

7-1-2015

Changes in psychological flexibility during acceptance and commitment therapy for obsessive compulsive disorder

Michael P. Twohig Ph.D.
Utah State University

Jennifer C. Vildardaga

Michael E. Levin
Utah State University

Steven C. Hayes
University of Nevada

Follow this and additional works at: http://digitalcommons.usu.edu/psych_facpub

 Part of the [Educational Psychology Commons](#)

Recommended Citation

Twohig, Michael P. Ph.D.; Vildardaga, Jennifer C.; Levin, Michael E.; and Hayes, Steven C., "Changes in psychological flexibility during acceptance and commitment therapy for obsessive compulsive disorder" (2015). *Psychology Faculty Publications*. Paper 1215.
http://digitalcommons.usu.edu/psych_facpub/1215

This Article is brought to you for free and open access by the Psychology at DigitalCommons@USU. It has been accepted for inclusion in Psychology Faculty Publications by an authorized administrator of DigitalCommons@USU. For more information, please contact dylan.burns@usu.edu.



Running head: PROCESSES OF CHANGE IN ACT FOR OCD

Changes in psychological flexibility during acceptance and commitment therapy
for obsessive compulsive disorder

Michael P. Twohig

Utah State University

Jennifer C. Plumb Vilardaga

VA Puget Sound Healthcare System, Seattle Division

Michael E. Levin

Utah State University

Steven C. Hayes

University of Nevada

Address correspondence to:

Michael P. Twohig, Ph.D.

Utah State University

Department of Psychology

2810 Old Main Hill, Logan, UT 84322-2810

Phone: (435) 797-1402

Fax: (435) 797-1448

E-mail: michael.twohig@usu.edu

Abstract

Acceptance and Commitment Therapy (ACT) has a small research base as a treatment for obsessive compulsive disorder (OCD) and related disorders. It is presumed that the process of change in ACT is an increase in psychological flexibility. This study focuses on session by session changes in psychological flexibility in 41 adults diagnosed with OCD who were treated with ACT compared with 38 individuals who received progressive relaxation training. In a randomized controlled design, participants received 8, one-hour weekly sessions with posttreatment assessment one week after treatment and follow up three months later. Results showed that treatment effects were gradual with significantly better outcomes for ACT occurring in the final two sessions. Multiple levels of analyses show that changes in psychological flexibility predict changes in OCD better than changes in OCD severity predicting changes in psychological flexibility. Similarly, multiple levels of mediational analyses showed that posttreatment levels of psychological flexibility mediate pretreatment to follow up reductions in OCD severity.

Keywords: Acceptance and Commitment Therapy, Obsessive Compulsive Disorder, Psychological Flexibility, Experiential Avoidance, Mediation

Changes in psychological flexibility during acceptance and commitment therapy
for obsessive compulsive disorder

Obsessive compulsive disorder (OCD) is characterized by obsessive thoughts, images, or impulses and related compulsive actions that are aimed at neutralizing or regulating obsessions (American Psychiatric Association, 2013). OCD affects about 1% of the population (Kessler, Chiu, Demler, & Walters, 2005) and is associated with deficits in many areas of functioning and low quality of life scores (Kugler et al., 2013). The most supported psychosocial treatment for OCD is exposure with ritual prevention (ERP) or ERP with cognitive therapy procedures (generally labeled CBT for OCD); but while effective for many, these treatments are not effective for everyone (Olatunji, Davis, Powers, & Smits, 2013). Thus, additional treatment options and conceptualizations of OCD are needed.

One treatment approach with growing empirical support for the treatment of OCD is acceptance and commitment therapy (ACT; Bluett, Homan, Morrison, Levin, & Twohig, 2014; Twohig, Morrison, & Bluett, 2014). Cognitive theorists have long held that thoughts with obsessive content are common across most people, but that there is something unique about the way individuals diagnosed with OCD experience and react to these thoughts (e.g., Rachman & de Silva, 1978). The ACT theory of OCD is consistent with this basic notion. The theory of cognition that undergirds ACT, Relational Frame Theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001), suggests that the meaning and function of cognitive events are regulated by separate contexts and that these contexts can be independently addressed. Specifically, ACT primarily focuses on putative functional contexts under which obsessions and associated anxiety are argued to occur including those that promote literal meaning, reason giving, and escape and avoidance of particular internal experiences. ACT attempts to change these contexts through

such methods as cognitive defusion (experiencing cognition as an ongoing process rather than allowing the results of this process to overly structure the situation and overly regulate behavior), experiential acceptance (willingness to contact inner experiences without needless defense), and values-based action (choosing desired consequences of ongoing patterns of behavior so as to establish reinforcers in the present). Thus, ACT focuses much more on the function of obsessions rather than the accuracy or frequency of their content.

ACT for OCD seeks to broaden the range of responses possible in the presence of obsessions and anxiety so that improved functioning is not dependent on levels of obsessions or anxiety (Twohig et al., 2014). This approach, focused on fostering psychological flexibility (Hayes, Levin, Plumb-Villardaga, Villatte, & Pistorello, 2013), has been supported in component studies (Levin, Hildebrandt, Lillis, & Hayes, 2012) and a similar number of process studies (e.g., Hayes et al., 2013). Research has consistently found that deficits in psychological flexibility are related to OCD symptoms (Bluett et al., 2014) as well as the broader development and maintenance of a range of mood and anxiety disorders (Spinhoven, Dros, de Rooij, van Hemert & Penninx, 2014). ACT as applied to OCD facilitates growth in psychological flexibility through in-session exercises, examples and metaphors, and discussions as well as modeling and reinforcing these processes within the context of the therapeutic relationship. Although structured exposure sessions provide another opportunity to foster psychological flexibility, ACT for OCD postulates that psychological flexibility can be taught without needing to do traditional exposure exercises during the therapy sessions.

