $t(10) = 4.31, p < .001, d = 1.30, -31.91, 95\% \text{ CI } [-48.39 \text{ to } -15.42]$, significantly reduced Discomfort from Time 1 to One-month Follow-up (see Figure 4). However, with Bonferroni corrected alpha, there was no significant reduction in Discomfort from Time 1 to One-month Follow-up for the 2-second Condition, $t(9) = 2.47, p = .018, d = 0.80, -14.30, 95\% \text{ CI } [-27.41 \text{ to } -1.19]$.

In summary, Believability was significantly reduced immediately after 30 seconds of repetition at the rates of one word per 0.5-second, 1-second, and 2-seconds (see Figure 1), whereas Discomfort was significantly reduced immediately after 30 seconds of repetition at the rates of one word per 0.5-second and per 1-second, but not at the rate of one word per 2-seconds (see Figures 2 and 4). The results showed that repetition at one word per 1-second

led to larger within-group reductions in Believability and Discomfort than repetition at one word per 0.5-second. Furthermore, the 1-second Condition led to non-significantly larger reductions in Believability and significantly larger reductions in between-group Discomfort than repetition at one word per 2-seconds (see Figures 3 and 4). Moreover, the 1-second Condition was the only condition with significant reductions in both Believability and Discomfort after one month (see Figure 4).

Discussion

It was proposed, based on increased opportunity for exposure to extinction processes (Vervoort et al., 2014) that word repetition at one word per 0.5-seconds would result in significantly greater reductions in Believability and Discomfort than word repetition at both one word per 1-second and one word per 2-seconds. This was not supported as the 0.5-second Condition resulted in the least within-groups reduction in Believability. Furthermore, it was expected that, based on Blackledge's (2015) analysis, word repetition at one word per 2-seconds would result in significantly greater reductions in Believability and Discomfort than repetition at one word per second. This was not supported either as the 2-second Condition showed the least reduction in Discomfort across the three word-repetition rates, and indeed, the opposite was found as the 1-second Condition produced significantly greater between-group reduction in Discomfort than the 2-second Condition. The final proposal was that the reductions found immediately after word repetition would be enduring at one-month follow-up. This was partially supported as Believability was significantly reduced in the 1-second and 2-second conditions but not in the 0.5-second Condition. Discomfort was significantly reduced in the 0.5-second and 1-second conditions, but not in the 2-second Condition.

Taken together, the results of this study support the use of word repetition as an effective technique for reducing the distressing private experiences associated with problematic self-referential evaluative words (Blackledge, 2015; Masuda et al., 2004; 2009).

Furthermore, they indicate that a single 30-second session of word repetition can have enduring effects that remain present one month later. This study supports both the observation that excessive word repetition can lead to disassociations of word meaning (Titchener, 1910) and the use of this technique by ACT to facilitate cognitive defusion (Blackledge, 2015; Hayes, et al., 2011).

The principal aim of this study was to assess the impact of word repetition rate on cognitive defusion efficacy. The results suggest that the rate of word repetition influences the reduction of distressing private experiences associated with problem words. One prediction, following the logic of Blackledge (2015) was that reductions in Believability and Discomfort would form inverted V-shaped graphs when plotted against the rate of word repetition, with the 1-second condition at top of the inverted V indicating the smallest amounts of reduction. V-shaped graphs did emerge; however, they were converse with repetition at one word per 1-second at V bottom point, indicating the largest reductions in both Believability and Discomfort. Furthermore, only the 1-second condition maintained significant reductions in both Believability and Discomfort after one month.

Based upon the analysis of Blackledge (2015), it might be expected that word repetition at the rate of one word per 1-second should result in the smallest reductions in both Believability and Discomfort due to it potentially retaining too much meaning of the word (Blackledge, 2015). This assumption was not supported by the current findings. The alternative prediction was that, rather than a V-shaped graph, based on extinction processes (e.g., Vervoort et al., 2014), a linear graph would be observed in that repetition at a rate of one word per 0.5 second would provide the greatest reductions in Believability and Discomfort (i.e., consistent with Masuda et al., 2004; Masuda et al., 2010; Ritzert et al., 2015), with systematically smaller reductions in turn for the 1-second and 2-second conditions. However, the results from the present study found that this 0.5 second Condition

resulted in the smallest within-group reductions in Believability, both immediately after repetition and at one-month follow-up; thus, this assumption also appears inaccurate.

