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Treatment of Clinical Perfectionism Using Acceptance and Commitment Therapy

Clarissa W. Ong
Utah State University

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TREATMENT OF CLINICAL PERFECTIONISM USING

ACCEPTANCE AND COMMITMENT THERAPY

by

Clarissa W. Ong

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

Approved:

<table>
<tr><td>_____
Michael P. Twohig, Ph.D.
Major Professor</td><td>_____
Tyson S. Barrett, Ph.D.
Committee Member</td></tr>
<tr><td>_____
Michael E. Levin, Ph.D.
Committee Member</td><td>_____
Karen Muñoz, Ed.D.
Committee Member</td></tr>
<tr><td>_____
JoAnn T. Tschanz, Ph.D.
Committee Member</td><td>_____
Richard S. Inouye, Ph.D.
Vice Provost for Graduate Studies</td></tr>
</table>

UTAH STATE UNIVERSITY
Logan, Utah

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ABSTRACT

Treatment of Clinical Perfectionism Using Acceptance and Commitment Therapy

by

Clarissa W. Ong

Utah State University, 2019

Major Professor: Dr. Michael P. Twohig
Department: Psychology

Clinical perfectionism is characterized by rigidly pursuing unrealistically high standards on which self-worth is contingent and experiencing distress when these standards are not met. Because clinical perfectionism is implicated across diagnoses, focusing on the treatment of this common process may be one way to provide a parsimonious intervention for topographically diverse presentations. This approach coheres with the movement in clinical psychology toward process-based cognitive-behavioral therapy (PB-CBT). PB-CBT aims to distill treatment protocols to core processes in order to develop more effective and efficient interventions. The research in this dissertation was an investigation of the effect of acceptance and commitment therapy (ACT), an acceptance-based cognitive-behavioral therapy, on 53 individuals with clinical perfectionism using a randomized controlled trial. Participants in the ACT condition received 10 individual therapy sessions and those in the control condition were on a waitlist for the duration of the study (14 weeks). Data were collected with self-report measures and functional neuroimaging assessment. The first study presents self-report outcomes from the treatment trial. Results supported the effectiveness of ACT relative to

the waitlist control group on measures including concern over mistakes, self-compassion, and quality of life. The second study tested moderators and mediators of treatment outcome to examine how outcomes were achieved and for whom ACT was effective. Reduced psychological inflexibility mediated the relationship between condition and higher quality of life whereas increased self-compassion mediated the relationship between condition and decreased concern over mistakes. In addition, baseline psychological inflexibility differentially moderated treatment response depending on the outcome tested. In contrast, average baseline self-compassion tended to predict better outcomes in ACT. The third study evaluated the effect of ACT on neurological outcomes as well as the association between neural and self-report changes over the course of treatment. Generally, there were reductions or smaller increases in neural activation from pre- to posttreatment in the ACT condition compared to the waitlist condition, which showed increases over time. This pattern of results broadly suggests greater cognitive efficiency and muted responsivity to emotionally salient stimuli following ACT. However, no significant correlations were observed between neural changes and improvement in self-report outcomes, underscoring the complex nature of the brain-behavior relationship. Collectively, this dissertation examined not only the efficacy of a process-based therapy (i.e., ACT) but also the parameters of and processes of change underlying its effects.

(179 pages)

PUBLIC ABSTRACT

Treatment of Clinical Perfectionism Using Acceptance and Commitment Therapy

Clarissa W. Ong

Clinical perfectionism is characterized by rigidly pursuing unrealistically high standards on which self-worth is contingent and experiencing distress when these standards are not met. Because clinical perfectionism is associated with many psychological diagnoses, understanding how to treat it may help streamline available treatments. The aim of this dissertation was to test the effect of acceptance and commitment therapy (ACT), a cognitive-behavioral therapy, on 53 individuals with clinical perfectionism. Participants in the ACT group received 10 therapy sessions and those in the control group were on a waitlist for 14 weeks. The first study supported the effectiveness of ACT relative to the waitlist control group with respect to perfectionism severity, quality of life, and general symptom distress. The second study showed changes in psychological inflexibility and self-compassion explained improvements in quality of life and concern over mistakes, respectively. It also found a variable effect of baseline psychological inflexibility on response to treatment depending on the outcome tested. In contrast, average self-compassion was generally associated with better outcomes in ACT. Neurological results from the third study suggest receiving ACT was associated with greater cognitive efficiency while performing error-prone tasks and decreased responsivity to emotionally meaningful stimuli. In addition, changes in brain activation were not linked to changes in self-report outcomes. Collectively, this dissertation examined not only the efficacy of an intervention focused on a maladaptive behavioral pattern like clinical perfectionism but also how and for whom such a therapy works.