Treatment based on this conceptualization has support in a number of studies for OCD and related disorders such as compulsive pornography use, skin picking, trichotillomania, and OCD (Arch et al., 2012; Bluett et al., 2014; Twohig et al., 2014). In the largest randomized

controlled trial of ACT for OCD, Twohig et al. (2010) treated 79 adults with either eight sessions of ACT or progressive relaxation training (PRT) with no in-session exposure in either condition. Results showed that ACT produced greater changes at posttreatment and follow up over PRT on OCD severity as measured by the Yale Brown Obsessive Compulsive Scale (Y-BOCS) and clinically significant change in OCD severity occurred more in the ACT condition than PRT using multiple criteria (clinical response rates: ACT post=46-56%, follow up 46-66%; PRT post=13%-18%, follow up 16-18%). Also of note, treatment refusal (2.4% ACT, 7.8% PRT) and drop-out (9.8% ACT, 13.2% PRT) were low in both conditions, and ACT participants showed an average score of 4.4 (on a 5 point scale) on the treatment acceptability measure used (Kelley, Heffer, Gresham, & Elliott, 1989) as compared to a score of 3.7 in the PRT condition, a significant difference.

A number of studies suggest that changes in ACT processes are associated with and often precede change in outcomes for a variety of disorders treated with acceptance and mindfulness based CBT, including ACT (e.g., S. A. Hayes, Orsillo, Roemer, 2010; Hesser, Westin, S. C. Hayes, & Andersson, 2009; Lundgren, Dahl, & S. C. Hayes, 2008; Masuda et al., 2009; Wolitzky-Taylor, Arch, Rosenfield, & Craske, 2012). For example, S. A. Hayes et al. (2010) found an increase in emotional acceptance and time spent on valued activities in those receiving acceptance-based behavior therapy for generalized anxiety disorder. Change in acceptance and values engagement was related to responder status at posttreatment above and beyond changes in worry. Similarly, scoring of videotapes of ACT for tinnitus sessions showed that increased cognitive defusion behaviors and acceptance behaviors predicted symptom reduction 6 months later even when accounting for prior improvement (Hesser et al., 2009). To date no studies have examined these issues in ACT for OCD. This study will investigate processes of change seen in

the randomized clinical trial of ACT versus PRT conducted by Twohig et al. (2010).

Standardized outcome and process measures were completed at pretreatment, posttreatment, and three month follow up. Weekly assessments of psychological flexibility and OCD severity were completed throughout the study to allow temporal analyses of changes. The findings from these assessments of process change are presented.

Method

Data for the current study were collected as part of a randomized clinical trial comparing ACT to PRT for adults seeking psychological treatment for OCD (Twohig et al., 2010). Further details regarding the clinical trial and its results can be found in the outcome publication.

Information relevant to the current study is represented here.

Participants

Participants were 79 treatment seeking adults who enrolled in a clinical trial conducted in two Western US states. There were 41 clients randomized to receive ACT and 38 who received PRT. Those who enrolled in the study met criteria for OCD via the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002), were 18 years of age or older, were not receiving concurrent psychological treatment and had not ceased psychotherapy within 30 days of enrolling in the study, did not initiate new psychotropic medications or change doses within 30 days of enrolling in the study, and did not meet criteria for a current psychotic disorder or have an organic mental disorder that would interfere with their ability to participate in the study.

The sample was 61% female, primarily Caucasian (88.6%) and was between 18 and 67 years of age ($M = 37$, $SD = 15.5$). Sixty three percent of the sample had received previous formal treatment (psychotherapy or medication) for OCD, 40% reported taking at least one psychotropic

medication at the time of enrollment, and 51% of the sample met criteria for at least one additional disorder via the SCID (most commonly either a comorbid mood disorder or another anxiety disorder). There were no significant differences between the ACT and PRT groups in OCD severity or any other measure at pretreatment.

Of the 79 clients enrolled, 69 completed post assessments and 63 completed the three month follow up. Clients lost to posttreatment and follow up assessments were equal across conditions. In terms of treatment dropout rates, one ACT participant (2.4%) and three PRT participants (7.8%) did not attend even the first treatment session (labeled treatment refusers). An additional four ACT participants (9.8%) and five PRT participants (13.2%) completed fewer than three of the eight planned treatment sessions.

Measures

Yale Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989). The Y-BOCS is a 10 item assessor-rated measure of OCD symptom severity that is commonly used as a primary outcome in clinical trials for OCD. Total scores on the Y-BOCS range from 0 to 40. The Y-BOCS has demonstrated both good interrater reliability for the total score (r s between .80 and .97) and two week test-retest reliability (between .81 and .97). In the current study, Cronbach's α at pretreatment was .79.

Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004). The 16 item AAQ was used to measure psychological flexibility. The 16 item AAQ was used rather than the more recent AAQ-II (Bond et al., 2011) due to the study being initiated prior to the publication of the newer version of the measure. Responses on the AAQ are self reported on a seven point Likert-type scale. Lower scores reflect greater experiential willingness and ability to act in the presence of difficult thoughts and feelings. Sample items include: "It's OK to feel depressed or anxious,"

and “It is unnecessary for me to learn to control my feelings in order to handle my life well.” The AAQ has demonstrated good convergent and discriminant validity and four month test-retest reliability was .64 (Hayes et al., 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). In the current study, α at pretreatment was .74.

Thought Action Fusion Scale (TAF; Shafran, Thordarson, & Rachman, 1996). The TAF is a 19 item self report measure that assesses the degree to which respondents equate thought and action. Items are rated from 0 (strongly disagree) to 4 (strongly agree). The TAF has two distinct subscales; the *likelihood* and *moral* subscales. *Likelihood* refers to the idea that having a thought makes an event more likely to happen and the *moral* subscale refers to the idea that having the thought is the same as engaging in the action. Mean scores of an obsessional sample (diagnosed with OCD or high scores on OCD severity measure) on the likelihood subscale are 9.18, and 3.12 for the community sample, and scores on the moral subscale were 20.03 for the obsessional sample and 12.74 in the community sample. Three month test-retest reliability for the total score were $r = .52$, and it shows construct validity with other measures (Rassin, Merckelbach, Muris, & Schmidt, 2001). In the current study, internal consistency was assessed at pretreatment: the total TAF $\alpha = .92$; TAF moral subscale $\alpha = .91$; TAF likelihood subscale $\alpha = .95$.

Thought Control Questionnaire (TCQ; Wells & Davies, 1994). The TCQ is a 30 item self report measure that assesses the use of thought control strategies. This is a widely used measure of this construct for obsessive compulsive and anxiety related disorders and has been shown to change as a result of cognitive behavioral interventions (e.g., Reynolds & Wells, 1999). An example item includes, “When I experience an unpleasant/unwanted thought I think pleasant thoughts instead.” The TCQ has demonstrated good test-retest reliability ($r = .83$). In the current

study, α at pretreatment was .82.

Weekly Assessment

In addition to pretreatment, posttreatment, and follow up assessments, participants were asked to respond to five questions at the beginning of session each week. Participants in both the ACT and PRT conditions reported the frequency of their obsessions and compulsions during the week prior (questions were verbatim items 1 and 6 of the Y-BOCS). Participants in the ACT condition responded to three questions (designed for this study) to capture weekly changes in psychological flexibility related to obsessions: 1) Distress: "On a 0-100 scale, where 0 = not distressing at all, and 100 = the most distressing ever, how distressing are your obsessions?", 2) Believability: "On a 0-100 scale, where 0 = not believable at all, and 100 = absolutely believable, how believable are your obsessions?", and 3) Reactivity: "On a 0-100 scale, where 0 = 'I do not feel I have to react to them at all', and 100 = 'I absolutely must react to them', how strongly do you feel that you must react to your obsessions?" Participants in the PRT condition responded to three questions designed to capture weekly changes in PRT processes; 1) "On a 0-100 scale, where 0 = no anxiety at all, and 100 = the most anxiety ever, how anxious have you felt this last week?", 2) "On a 0-100 scale, where 0 = cannot control it at all, and 100 = can absolutely control your anxiety, how well can you control your anxiety?", and 3) "On a 0-100 scale where 0 = not at all and 100 = very well, how good are you getting at applying the techniques in relaxation training?"

Procedures

All measures were assessed at pretreatment (one week prior to treatment), posttreatment (one week after treatment), and three month follow up. The weekly process measure was also completed at the beginning of each therapy session, and the SCID was conducted only at the

pretreatment assessment. As the clinical trial employed an intent-to-treat design, participants were asked to complete posttreatment and follow up assessments even if they did not attend all treatment sessions. Treatment occurred individually, one hour per week for eight weeks, and was administered by trained clinical psychology graduate students under the supervision of experts in the respective treatment being applied. All assessment and treatment sessions were videotaped and integrity checks were performed on both. There was 100% agreement between assessors and an independent rater on the fidelity of the diagnostic interviews (via the SCID), and there was 90% agreement between independent raters and assessors on the severity of OCD across pretreatment, posttreatment, and follow up assessments (via the Y-BOCS). A treatment integrity coding system for ACT that had been used successfully in previous studies (e.g., Twohig, Hayes Masuda, 2006) was employed in the current study and indicated that each therapist's adherence to the manual and competence were high. See Twohig et al. (2010) for details.

Treatment

ACT for OCD employed exercises and metaphors to promote overall psychological flexibility (see Hayes et al., 2013) which refers to the ability to persist in activities in line with chosen personal values even when uncomfortable thoughts (e.g., obsessions) and feelings (e.g., the distress associated with obsessions or attempting to refrain from compulsions) arise. Participants practiced acceptance, present moment awareness and defusion exercises that helped them see that obsessions and their related anxiety are merely experiences that can be noticed rather than events that must be heeded (via enacting compulsions), changed, or avoided in order to live a values directed life. For reasons explained in detail in Twohig (2010), the clinical trial did not include formal in-session exposure exercises. Participants made values-based behavioral changes between sessions that often involved engaging in previously avoided behaviors. A

detailed description of the treatment is available in Twohig et al. (2010) or from the corresponding author.