The reasons for the present findings are unclear. If relational framing behavior (see Relational Frame Theory; Hayes, Barnes-Holmes, & Roche, 2001) leads us to cognitively fuse with a single and specific problematic lexical stimulus (Blackledge, 2007), then perhaps maintaining an authentic form of that word during repetition would help to cognitively process the word and its associations. In line with the ACT conceptualization of defusion, the purpose is to expose the client to the aversive stimulus and also to broaden its response functions by remaining in its presence while continuing to discriminate the stimulus itself. If the stimulus is altered in form by overly rapid repetition sufficiently that it is no longer effectively the same stimulus (e.g., it no longer sounds exactly like the original stimulus upon each iteration) then the benefits of the defusion exercise may be lost (see Vervoort et al., 2014). Indeed, at this point the defusion exercise may begin to operate as a distraction technique, which we would expect to be less effective than defusion as a covert exposure based technique that likely relies at least partially on extinction processes. Interestingly, Pilecki and McKay (2012) emphasised that cognitive defusion is a cognitively complex process and likely best executed by repeating a problem word with clarity and accuracy rather than in its mutated form. Thus, the current findings suggest that word repetition may in fact be less effective at high speeds unless the problem word can be reproduced accurately and continue to be discriminated upon each iteration.

It should be acknowledged, however, that reduction in discomfort or psychological distress associated with negative or problematic thoughts is not typically a direct target for ACT treatments *per se*. Indeed, the overarching goal of cognitive defusion is to reduce the believability of negative thoughts. However, while acknowledging that reducing discomfort is not a primary target for ACT interventions it must also be noted that many studies using

cognitive defusion techniques also measure levels of self-reported discomfort as an additional indicator of the relative success of those techniques (e.g., Masuda et al., 2009, 2010), and as such, Discomfort was assessed in the present study to be consistent with previous research in this area. For example, Larrison, Hooper, Osborne, Bennett, and McHugh (2015) found similar levels of reduction in discomfort, albeit with an alternative cognitive defusion technique.

It should be clear that the aim of the present study was not to examine or elucidate the process of cognitive defusion, but rather to define cognitive defusion as a set of therapeutic protocols and examine the relative merits of one of those protocols (i.e., the word-repetition technique). The underlying process behind cognitive defusion is little understood, and debate over current understanding of a number of key terms or processes in the ACT model is ongoing (e.g., see Barnes-Holmes, Hussey, McEnteggart, Barnes-Holmes, & Foody, 2016 for a detailed discussion). While the goal of the present study was not to explicitly examine cognitive defusion as a process, the current work could potentially reveal useful information regarding defusion as a process. It is generally the case that processes are defined in three ways. The first is functionally, and studies such as these provide new functional information about how defusion protocols work. For example, it could be useful in showing functional equivalence or differences in the protocols. The second is mechanistically. These kinds of studies might give new information as to the underlying mechanisms in cognitive defusion (e.g., see also Barrera, Szafranski, Ratcliff, Garnaat, & Norton, 2016). One of these could be extinction, but others are also possible such as counterconditioning or attentional modification. Thirdly, a process could be implementational or organic but admittedly our current study does have much to say about that aspect.

Limitations

The current study was arguably underpowered, and a large sample of around 30 or more per condition might provide sufficient power to avoid a Type II error (Wilson VanVoorhis & Morgan, 2007). Importantly, however, the sample size did not impact the within-subjects analysis with each of the significant outcomes also having large effect sizes. This suggests that statistical power was in fact achieved for some analyses by the large impact of the independent variables. The present study relied on an analog sample, therefore limiting generalisability of findings somewhat.

Methodologically, the current study sought exclusive reliance on self-report measures, rather than more objective physiological responses or overt behavioral responses (e.g., operant avoidance of particular word stimuli). From an ACT perspective, Discomfort and Believability are distinct functional processes, and it is difficult to directly assess these stimulus functions using self-report alone (Masuda et al., 2010). Future research could include more objective or overt measures of post-defusion behavioral change. For example, behavioural approach tests (BATs) could be employed, with the *perceived-threat behavioral approach test* (PT-BAT; Cochrane, Barnes-Holmes, & Barnes-Holmes, 2008) a potentially useful overt index of post-defusion avoidance behavior. Moreover, similar preparations could be adopted such as the reductions in avoidance rates observed in some studies of generalised laboratory conditioned fear and avoidance (e.g., Dymond, Schlund, Roche, De Houwer, & Freegard, 2012). With such overt behavioral measures it should be possible to examine if declines in rates of avoidance responding in the presence of a particular stimulus or set of stimuli could be observed even if the original level of intensity of aversion of the stimulus or stimuli is maintained, which might be commensurate with ACT outcome targets.