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Clarissa W. Ong

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CHAPTER I

INTRODUCTION

Clinical perfectionism is characterized by rigid striving for unrealistically high standards on which self-worth is contingent and experiencing distress when those standards are not met (Shafran & Mansell, 2001). Research suggests clinical perfectionism is a maladaptive process implicated in the development and maintenance of various diagnoses including obsessive-compulsive disorder (OCD), social anxiety, obsessive-compulsive personality disorder (OCPD), and eating disorders (Egan, Wade, & Shafran, 2011). Perfectionism has also been associated with poorer treatment outcomes (Egan et al., 2011), underscoring the importance of addressing perfectionism even when it is not identified as the primary presenting concern.

Examining clinical perfectionism as a common process across diagnostic labels represents a move toward a system of process-based care in which assessment and intervention decisions are based on function or underlying processes of change rather than symptom topography (Hofmann & Hayes, 2018). That is, case conceptualization is organized around patterns of behavior that share similar functions even if those behaviors appear to be formally distinct. For example, clinical perfectionism can manifest in different ways including worrying over potential failure (as in generalized anxiety disorder; GAD), spending excessive time arranging things to achieve symmetry (as in OCD), or being overly self-critical in response to perceived failure (as in depression). At the same time, these behaviors all share the same underlying process of inflexibility around self-imposed standards that are associated with significant distress.

Processes of change of interest in a process-based model of care are presumed to

be useful in that they are linked to evidence-based therapeutic procedures and personally relevant outcomes (Hofmann & Hayes, 2018). Focusing on core processes across theoretical orientations and treatment protocols facilitates distillation of the myriad of available interventions to their most robust components, increasing parsimony and streamlining adoption and implementation of evidence-based treatments (Hofmann & Hayes, 2018). Ultimately, a shift toward process-based care may decrease therapist burden and increase accessibility and quality of mental healthcare.

Current interventions for perfectionism are based on a traditional cognitive-behavioral treatment model and include procedures like behavioral experiments and cognitive restructuring (e.g., Riley, Lee, Cooper, Fairburn, & Shafran, 2007). These interventions have produced clinically significant improvements in outcomes across different formats and represent a promising approach to treating clinical perfectionism (Handley, Egan, Kane, & Rees, 2015; Riley et al., 2007; Rozental et al., 2017; Shafran et al., 2017; Steele et al., 2013). However, one limitation of the extant literature is only procedures from a traditional cognitive-behavioral perspective have been tested, precluding examination of other processes of change that may be helpful to consider in treatment. Identifying alternative processes of change provides clinicians with more options for treatment delivery and may increase likelihood of positive treatment response especially among nonresponders.

From an acceptance-based framework, psychological flexibility is a theoretically and empirically grounded process of change linked to specific therapy procedures (Levin, Hildebrandt, Lillis, & Hayes, 2012) as well as outcomes associated with wellbeing (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Kashdan & Rottenberg, 2010).

Psychological flexibility is the ability to make space for experiences in the present moment while engaging in behaviors consistent with personal values; it is the hypothesized key process of change in acceptance and commitment therapy (ACT; Hayes et al., 2006).

ACT is a process-based or functional cognitive-behavioral therapy originating from the contextual behavioral science tradition (Hayes, Strosahl, & Wilson, 2011). ACT is considered a functional psychotherapy because its principles focus on the effect of stimuli on behaviors rather than their form. In other words, the purpose of a specific behavior is more pertinent to case conceptualization in ACT than the topography of the behavior. In the case of clinical perfectionism, procrastination and premature task completion typically serve the same function of avoiding task-related distress even though they appear to be opposite behaviors. Accordingly, ACT would use the same therapeutic procedure—practicing willingness to experience task-related distress—to target this avoidance.

ACT has led to significant improvements in outcomes for diagnoses commonly associated with perfectionism (e.g., OCD, social anxiety disorder; A-Tjak et al., 2015; Arch, Eifert, et al., 2012; Craske et al., 2014; Twohig et al., 2018), suggesting it may be a helpful treatment for clinical perfectionism. Psychological inflexibility—the key skill emphasized in ACT—has also been found to mediate the cross-sectional and longitudinal relationship between self-critical perfectionism and anxious and depressive symptoms, indicating psychological inflexibility may be an important treatment target for individuals who present with high self-critical perfectionism and further supports the potential utility of ACT for clinical perfectionism (Moroz & Dunkley, 2015, 2019). On a theoretical

level, given clinical perfectionism tends to be functionally defined (i.e., avoidance of distress related to perception of failure), the process-based approach intrinsic to ACT may be particularly well-suited to this presentation.

In addition to testing if an intervention improves outcomes for clinical perfectionism, it is also imperative to determine how and for whom outcomes are attained (Hofmann & Hayes, 2018). Identifying mediators of treatment response are important because they are a means to verify theoretical assumptions underlying hypothesized processes of change (Hofmann & Hayes, 2018). Furthermore, understanding processes of change on multiple levels of analysis (e.g., behavioral, neurological) lends depth to scientific query and supports interdisciplinary coherence of empirical findings, providing a more robust test of our hypotheses and predictions (Hayes, Barnes-Holmes, & Wilson, 2012). If a treatment is effective but does not work through its purported mechanism of change, then the theoretical model on which it is based needs to be revised. Without a proper and empirically girded understanding of how treatments effect change, it is difficult to modify interventions to enhance quality of care. In addition, moderators provide information on the parameters of treatment effectiveness. Moderators not only aid treatment matching to maximize treatment response but also signal limitations of current interventions and direct clinicians and researchers toward clinical profiles for whom available treatments are ineffective. In other words, knowing for whom treatment does not work is just as important as knowing for whom treatment works so the field can move toward developing effective interventions for all individuals regardless of their learning histories and present contexts.