Results

In order to provide relevant context and findings for the process of change analyses, we will briefly review the pertinent outcome and process effects already presented in Twohig et al. (2010) before moving to the central topic of the current paper. These findings provide detailed information regarding the total effect of treatment condition on outcomes (*c* path) and on process measures (*a* path). Longitudinal data were analyzed using Hierarchical Linear Modeling (HLM), or Mixed Model Repeated Measures (MMRM; Hedeker & Gibbons, 2006) if the HLM analysis did not fully converge (indicated by the Hessian matrix not positive definite) or fit less well as determined by the restricted log-likelihood of nested models. All analyses used an intent-to-treat sample containing all randomized participants. Different covariance structures were explored and the model with the fewest covariance parameters was used provided there was no significant difference in an unstructured covariance model based on a comparison of models through the restricted log-likelihood. Denominator degrees of freedom for fixed effects test statistics were based on the Satterthwaite approximation. Effect sizes for MMRM outcomes were calculated as specified by Wackerly, Mendenhall, and Scheaffer (2008) and for HLM by examining end point outcomes as suggested by Feingold (2009). Effect sizes were discussed using Cohen's (1988) cutoffs (Small > .2; Medium > .5; Large > .8).

Summary of Previously Reported Outcome Results

In the original paper, an HLM analyses of the pretreatment, posttreatment, and follow up data found that participants in both conditions showed significantly improving slopes on the Y-BOCS, but the ACT condition produced significantly greater improvement (Y-BOCS means:

ACT pre=24.22, post=12.76, follow up=11.79; PRT pre=25.4, post=18.67, follow up=16.23).

The difference in end point outcomes (via the method suggested by Feingold, 2009) revealed a between condition effect size of .88, a large effect. Clinically significant change in OCD severity occurred more in the ACT condition than PRT using multiple criteria (clinical response rates: ACT post=46-56%, follow up 46-66%; PRT post=13%-18%, follow up 16-18%).

AAQ. An MMRM analysis found that time and condition interacted significantly (effect size = .58, a medium effect) with ACT participants improving significantly more from pretreatment to posttreatment than did PRT participants (effect size = .59, a medium effect). The two groups did not differ at follow up.

TCQ. A MMRM analysis found that time and condition interacted significantly (effect size = .54, a medium effect) with ACT participants improving significantly more from pretreatment to posttreatment than did PRT participants (effect size = .75, a medium effect), and marginally more so from pretreatment to follow up (effect size = .42, a small effect).

TAF. A HLM analysis found that ACT participants improved significantly but PRT participants did not, leading to a significant difference between the two conditions (effect size = .65, a medium effect).

New Results: Weekly Outcomes and Processes

In order to explore the process – outcome relations, the first analytic approach was to examine weekly OCD results during treatment. These are shown in Figure 1, which plots the adjusted means taken from a MMRM analysis with a compound symmetry covariance structure. A HLM analysis with an unstructured covariance structure best fit the data for weekly OCD outcomes and revealed a non-significant effect for treatment condition, $F(1, 74.00) = 2.58, p = .11$, and a significant effect for time, $F(1, 69.71) = 47.61, p < .001$, and the interaction of

condition and time, $F(1, 69.71) = 10.69, p = .002$ (effect size = .78, a medium effect).

Participants in both conditions showed significantly improving slopes (ACT: Estimate = $-.31$, SE = $.042, t(67.82) = -7.46, p < .001$; PRT: Estimate = $-.11$, SE = $.045, t(71.39) = -2.48, p = .015$) but improvement was significantly more rapid in the ACT condition (this is what the condition by time interaction above tests). The same analysis was repeated for obsessions and compulsions alone and showed similar interactions between condition and time for obsessions, $F(1, 68.52) = 5.56, p = .021$, effect size = .57, a medium effect) and compulsions, $F(1, 66.39) = 11.92, p = .001$, effect size = .85, a large effect). MMRM contrast tests on individual weeks showed that there was no significant difference between conditions on the weekly outcome measure until weeks 7 and 8 (the final two weeks of therapy) when they were in favor of ACT (respectively, $t(64.86) = -2.15, p = .036$, and $t(64.13) = -3.05, p = .003$).

Weekly process measures were then examined. Each ACT process question correlated significantly ($p < .001$) with the weekly outcome measures (Believability, $r(288) = .55$, Reactivity, $r(289) = .65$, Distress, $r(289) = .61$) and between themselves (r range: $.73$ to $.77$, all $p < .001$). A somewhat similar picture was seen with each of the weekly PRT process ratings, each of which also correlated significantly ($p < .001$) with the weekly outcome rating (PRT: Anxiety, $r(231) = .39$, Controlling obsessions, $r(231) = -.38$, Applying relaxation techniques, $r(208) = .22$) and between themselves (r range: $.29$ to $.50$, all $p < .001$).

In order to relate weekly process measures to weekly outcomes measures overall, each set of process measures was factor analyzed, using a principle components analysis and an unrotated solution with Eigenvalues set to 1 or above. Factor analysis of process scores for each condition revealed a single factor solution in the two conditions among the three process questions, with all three questions in each case loading above $.4$ on the lone retained factor. The overall factor score

for the process questions in each condition were saved and then correlated with OCD outcomes with zero lags, and lags of 1 through 4 weeks. What this analysis does is to ask whether overall process measures taken at any given time predict outcome scores 1, 2, 3, and 4 weeks later and then compares that to the degree that outcome measures at any given time predict process scores 1, 2, 3, and 4 weeks later. The results are shown in Figure 2 (to avoid confusion signs are changed so that positive correlations always mean that better processes were related to better outcomes). The correlations fall off over time regardless of direction and focus, as would be expected. However, in the ACT condition process measures always predict outcomes better than outcomes predict processes regardless of the lags. Across the four lags, ACT processes predicted outcomes, $r(775) = .50$, significantly more than outcomes predicted processes, $r(775) = .40$ ($z = 2.34, p < .02$, two-tailed). The picture was different for PRT, in which processes predicted outcomes better than outcomes predicted processes only at lag 1 (see Figure 2) and across all four lags processes predicted outcomes, $r(589) = .19$ slightly less well than outcomes predicted processes, $r(589) = .22$, though not significantly so ($z = -.54, p = .59$, two-tailed).