Future Research

The findings of the current study suggest that a *normal* rate of word repetition might facilitate larger and more enduring reductions in distressing private experiences than rapid

word repetition. Therefore, the most compelling opportunity for future research would appear to involve the comparison of the 0.5-seconds word repetition rate with the 1-second word repetition rate in greater depth. While the VAS used to measure the DVs are highly subjective (Wewers & Lowe, 1990), they could be retained in future studies because they are easy to administer and quick to complete. However, future research could incorporate an objective measure such as an emotional Stroop task (Macleod, 1991) to complement the subjective measures. This addition would provide an indirect measure of the emotional valence of problem word stimuli, pre- and post-intervention. While the current study was designed as a laboratory-based investigation into the effect of word-repetition rate in defusion exercises in general populations, it may be prudent for future studies to check whether or not these effects apply within clinical populations. It may well be that these effects are either enhanced or even undermined depending upon how the well-entrenched responses to emotional distress exhibited by clinical patients interacts with the experimental variables. Such basic research into ACT methods and processes and that is conducted in clinical contexts is in poor supply (see Craske et al., 2014). Future studies also would benefit from employing a control group that repeats a neutral word or completes a distraction task instead of repeating a problem word. The addition of such a control group would provide a baseline measurement for the effect of time alone on measures of Discomfort and Believability, and help to improve the reliability of statistical analyses.

Conclusion

The present pilot study was the first to evaluate the impact of word repetition rate on the efficacy of cognitive defusion. The outcomes support word repetition as an effective technique to reduce the distressing private experiences associated with problematic evaluative words and indicate that a single 30-second session of word repetition can have enduring effects that are present one month later. The 0.5-second word repetition rate resulted in the

smallest within-groups reductions in Believability, both immediately after repetition and one month later, despite most closely representing rapid word repetition which is most well-supported by previous literature (e.g., Masuda et al., 2004; Masuda et al., 2010). The 1-second word-repetition rate significantly reduced reported Discomfort compared to the 2-second word-repetition rate. The outcomes of the present study do not suggest that rapid word repetition is ineffective, nor do they suggest that repetition at a more natural rate is conclusively more effective. However, they do suggest that we should not routinely assume that rapid word repetition is the most effective technique of reducing the distressing private experiences associated with problem words. Indeed, this study highlights the potential to improve word repetition as a technique, and ACT therapeutic interventions more generally, imploring that further research continues to assess the impact of word repetition rate on cognitive defusion efficacy.

Compliance with Ethical Standards:

Funding: This research did not receive any grant funding.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants in the study.

Conflict of Interest: On behalf of all authors, the corresponding author states there is no conflict of interest.

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Table 1

Mean Believability and Discomfort rating scores across the three conditions (0.5 s, 1 s, 2s) at the three time points (Time 1, Time 2, and 1-month Follow-up). Standard error in parentheses.

Time	Condition	Believability	Discomfort
		Mean (SE)	Mean (SE)
Time 1	0.5 s	62.33 (3.87)	74.77 (6.49)
	1 s	67.36 (2.74)	81.09 (4.60)
	2 s	69.30 (5.84)	69.40 (5.06)
Time 2	0.5 s	52.18 (2.72)	51.86 (7.76)
	1 s	51.14 (5.14)	45.27 (7.48)
	2 s	57.15 (5.11)	58.05 (6.39)
1-month Follow-up	0.5 s	54.40 (6.57)	46.00 (6.62)
	1 s	44.36 (4.66)	49.18 (4.62)
	2 s	49.00 (7.12)	55.10 (6.45)

Figure 1. Mean Believability through Time 1 (T1), Time 2 (T2), and one-month Follow-up (FU) by Word Repetition Rate.

Figure 2. Mean Discomfort through Time 1 (T1), Time 2 (T2), and one-month Follow-up (FU) by Word Repetition Rate.

Figure 3. Mean Believability change between Time 1 (T1) and Time 2 (T2), and Time 1 (T1) and one-month Follow-up (FU) by Word Repetition Rate.

Figure 4. Mean Discomfort change between Time 1 (T1) and Time 2 (T2), and Time 1 (T1) and one-month Follow-up (FU) by Word Repetition Rate.