The aim of this dissertation is to investigate the effectiveness, mediators, and

moderators of ACT, a process-based therapy, for clinical perfectionism using a randomized controlled trial design. Demonstrating effectiveness of ACT for clinical perfectionism would inform how to deliver therapy in a process-based way and provide therapists with an alternative method for treating topographically different concerns that share perfectionistic functions. Moreover, mediation and moderation results would identify processes of change for and parameters of treatment effects in the specific context of ACT for clinical perfectionism. Finally, neurological findings would provide another level of analysis for outcomes tested and information on neural mechanisms underlying behavioral change, verifying theoretical assumptions regarding cognitive processes of change and testing coherence of results across levels of scientific analysis. More broadly, the studies presented aim to provide empirical data on the feasibility, utility, and workings of a process-based treatment and may be a useful stepping stone on which future research on process-based therapy can build.

CHAPTER II

STUDY 1

The first study presented self-report outcomes from the randomized controlled

trial. The manuscript has been published in the *Journal of Obsessive-Compulsive and*

Related Disorders: https://doi.org/10.1016/j.jocrd.2019.100444.

A Randomized Controlled Trial of Acceptance and Commitment Therapy for

Clinical Perfectionism

Clarissa W. Ong, M.S.

Eric B. Lee, M.A.

Jennifer Krafft, M.S.

Carina L. Terry, B.S.

Tyson S. Barrett, Ph.D.

Michael E. Levin, Ph.D.

Michael P. Twohig, Ph.D.

Department of Psychology

Utah State University

Corresponding author:
Clarissa W. Ong
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810
(435) 797-8303
clarissa.ong@usu.edu

Abstract

Clinical perfectionism is characterized by imposing excessively high standards on oneself

and experiencing severe distress when standards are not met. It has been found to

contribute to the development and maintenance of various clinical presentations including

anxiety, obsessive-compulsive, and eating disorders. The present study tested the efficacy

of ten weekly individual sessions of acceptance and commitment therapy (ACT) relative

to a waitlist control on clinical perfectionism and global outcomes among 53 individuals

with clinical perfectionism. ACT is a process-based therapy that targets maladaptive

underlying processes (e.g., rigid adherence to unrealistic high standards) rather than

symptom topography (e.g., anxiety, depression). Participants completed assessments at

pretreatment, posttreatment, and one-month follow-up. Results indicated compared to the

waitlist condition, the ACT condition led to greater improvements in clinical

perfectionism as well as outcomes related to wellbeing, functional impairment, distress,

and processes of change. Our study suggests targeting core dysfunctional processes (i.e.,

clinical perfectionism) rather than symptom topography with treatments like ACT is

feasible and efficacious, supporting a shift from symptom-focused to process-based care.

We also note potential weaknesses in our treatment protocol and study methodology that

should be addressed in future research. Study limitations included a small sample size

and high dropout rate (35.7%).

Keywords: acceptance and commitment therapy, clinical perfectionism,

randomized controlled trial, psychological inflexibility, self-compassion

A Randomized Controlled Trial of Acceptance and Commitment Therapy for

Clinical Perfectionism

Perfectionism has been conceptualized as a multidimensional construct that

entails striving for high standards and experiencing distress when these standards are not

met (Shafran & Mansell, 2001). Perfectionism is not inherently problematic; it has

adaptive and maladaptive qualities. Researchers have demonstrated evidence for a two-

factor measure of perfectionism that includes maladaptive evaluative concerns and

positive striving (Bieling, Israeli, & Antony, 2004). The maladaptive evaluative concerns

factor was related to anxiety, depression, and distress whereas the positive striving factor

was not, indicating perfectionistic traits that foster excellence and achievement can be

adaptive and contribute to the wellbeing of individuals with perfectionistic qualities.

Maladaptive (clinical) perfectionism is defined by rigid adherence to unrealistic

self-imposed standards that interferes with functioning and/or causes the individual

significant distress (Shafran & Mansell, 2001). Clinical perfectionism is a risk and

maintenance factor in a wide range of dysfunctional and pathological behaviors including

anxiety, depression, obsessive-compulsive behavior, problematic eating behavior, self-

harm, suicidal ideation, and general distress (Egan, Wade, & Shafran, 2011; Limburg,

Watson, Hagger, & Egan, 2017). Because it is a process common across diagnostic labels

(Egan et al., 2011), clinical perfectionism can be used to characterize a range of

diagnoses and simplify case conceptualization by focusing on the function rather than the

form of behaviors. Clinical perfectionism has also been shown to interfere with treatment

of these problematic behaviors (Chik, Whittal, & O'Neill, 2008; Jacobs et al., 2009;

Welch, Miller, Ghaderi, & Vaillancourt, 2009), underscoring the importance of

addressing clinical perfectionism even when it is not identified as the primary presenting concern.