This same general issue can be examined in a more focused way by examining the relation of measures taken during the first few weeks of treatment with those taken at the end of treatment. ACT processes in weeks 1, 2, and 3 correlated with OCD outcomes in week eight, $r(34) = .34^*$, $.42^{**}$, and $.31^*$, respectively, ($**p < .05$, $*p < .10$) while OCD outcomes in weeks 1, 2, and 3 were weakly and non-significantly related to the level of ACT processes in week 8, $r(34) = .06$, $.11$, and $.25$ ($p > .1$). By Week 6 ACT processes significantly predicted posttreatment levels of the AAQ, $r(34) = -.42, p = .022$, and continued to do so through the rest of the treatment period, but weekly OCD ratings did not correlate with posttreatment AAQ scores to a significant degree until Week 8. Thus across all sources of information available, processes significantly

predicted outcomes in the ACT condition, and do so earlier and to a greater degree than outcomes predicted processes. This was not true in the PRT condition where relationships were weaker and inconsistent in terms of directionality.

Mediation Analysis

Mediation analyses were conducted to explore the functional relationship between posttreatment process scores and pretreatment to follow up outcome change scores using non-parametric cross products of the coefficients approach (Preacher & Hayes, 2004). Mediation refers to a statistical difference between the direct path (treatment on outcome or c) and the indirect path (treatment on outcome accounting for the mediator or c'). There is general agreement (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) that this can be directly assessed by testing the significance of the cross-product of the “ a path” (treatment on the mediator) and “ b path” (relation of the mediator to outcome, controlling for treatment), which is mathematically similar to the difference between the c and c' path (Preacher & Hayes, 2004). A cross product test is preferable over the more familiar causal steps approach (Baron & Kenny, 1986) which fails to account for mutuality (the larger the “ a ” path the smaller the “ b ” and vice versa) and never directly tests the statistical significance of the difference between the direct and indirect paths. Widely used parametric tests of the cross-product (e.g., Sobel, 1982) assume a normal distribution of the cross product, which has been shown to be generally incorrect (Preacher & Hayes, 2004). The nonparametric method used in the current study to test the statistical significance of the cross product of the coefficients (Preacher & Hayes, 2004) solves the distribution problem through bootstrapping, in which k samples of the original size are taken from the obtained data (with replacement after each specific data point is selected). A cross product test is then calculated in each sample.

In the present set of analyses, parameter estimates were based on 3,000 bootstrap samples. The bias corrected and accelerated 95% confidence intervals are similar to the 2.5 and 97.5 percentile scores of the obtained distribution of the cross products over the k samples, but with z -score based correction for bias due to the underlying distribution (Preacher & Hayes, 2004). If the confidence intervals do not contain zero, the point estimate is significant at the level indicated.

Posttreatment mediators and pretreatment to follow up change score outcomes were used because these best fit the theoretical claim that levels of ACT processes are predictive of improvement. The mediation results were similar across a range of commonly used methods however (e.g., using process change scores).

Pretreatment to follow up changes in Y-BOCS outcomes were not significantly mediated by the posttreatment levels of the TCQ (bootstrapped point estimate = .807, SE = .829, 95% CI: -.17, 3.37; proportion of effect mediated = .18), or the TAF (bootstrapped point estimate = .59, SE = .68, 95% CI: -.25, 2.50; proportion of effect mediated = .11), but they were by the AAQ (bootstrapped point estimate = 4.27, SE = 1.59, 95% CI: 1.51, 7.57; proportion of effect mediated = .84). The significant effect of treatment on pretreatment to follow up Y-BCOS changes, ($t(63) = 2.41, p = .019$), became non-significant when adjusting for the effect of the mediator, ($t(63) = .38, p = .71$). Outcomes had already changed by posttreatment, however, violating the temporality desirable in mediation analysis (Stice, Presnell, & Gau, 2007). In the absence of temporal precedence, mediation cannot show that a pathway is functionally important but as we will discuss later, it can provide evidence for model disconfirmation. In the present case, no such evidence was provided. Reversing the ordering of mediator and outcome is not statistically informative in this case because there were no differences in follow up AAQ scores

(see above) and thus the c path is not significant.

There is a way to examine mediation without the violation of temporality if the question can be shifted from psychological flexibility as the mediator, to the meditational role of changes in model specific processes. Because outcomes did not differ until Week 7 it is possible to conduct a mediation analysis on the Y-BOCS pretreatment to follow up change scores using the amount of change in ACT or PRT processes from Week 1 through Week 6. In order to create a similar metric between the two conditions, process change scores were generated and then standardized within condition.