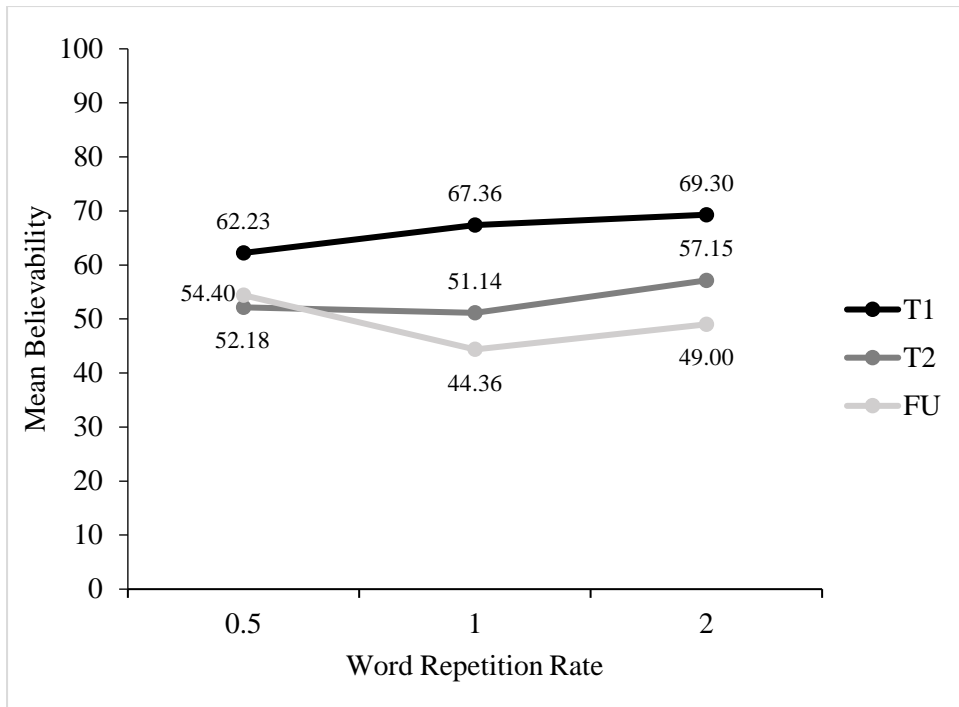


Figure 1

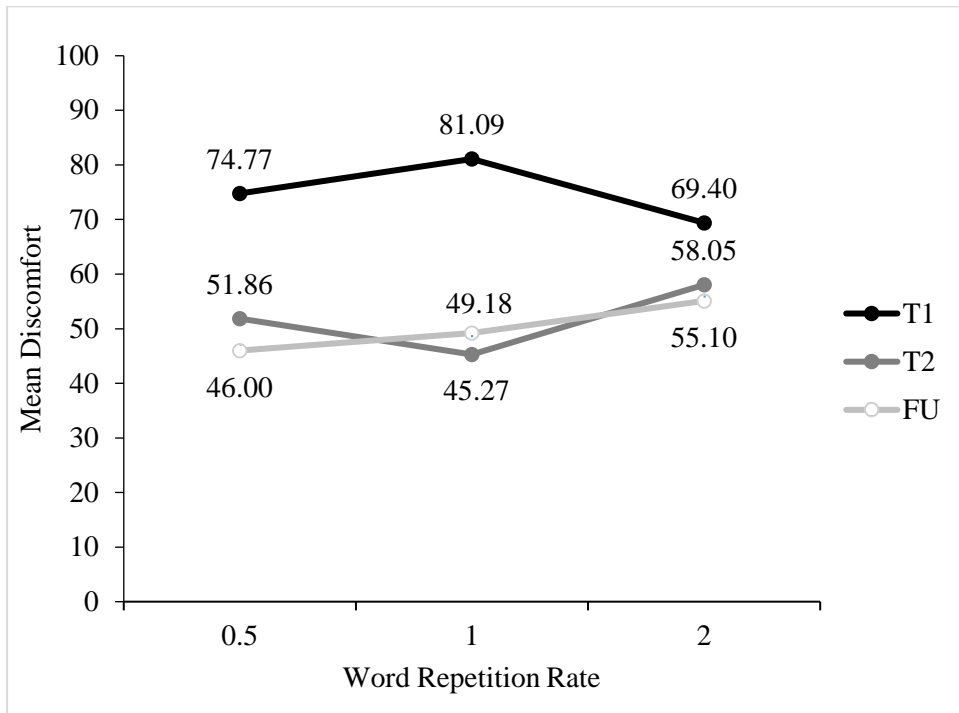


Figure 2