Despite the important role clinical perfectionism appears to play in psychopathology and its treatment, few treatments identify clinical perfectionism as the primary intervention target. The most empirically supported intervention for clinical perfectionism is cognitive-behavioral therapy for clinical perfectionism (CBT-P). CBT-P generally attempts to change dysfunctional beliefs related to self-imposed standards through techniques like behavioral experiments and cognitive restructuring. CBT-P has produced clinically significant improvements in clinical perfectionism (Handley, Egan, Kane, & Rees, 2015; Riley, Lee, Cooper, Fairburn, & Shafran, 2007; Shafran et al., 2017; Steele et al., 2013), with a recent meta-analysis of eight studies finding medium to large pooled effect sizes for improvements in measures of clinical perfectionism (Lloyd, Schmidt, Khondoker, & Tchanturia, 2015). Despite empirical support for symptomatic improvement following CBT-P, there remains limited understanding of how other indices of outcome like functioning and wellbeing are impacted by these interventions. Given that absence of psychopathology does not necessarily reflect presence of positive mental health (Keyes, 2005), it is important for outcome studies to test if improvement in symptoms are also accompanied by gains in psychological wellbeing. Furthermore, another limitation of the extant literature is only procedures from a traditional cognitive-behavioral perspective have been tested, precluding examination of other therapeutic methods that may be helpful to consider in treatment. Identifying alternative therapeutic procedures provides clinicians with more options for treatment delivery.

Targeting the function or effect of maladaptive processes rather than their content provides an alternative approach to treating clinical perfectionism. In this iteration of intervention, therapy is aimed at process-based patterns (e.g., avoidance of perceived failure) and skills taught tend to address those underlying patterns. Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 2011) is a modern cognitive-behavioral therapy grounded in contextual behavioral science and influenced by acceptance and mindfulness principles. ACT is a process-based or functional psychotherapy that relies heavily on identification of underlying processes for case conceptualization (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes et al., 2011). The ultimate goal of ACT is to enhance valued living and not to reduce symptoms per se. As such, theoretically consistent outcomes in ACT trials include indices of wellbeing like values-consistent behaviors (valued action), quality of life, life satisfaction, and overall functioning (Hayes et al., 2011).

From an ACT perspective, clinical perfectionism is conceptualized as unhelpful (typically avoidant) responses to unwanted inner experiences (e.g., procrastinating to avoid feeling overwhelmed, overworking to dispel thoughts like "I'm not good enough") and overregulation of behavior by rules (e.g., "I should be getting straight As," "I should please my parents"). ACT has the potential to influence perfectionistic behavioral patterns with a unique perspective on how to address "dysfunctional" perfectionistic verbal processes (e.g., thoughts, rules, feelings). From an ACT framework, such thoughts—or inner experiences more broadly—have no inherent power to affect behavior and do not need to be altered. Thus, ACT focuses on changing the effect of the

perfectionistic thought on behavior without necessarily changing the content of the thought.

In contrast, CBT-P posits a different maladaptive process and means of addressing the target process: CBT-P identifies dichotomous thinking as a critical mediator between perfectionism and psychopathology and focuses on changing the content of the thought to reduce its influence on behavior (Egan et al., 2014; Hofmann & Asmundson, 2008). At the same time, we note CBT-P indirectly addresses avoidance through use of behavioral experiments—necessitating contact with previously avoided stimuli—but with the goal of challenging irrational thoughts and aligning them more closely with reality (Egan et al., 2014; Hofmann & Asmundson, 2008).

Conversely, ACT works to build skills that undermine the perceived "causal" relationship between inner events and behavior so individuals can allow inner experiences to be present as they are while still engaging in personally meaningful behavior. The ability to do so is termed psychological flexibility—the key mechanism of change in ACT (Hayes et al., 2006). Given the critical role psychological flexibility is hypothesized to play in ACT, testing if ACT actually shifts psychological flexibility provides an important test of theory. If ACT produces improvements in outcome without moving psychological flexibility, then the theoretical model on which ACT is based needs to be revised. Although this is not a sufficient test of theory as ACT may simultaneously shift other processes of change (e.g., cognitive change) that ultimately influence outcomes, establishing that ACT shifts its hypothesized process of change would provide at least preliminary support for the theory underlying ACT.