Both by normal theory ($z(43) = 2.72, p = .0065$) and through a non-parametric test using bootstrapping (estimate = 8.49, SE = 3.61, 95% CI: 1.10, 15.45) the $a*b$ cross product was significant, and the direct path [$t(43) = 1.82, p = .076$] became non-significant [$t(43) = -.88, p = .38$] after the effect of process changes from Week 1 to Week 6 were included in the model, suggesting that targeted processes mediated long term outcomes even if assessed before outcomes differed.

Discussion

ACT for OCD is based on the assumption that OCD stems from the social / verbal context under which obsessive thoughts are experienced rather than the content of the obsessions themselves. It is assumed that obsessive thoughts occur under an inflexible social / verbal context that supports removal or regulation of obsessive thoughts, treating them literally, or using them to provide reasons for actions. As a result, people diagnosed with OCD respond to their thoughts in a cognitively fused fashion and they deploy methods such as distraction or ritualistic undoing to avoid feared stimuli. The aim of ACT is to help clients learn more flexible

ways of experiencing and responding to obsessive thoughts and behaving while the obsession is present.

This skill was taught to 41 adults diagnosed with OCD over the course of eight weekly one-hour therapy sessions. No in-session exposure exercises were included in the treatment so that the effects of ACT processes could be tested without the interference of already supported procedures. These results were compared to 38 participants who received the same duration of PRT. Analyses presented in Twohig et al. (2010) show that ACT was superior to PRT in the outcomes obtained.

The present study examined the purported process of change and its relationship to outcomes measured weekly and at pretreatment, posttreatment, and follow up. Weekly outcome data confirmed the previously published results. Treatment differences were not seen immediately. Gradual improvements were seen for ACT, with significantly better outcomes occurring in ACT over PRT in the final two sessions: sessions seven and eight.

All ACT and PRT weekly process ratings correlated with outcomes, but those correlations were higher in the ACT condition. Lag correlations between the target process showed that changes in psychological flexibility in earlier sessions predicted decreases in OCD severity in later sessions for ACT stronger than outcomes correlating with changes in process. This was not the case for PRT where changes in outcome correlated more strongly with changes in process at later sessions than process correlating with OCD severity. Mediation analyses showed that posttreatment levels of the AAQ, but not the TAF or TCQ, mediated pretreatment to follow up scores on the Y-BOCS. Standardized change scores for treatment processes from week one to six (before there were significant differences in outcomes) mediated pretreatment to follow up scores on the Y-BOCS between the conditions.

It is important to underscore the implications of meditational and process of change results. Rather than indicators of causality, the processes of change measures used in the current study are merely theoretically important dependent variables. Holding to the idea that dependent variables are causal variables for change may distract researchers from the search for manipulable independent variables that can be shown to be important using an experimental analysis (Hayes & Brownstein, 1986). Described another way, because clinicians cannot directly manipulate dependent variables, by definition, it seems pragmatically more useful to reserve the potent term “cause” for events they can directly control.

What process of change analyses provide is an opportunity for theories to fail. For example, if outcomes predict processes of change more so than vice versa, either there is something wrong with the theory or with the measurement of its concepts. Conversely, if processes *do* relate to outcomes more than vice versa, the theory can continue to be entertained, but it is not “proven” by such results because a third variable could still be responsible for that relation.

Consider the issue of temporality in meditational analysis as an example of this distinction. It has become “conservative” to eliminate from publication meditational analyses that violate temporality, because outcomes could then cause processes of change as much as vice versa. This is conservative, however, only if one incorrectly believes that meditational analysis detects causal processes. Successful meditational analyses that do not violate temporality suggest a functionally important pathway may exist (not a causal one if the mediators are dependent variables). But if the primary point is to provide an opportunity for theories to fail, meditational analyses that *do* violate temporality can also be very important intellectually in a specific circumstance: when they fail consistently. If, with all the statistical advantages a violation of

temporality provide, meditational analysis under those conditions regularly fail, then either there is something wrong with the theory or with the measurement of its concepts.

Looking at the entire pattern of results in the present study, including outcome and processes of change results, lag analyses of processes and outcomes, and meditational analyses (both with and without temporality violations) it can be said that ACT impacted targeted outcomes and processes of change positively. Such a pattern of results indicates general support for the overall ACT model for improving outcomes in OCD. No evidence emerged that would suggest that the psychological flexibility theory that underlies ACT was disproven.

Limitations

In addition to the strengths of this study there are a variety of limitations that may decrease the reliability and validity of the findings. These limitations may be addressed in future research. To begin with, there are design limitations in this study. The use of all self report measures to assess processes of change is also a limitation. All self report assessments carry with them the limitation of simply measuring one's report of an event (as opposed to the actual event), but this concern is compounded by the fact that participants in this study were asked to rate their perceptions of internal processes which increases subjectivity. Nonetheless, self report measures are still by far the most commonly used assessment procedure as alternatives are not often feasible or readily available. Future research would benefit by using additional methods of assessment for processes of change than solely self report.

A related limitation is that face valid assessment questions, rather than traditionally validated measures, were used to collect weekly changes in processes. When collecting weekly data, the experimenter must balance the need for frequent assessments and not overburdening the participant. Valid assessments are needed that are not only brief, but suited for the issues that are

addressed in the particular treatment. For example, the AAQ is the most consistent with ACT processes, but not necessarily asked in such a way that is best for participants with OCD—it is more of a general measure. Therefore, a brief measure of ACT processes targeted in the treatment of OCD is needed.