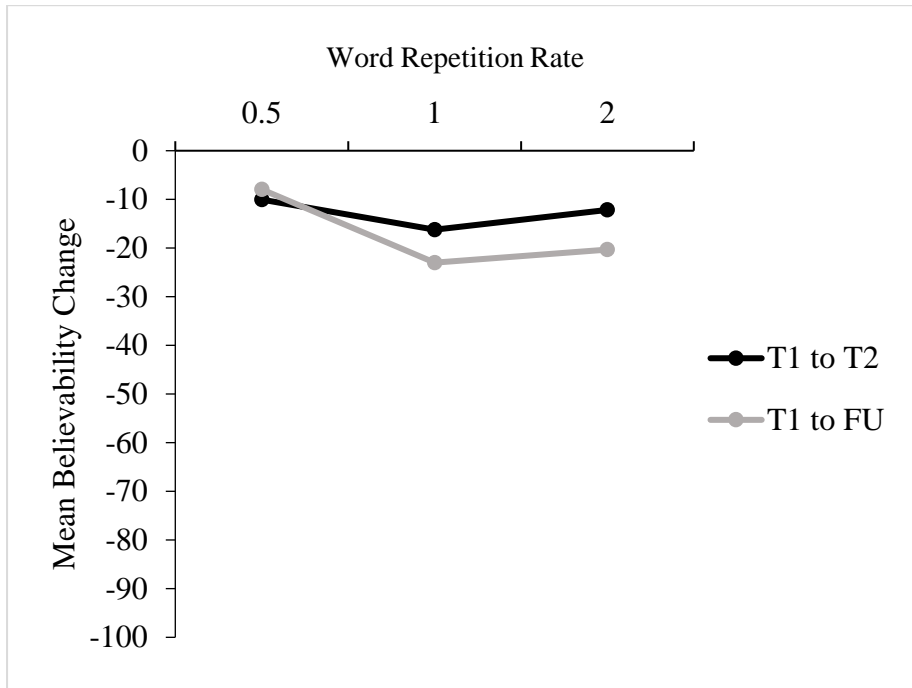


Figure 3

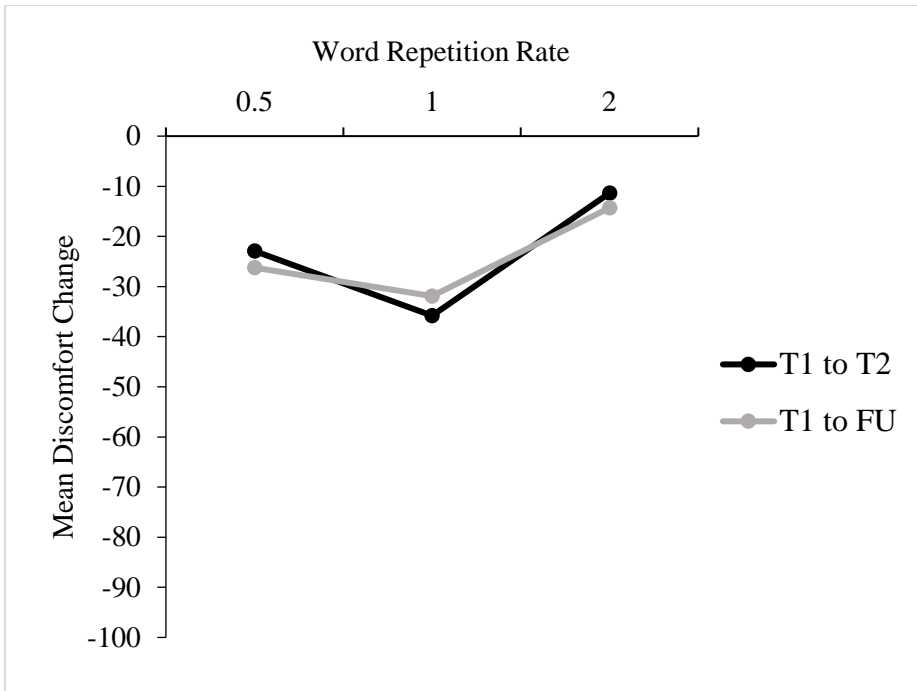


Figure 4.