Psychological inflexibility has been found to mediate the relationship between maladaptive perfectionism and depression as well as anxiety in cross-sectional and longitudinal investigations (Moroz & Dunkley, 2015, 2019), suggesting inflexible responding to perfectionistic internal experiences (e.g., self-critical thoughts) may explain how maladaptive perfectionism is linked to psychological symptoms. Specifically, these findings suggest more engagement in inflexible responding to perfectionism-related stimuli increases depression and anxiety over time (Moroz & Dunkley, 2019), supporting the hypothesized paradoxical effect of attempts to regulate distress (i.e., attempts to control distress tend to exacerbate it; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Given ACT targets psychologically inflexible responding, it should lead to reductions in distress among individuals with clinical perfectionism—even though the explicit goal of ACT is to increase valued living.

Psychological inflexibility has also been associated with problematic behaviors related to clinical perfectionism such as eating disorders, obsessive-compulsive and related disorders, depression, and anxiety disorders (A-Tjak et al., 2015; Powers, Zum Vorde Sive Vording, & Emmelkamp, 2009), further suggesting clinical perfectionism may be treated by improving psychological flexibility. Other support for this hypothesis comes from clinical trials demonstrating positive outcomes from ACT for multiple behavioral problems related to clinical perfectionism, including obsessive-compulsive disorder (OCD; Twohig et al., 2018; Twohig et al., 2010), trichotillomania (Lee et al., 2018), anxiety and depression (Arch et al., 2012; Forman, Herbert, Moitra, Yeomans, & Geller, 2007), and problematic eating (Juarascio, Forman, & Herbert, 2010). However, ACT has not been specifically tested as a treatment for clinical perfectionism.

The aim of the current study was to investigate the potential efficacy of ACT as a treatment for clinical perfectionism using a randomized controlled trial of ACT versus a waitlist control. We predicted: (1) levels of clinical perfectionism would significantly decrease from pretreatment to follow-up in the ACT condition compared to the waitlist control condition; (2) valued action, quality of life, and symptom distress/functional impairment would significantly improve from pretreatment to follow-up in the ACT condition compared to the waitlist control condition; (3) psychological inflexibility would significantly decrease from pretreatment to follow-up in the ACT condition compared to the waitlist control condition; and (4) participants in the ACT condition would give high treatment acceptability ratings.

Method

Participants

Participants were recruited from a western U.S. town using newspaper advertisements, flyers posted in the community and on the local university campus, and announcements in university classes. Recruitment materials specified intervention targets as "procrastination, spending a lot of time planning/organizing, and difficulty starting/completing tasks because you need to get them exactly right." Inclusion criteria were: (1) score of at least five on the Dimensional Obsessive-Compulsive Scale (DOCS) Symmetry subscale as an indicator of elevated clinical perfectionism (Abramowitz et al., 2010), (2) reported significant distress and/or functional impairment associated with clinical perfectionism based on a clinical interview, (3) willingness to complete ten sessions of therapy, (4) cognitively and physically able to complete intervention and

assessments, (5) not currently seeking therapy for clinical perfectionism, and (6) no change in psychotropic medication in the past 30 days.

Procedures

Procedures were reviewed and approved by a university institutional review board. Individuals interested in the study completed screening online (criterion 1) and over the phone (criteria 3-6) to ascertain they met initial eligibility criteria. Those eligible for the study were scheduled for a baseline assessment during which criterion 2 was evaluated. Prior to the baseline assessment, participants reviewed and signed an informed consent form. After the baseline assessment was completed and study eligibility was confirmed, participants were randomly assigned to the treatment or waitlist condition using a random number table with an equal number of odd and even numbers representing each treatment condition. This was done to ensure roughly equivalent group sizes. The researcher responsible for random assignment was unaware of the condition to which participants would be assigned until the actual assignment was conducted.

Participants in the treatment condition received ten weekly sessions of ACT and participants in the waitlist condition were on a 14-week waitlist. Study assessments were conducted at pretreatment, each session, posttreatment (10 weeks after pretreatment), and one-month follow-up. Participants completed self-report measures at all assessment points and functional near-infrared spectroscopy neuroimaging at pretreatment and posttreatment. Neuroimaging and session data were not included in this report. The waitlist group was offered ten sessions of ACT after follow-up data were collected. Students in eligible classes received research course credit for their participation in the study. Figure 1 provides an illustration of participant flow throughout the study.

Intervention

Treatment consisted of ten weekly 50-minute sessions of ACT. The first session covered limits to confidentiality, informed consent (orientation to therapy), and information gathering. The second session focused on creative hopelessness. Sessions 3 and 4 were on acceptance/willing, 5 and 6 on defusion, and 7 and 8 on values and committed action. The final two sessions reviewed skills learned and discussed maintenance of gains and relapse prevention. Sessions were conducted by a clinical psychologist who has been licensed for more than 10 years or one of two graduate students who were supervised by the psychologist on a weekly basis. Sessions were recorded to evaluate treatment integrity.