There are also limitations to the findings of this investigation. First, while the data collection procedures used in this investigation have many fine points, such as frequent data collection, there are also issues that need to be addressed in future work. Each condition received the same questions of OCD severity, but they did not receive the same process of change questions. It was assumed that if both conditions were given both sets of process questions, it would have confused the participants. While this may or may not have been accurate, by not giving both conditions both sets of process questions we were not able to rule out whether these changes were actually the result of the respective treatment conditions (e.g., it is unclear if PRT would have also led to the same changes in psychological flexibility). Similarly, this study does not clarify the extent that the processes seen in ACT are unique to ACT. There has been considerable dialogue in professional journals as to the uniqueness of the processes of changes across varieties of cognitive behavioral therapies including ACT and traditional cognitive behavior therapy in general (e.g., Fresco, 2013) and as applied to OCD specifically (Tolin, 2009). While this is still a possibility, the mounting data tends to indicate that psychological flexibility is a specific process and it is the process of change that is seen in ACT (Hayes et al., 2013).

Despite these limitations, the present study provides additional and supportive data on the process of change in ACT, and more specifically ACT as applied to OCD. This is of particular importance as the work on ACT for OCD moves forward. Given the results of numerous studies

on ACT for OCD and related disorders (Twohig et al., 2014) it appears prudent to continue to look into the utility of ACT as a treatment for OCD, but knowing how it works is as, or more, important than whether it works, in the long run. There are already successful treatments for OCD such as ERP, and if additional treatments are added to the field, they should indeed be different. Their difference should be determined at the level of process of change and not be based on formal similarities or dissimilarities. Processes of change that fail to be disconfirmed can in turn provide a target for treatment developers. If that final step is positive, a focus on processes of change should ultimately lead to more successful treatments for those with OCD and other conditions.

Author Note

Michael Twohig and Michael Levin are in the Department of Psychology at Utah State University 2810 Old Main Hill, Logan, UT, 84322; michael.twohig@usu.edu. Steven Hayes is in the Department of Psychology at the University of Nevada, Reno. Jennifer Plumb is at the VA Puget Sound Healthcare System, Seattle Division. We would like to thank Angela Collins, Holly Hazlett-Stevens, Tami Jeffcoat, Heidi LaBash, Lindsay Martin, Kate Morrison, Dahlia Mukherjee, Kimberly Pratt, Larry Pruitt, and Michelle Woidneck for their assistance with this project. This project was conducted as part of M. P. Twohig's dissertation at the University of Nevada, Reno for which he received the Virginia Roswell Dissertation Award from the Association for Behavioral and Cognitive Therapies. The present project was funded by a grant from the National Institutes of Mental Health (R21 MH074968), S. C. Hayes, Principal investigator. The treatment protocols are available at www.contextualscience.org or from the first author.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5™ (5th ed.)*. Arlington, VA, US: American Psychiatric Publishing, Inc.
- Arch, J. J., Eifert, G. H., Davies, C., Vilardaga, J. C. P., Rose, R. D., & Craske, M. G. (2012). Randomized clinical trial of cognitive behavioral therapy (CBT) versus acceptance and commitment therapy (ACT) for mixed anxiety disorders. *Journal of Consulting and Clinical Psychology, 80*(5), 750-765.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology, 51*, 1173-1182.
- Beck, A. T. (1996). *Beck Depression Inventory (2nd ed.)*. San Antonio, TX: The Psychological Corporation.
- Bluett, E. J., Homan, K. J., Morrison, K. L., Levin, M. E., & Twohig, M. P. (2014). Acceptance and commitment therapy for anxiety and OCD spectrum disorders: An empirical review. *Journal of Anxiety Disorders, 28*(6), 612-624.
- Bond, F. W., Hayes, S.C., Baer, R. A., Carpenter, K., Guenole, N., Orcutt, H. K., ... Zettle, R.D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: A revised measure of psychological flexibility and acceptance. *Behavior Therapy, 42*, 676-688.
- Burckhardt, C. S., Woods, S. L., Schultz, A. A., & Ziebarth, D. M. (1989). Quality of life of adults with chronic illness: A psychometric study. *Research in Nursing & Health, 12*, 347-354.
- Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement, 12*, 347-354.

12, 425-434.

Feingold, A. (2009). Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychological Methods, 14*, 43-53.

First, M. B., Spitzer, R. L., Gibbon M., & Williams, J. B. W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition. (SCID-I/P)*. New York: Biometrics Research, New York State Psychiatric Institute.

Fresco, D. M. (2013). Tending the Garden and Harvesting the Fruits of Behavior Therapy. *Behavior Therapy, 44*(2), 177-179. doi: <http://dx.doi.org/10.1016/j.beth.2013.02.003>

Goodman, W.K., Price, L.H., Rasmussen, S.A., Mazure, C., Fleischmann, R.L., Hill, C.L., ... Charney, D.S. (1989). The Yale-Brown Obsessive Compulsive Scale: Development, use, and reliability. *Archives of General Psychiatry, 46*, 1006-1011.

Hayes, S. A., Orsillo, S. M., & Roemer, L. Changes in proposed mechanisms of action during an acceptance-based behavior therapy for generalized anxiety disorder. *Behaviour Research and Therapy, 48*, 238-245.

Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-Skinnerian account of human language and cognition*. New York, NY US: Kluwer Academic/Plenum Publishers.