The study treatment manual was based on an ACT protocol for OCD (Twohig et al., 2010). Because ACT is a process-based therapy, much of the manual adaptation entailed replacing the distressing internal experience of obsessions in OCD with experiences relevant to participants' perfectionistic presentation such as fear of failure and a perceived need to be "perfect." In addition, other considerations were detailed for features specific to clinical perfectionism. First, individuals struggling with clinical perfectionism may not exhibit significant functional impairment. That is, they may still be able to complete tasks at work/school and maintain satisfactory interpersonal relationships. However, they may experience significant psychological distress in the form of worry, anxiety, rumination, and self-critical thoughts and may be acting in accordance with rules that do not align with their values. Furthermore, even if they are highly functional, their pattern of behavior may not be sustainable or enjoyable over time. Second, because there is a distinction between adaptive and maladaptive perfectionism,

treatment needed to focus on the maladaptive aspects of perfectionism and not

perfectionism in general. For example, having high standards per se may be adaptive, but

the cognitive and behavioral rigidity with which one regards those standards (e.g., "If I

don't get an A, I'm a failure") may not be. Furthermore, the function of the

behavior—not its topography—defines whether it is adaptive. For instance, completing

homework to avoid feelings of inadequacy is likely less adaptive than doing so to

approach a value of learning. This makes training awareness of the function of behavior a

critical component of ACT for clinical perfectionism. Third, perfectionism is typically

ego-syntonic and individuals may show resistance to changing what they view as a

dimension of their personality. From an ACT perspective, fusion with perfectionism that

interferes with valued living is viewed as a form of self-as-content (as opposed to self-as-

context). Hence, one potential component of treatment was to practice holding this aspect

of identity "more lightly" in the service of values.

Measures

  Screening measure.

  Dimensional Obsessive-Compulsive Scale (DOCS)—Symmetry (Abramowitz et

al., 2010). This five-item subscale assesses severity of avoidance, distress, and

interference due to a perceived need to make things "just right" (Abramowitz et al.,

2010). Examples of this type of avoidance and/or distress include a perceived need for

"symmetry, evenness, balanced, or exactness" and behavioral repetition to obtain a

feeling of being "just right" or "balanced." Given the overlap between rigid pursuit of a

sense of "just right" in the DOCS Symmetry subscale and the behavioral inflexibility

around arbitrarily imposed standards in clinical perfectionism, we used the DOCS

Symmetry subscale to screen for clinical perfectionism in the current study. Each item is

scored from 0 to 4 with higher scores indicating higher severity (Abramowitz et al.,

2010). Individuals who scored at least five (just below the mean of 6.13 [SD = 5.50] in an

OCD sample; Abramowitz et al., 2010) were assessed further for eligibility. A lower

screening cutoff was selected to err on the side of over-including potential participants

for further eligibility assessment. The symmetry subscale has shown good to excellent

internal consistency in both clinical and unscreened samples and good convergent,

divergent and criterion validity (Abramowitz et al., 2010).

Baseline measures.

Demographics. Participants were asked a series of demographic questions,

including items on gender, race, ethnicity, and socioeconomic status.

Structured Clinical Interview for DSM-5 (SCID-5; First, Williams, Karg, &

Spitzer., 2016). The SCID-5 is a semi-structured interview used to assess DSM-5

diagnoses, including mood and anxiety disorders, psychotic disorders, and substance use

disorders. In the current study, we administered a truncated version of the SCID-5

focusing on diagnoses related to clinical perfectionism: social anxiety disorder,

generalized anxiety disorder (GAD), OCD, hoarding disorder, body dysmorphic disorder,

trichotillomania, excoriation disorder, anorexia nervosa, bulimia nervosa, binge-eating

disorder, and obsessive-compulsive personality disorder (OCPD). Diagnostic interviews

were conducted by trained research assistants and diagnoses were assigned in accordance

with DSM-5 criteria.

Outcome measures.

Frost Multidimensional Perfectionism Scale (FMPS; Frost, Marten, Lahart, &

Rosenblate, 1990). The FMPS includes six subscales. However, for the present study

only the most clinically relevant three subscales indicative of maladaptive perfectionism

were analyzed: Concern Over Mistakes (9 items), Doubts About Actions (4 items), and

Personal Standards (7 items). Previous treatment trials for clinical perfectionism also

used these subscales to evaluate outcomes (e.g., Egan et al., 2014; Handley et al., 2015;

Riley et al., 2007). The Concern Over Mistakes subscale assesses unhelpful responses to

mistakes and viewing mistakes as personal failure, Doubts About Actions evaluates

doubts about personal competence, and Personal Standards reflects setting high personal

standards and basing self-evaluation on ability to meet these standards. We analyzed

Personal Standards in this study to provide a comparison to previous trials although we

note that this subscale appears to be less sensitive to treatment effects (Egan et al., 2014;

Handley et al., 2015) and has been linked to healthy perfectionism (Bieling et al., 2004;

Stoeber & Otto, 2006). Each item is scored from 1 to 5 with higher scores indicating

more maladaptive perfectionism. This measure has shown construct validity and adequate

internal consistency (Frost et al., 1990). In our sample, internal consistency was good to

excellent across the three subscales; Cronbach's αs ranged from .85 to .94.

Outcome Questionnaire-45.2 (OQ-45; Lambert et al., 1996). The OQ-45 is a 45-

item measure of symptom distress and functional impairment (Lambert et al., 1996).