Hayes, S. C., & Brownstein, A. J. (1986). Mentalism, behavior behavior relations and a behavior analytic view of the purposes of science. *The Behavior Analyst, 9*, 175-190.

Hayes, S. C., Levin, M. E., Plumb-Villardaga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavior Therapy, 44*(2), 180-198.

- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*, 1-25.
- Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., ...
McCurry, S.M. (2004). Measuring Experiential Avoidance: A Preliminary Test of a Working Model. *The Psychological Record*, *54*, 553-578.
- Hedeker, D., & Gibbons, R. D. (2006). *Longitudinal data analysis*. Hoboken, NJ: Wiley-Interscience.
- Hesser, H., Westin, V., Hayes, S. C., & Andersson, G. (2009). Clients' in-session acceptance and cognitive defusion behaviors in acceptance-based treatment of tinnitus distress. *Behaviour Research and Therapy*, *47*, 523-528.
- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-Month DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, *62*, 617-627.
- Kugler, B. B., Lewin, A. B., Phares, V., Geffken, G. R., Murphy, T. K., & Storch, E. A. (2013). Quality of life in obsessive-compulsive disorder: The role of mediating variables. *Psychiatry Research*, *206*(1), 43-49.
- Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012). The impact of treatment components suggested by the psychological flexibility model: A meta-analysis of laboratory-based component studies. *Behavior Therapy*, *43*(4), 741-756.
- Lundgren, T., Dahl, J., & Hayes, S. C. (2008). Evaluation of mediators of change in the treatment of epilepsy with acceptance and commitment therapy. *Journal of Behavioral Medicine*, *31*, 225-235.

- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83-104.
- Masuda, A., Hayes, S. C., Lillis, J., Bunting, K., Herbst, S. A., & Fletcher, L. B. (2009). The relation between psychological flexibility and mental health stigma in Acceptance and Commitment Therapy: A preliminary process investigation. *Behavior and Social Issues, 18*, 1-16.
- Olatunji, B. O., Davis, M. L., Powers, M. B., & Smits, J. A. J. (2013). Cognitive-behavioral therapy for obsessive-compulsive disorder: A meta-analysis of treatment outcome and moderators. *Journal of Psychiatric Research, 47*(1), 33-41.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments & Computers, 36*, 717-731.
- Rachman, S., & de Silva, P. (1978). Abnormal and normal obsessions. *Behaviour Research and Therapy, 16*, 233-248.
- Rassin, E., Merckelbach, H., Muris, P., & Schmidt, H. (2001). The thought-action fusion scale: Further evidence for its reliability and validity. *Behaviour Research and Therapy, 39*, 537-544.
- Reynolds, M., & Wells, A. (1999). The Thought Control Questionnaire--Psychometric properties in a clinical sample, and relationships with PTSD and depression. *Psychological Medicine, 29*, 1089-1099.
- Shafran, R., Thordarson, D. S., & Rachman, S. J. (1996). Thought-action fusions in obsessive compulsive disorder. *Journal of Anxiety Disorders, 10*, 209-221.

- Sobel, M. E., (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological Methodology 1982* (pp. 290-312). Washington, DC: American Sociological Association.
- Spinhoven, P., Drost, J., de Rooij, M., van Hemert, A.M. & Penninx, B.W. (2014). A longitudinal study of experiential avoidance in emotional disorders. *Behavior Therapy*, 45, 840-850.
- Stice, E., Presnell, K., & Gau, J. (2007). Testing mediators of intervention effects in randomized controlled trials: An evaluation of two eating disorder prevention programs. *Journal of Consulting and Clinical Psychology*, 75, 20-32.
- Tolin, D. F. (2009). Alphabet soup: ERP, CT and ACT for OCD. *Cognitive and Behavioral Practice*, 16, 40-48.
- Twohig, M. P., Hayes, S. C., Plumb, J. C., Pruitt, L. D., Collins, A. B., Hazlett-Stevens, H., & Woidneck, M. R. (2010). A randomized clinical trial of acceptance and commitment therapy vs. progressive relaxation training for obsessive compulsive disorder. *Journal of Consulting and Clinical Psychology*, 78, 705-716.
- Twohig, M. P., Hayes, S. C., & Masuda, A. (2006). Increasing willingness to experience obsessions: Acceptance and commitment therapy as a treatment for obsessive compulsive disorder. *Behavior Therapy*, 37, 3-13.
- Twohig, M. P., Morrison, K. L., & Bluett, E. J. (2014). Acceptance and commitment therapy for OCD and OC-spectrum disorders. *Current Psychiatry Reviews*, 10, 296-307.
- Wackerly, D., Mendenhall, W., & Scheaffer, R. L. (2008). *Mathematical statistics with applications (7th ed.)*. Pacific Grove, CA: Duxbury Press.
- Wells, A., & Davies, M. (1994). The thought control questionnaire - a measure of individual

differences in the control of unwanted thoughts. *Behaviour Research and Therapy*, 32, 871-878.

Wolitzky-Taylor, K. B., Arch, J. J., Rosenfield, D., & Craske, M. G. (2012). Moderators and non-specific predictors of treatment outcome for anxiety disorders: A comparison of cognitive behavioral therapy to acceptance and commitment therapy. *Journal of Consulting and Clinical Psychology*, 80(5), 786-799.

Figure Caption:

Figure1: OCD severity throughout treatment by condition

Figure2: Lag correlations between specific treatment processes and OCD severity from pretreatment through sessions one through 4