Each item is scored from 0 to 4 and higher scores indicate greater distress and/or

impairment (Lambert et al., 1996). The full measure has excellent internal consistency

and good temporal stability and convergent validity (Lambert et al., 1996). Internal

consistency was excellent in the present sample ($\alpha = .94$).

Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003; Flanagan, 1978).
The revised 16-item version of the QOLS (Burckhardt & Anderson, 2003) was used in
the present study to assess overall satisfaction with quality of life. Each item is rated from
1 to 7 with higher scores indicating greater quality of life (Burckhardt & Anderson,
2003). The QOLS has demonstrated reliability and convergent and divergent validity
(Burckhardt & Anderson, 2003). In the present study, internal consistency was good (α
= .89).

Valuing Questionnaire (VQ)—Progress (Smout, Davies, Burns, & Christie,
2014). The 5-item Progress subscale was used in the current study to assess progress
toward personal values. Items are rated from 0 to 6; higher scores indicate more valued
action (Smout et al., 2014). The Progress subscale has demonstrated convergent and
incremental validity as well as good internal consistency in past research (Smout et al.,
2014). Internal consistency was good in this study (α = .81).

Process measures.

Acceptance and Action Questionnaire — II (AAQ-II; Bond et al., 2011). The
AAQ-II is a seven-item measure of psychological inflexibility, the process wherein
individuals disengage from actions in line with personal values due to disconnection from
the present moment and/or ineffective attempts to control thoughts and feelings (Bond et
al., 2011). Each item is scored from 1 to 7. Higher scores indicate higher psychological
inflexibility. The AAQ-II has demonstrated adequate reliability and validity in both
clinical and unscreened samples (Bond et al., 2011) and is sensitive to treatment (e.g.,
Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012). In the current study internal
consistency was excellent (α = .92).

Self-Compassion Scale (SCS; Neff, 2003). The SCS is a 26-item measure of self-compassion. Each item is scored from 1 to 5. A total sum score is calculated from items assessing three components of self-compassion (i.e., mindfulness, self-kindness, and common humanity) as well as reverse-scored items that measure their inverse (i.e., over-identification, self-judgment, and isolation). The scale has excellent internal consistency and strong evidence of convergent and divergent validity (Neff, 2003). Internal consistency was excellent in our sample (α = .95).

Treatment Acceptability

Treatment Evaluation Inventory—Short Form (TEI-SF; Kelley, Heffer, Gresham, & Elliot, 1989). The TEI-SF is a nine-item measure of the degree to which clients find a psychological intervention acceptable (Kelley et al., 1989). The present study used a seven-item version of the TEI-SF; items were revised and two were omitted due to irrelevance to an adult sample. Each item is scored from 1 to 5; higher scores indicate greater treatment acceptability (Kelley et al., 1989). The measure has good internal consistency and has been found to detect differences between treatments in previous research (Kelley et al., 1989). Internal consistency was good in our sample (α = .80).

Treatment Adherence

A fifth of all possible therapy sessions (n = 38) from the 19 participants who attended at least five sessions were randomly selected to be coded for treatment adherence (Plumb & Vilardaga, 2010). Sessions from one participant who completed five sessions were excluded due to irretrievable data (broken disc). Selection was balanced within and across participants such that two sessions from each participant and at least

three of each therapy session were coded to ensure fair representation of participants over

the course of treatment. Treatment adherence was scored based on a standardized coding

system used in previously published ACT randomized controlled trials (e.g., Crosby &

Twohig, 2016; Twohig et al., 2010).

Raters were trained research assistants who coded at least nine sessions with an

experienced graduate student who had used the current adherence coding system in

previous clinical trials. After each session, raters discussed scores assigned and

discrepancies were discussed to increase consistency between raters. Raters also watched

at least one therapy session together and coded the session simultaneously to clarify

definition of constructs and use of the coding scheme. ICCs ranged from .83 to 1.00 for

Rater 1 and .79 to 1.00 for Rater 2. By the end of the training period, both raters received

at least two consecutive ICCs > .90. The remaining sessions were independently coded

by the two trained raters.

ACT-congruent and ACT-incongruent processes were coded for quality and

quantity on a five-point scale (1 = the process was never explicitly covered, 2 = the

process occurred at least once and not in an in-depth manner, 3 = the process occurred

several times and was covered at least once in a moderately in-depth manner, 4 = the

process occurred with relatively high frequency and was addressed in a moderately in-

depth manner, 5 = the process occurred with high frequency and was covered in a very

in-depth manner). ACT-congruent processes included acceptance, defusion, contact with

the present moment, self-as-context, committed action, and values. ACT-inconsistent

processes included cognitive restructuring, attribution of causal power to internal

experiences, and control/avoidance strategies. In addition, raters provided overall ratings

for adherence to the ACT model and general quality of therapy.

Data and Statistical Analyses

Data were collected from participants who were willing to complete pretreatment,

posttreatment, and follow-up assessments, including those who did not attend all ten

sessions of therapy. All participants assigned to a study condition were included in

analyses. Calculation of sample size was based on previous clinical trials on

perfectionism that reported significant effects (e.g., Egan et al., 2014; Riley et al., 2007)

due to insufficient information on parameters (e.g., intra-individual correlations) required

to conduct a priori power analyses for multilevel modeling. Use of multilevel models

permitted inclusion of all data from this intent-to-treat sample irrespective of missing data

at posttreatment or follow up. Therefore, no data imputation methods were used.

Statistical analyses were conducted with R in RStudio (R Core Team, 2015; RStudio

Team, 2015) using the following packages: tidyverse (Wickham, 2017), lme4 (Bates,

Maechler, Bolker, & Walker, 2015), effsize (Torchiano, 2017), and texreg (Leifeld,

2013).

Between-group comparisons (*t*-test or χ^2 test) were used to evaluate differences

between ACT and waitlist participants at pretreatment as well as between treatment

completers and dropouts. Participants who did not complete at least six sessions of

treatment were considered dropouts.

Linear mixed effects models were used to examine the effect of the intervention

condition on outcomes over time. A series of nested models were specified for each

outcome of interest: FMPS-CM, FMPS-PS, FMPS-DA, OQ-45, QOLS, VQ Progress,

AAQ-II, and SCS. All models included random intercepts for individuals. For all

outcomes, the first model only included time, where time was measured in three discrete

values (i.e., pretreatment, posttreatment, and follow-up). The second model added the

condition as a main effect. In the third and final model, the interaction between time and

condition was tested. These models were compared in terms of fit using a χ^2 difference

test based on the likelihood function. Only coefficients from the best-fitting model were

interpreted. Final models were estimated using the maximum likelihood criterion. All

coefficient *p*-values reported are based on the Satterthwaite approximation to degrees of

freedom.

Clinically Significant and Reliable Change

Three different indices of change were used to categorize participants at

posttreatment and one-month follow-up (see Table 4).

Clinically significant change. Clinically significant change was operationalized

as having scores fall within functional range at posttreatment (i.e., one standard deviation

from a normative mean; Shafran et al., 2017). This is a stricter criterion than that of two

standard deviations within a normative mean proposed by Jacobson and Truax (1991).

For these analyses, we only examined the primary (most clinically relevant) variable in

each domain of interest— clinical perfectionism (FMPS-CM), overall clinical severity

(OQ-45), and wellbeing (QOLS). The healthy cutoff was < 26 for FMPS-CM (Frost &

Steketee, 1997), < 66 for OQ-45 (Lambert et al., 1996), and > 71 for QOLS (Langeland,

Wahl, Kristoffersen, Nortvedt, & Hanestad, 2007).

Reliable change index. We also calculated a reliable change index (RCI)—the

difference between pretreatment and posttreatment scores and between pretreatment and

follow-up scores divided by the standard error of the difference between the two scores (Jacobson & Truax, 1991). An RCI greater than 1.96 suggests real change rather than change due to random error (Jacobson & Truax, 1991). Whereas clinically significant change measures proximity to normative functioning, the reliable change index provides a measure of the magnitude of change over the course of treatment (Jacobson & Truax, 1991).

Recovery status. Participants were classified as "recovered" if they met criteria for both clinically significant and reliable change (i.e., fell within normative range and showed real change), "improved" if they showed positive reliable change but did not end up in the normative range, and "deteriorated" if they showed negative reliable change regardless of whether they ended up in the normative range; participants who did not show reliable change were considered "unchanged" (Egan et al., 2014).

Results

Sample Descriptives

Mean age of the sample was 25.4 years (SD = 12.3). The majority of participants identified as female (74%), European American (85%), single (74%), and members of The Church of Jesus Christ of Latter-day Saints (79%; see Table 1 for details). The most common DSM-5 diagnoses assigned were OCPD, GAD, and OCD. There were no significant differences between groups on demographic, outcome, or process variables at pretreatment (see Table 1). There were significantly more participants diagnosed with GAD in the ACT condition than in the waitlist condition ($p = .043$). Baseline FMPS subscale scores in the current study were comparable to those reported in previous

clinical trials (e.g., Egan et al., 2014; Rozental et al., 2017; Shafran et al., 2017),

suggesting eligibility screening methods yielded a clinical sample.

Treatment Dropout

Treatment dropout rate was high (35.7%) in the current study. Post hoc *t*-test

analyses revealed no significant differences between completers and dropouts on primary

outcome variables. However, the direction of between-group differences indicated

participants who dropped out of treatment generally had higher mean scores of

maladaptive perfectionism and symptom distress and lower mean scores on quality of

life: FMPS-CM ($M_{completer}$ = 32.1, $M_{dropout}$ = 35.4, *p* = .305), FMPS-DA ($M_{completer}$ = 14.9,

$M_{dropout}$ = 16.9, *p* = .139), OQ-45 ($M_{completer}$ = 75.5, $M_{dropout}$ = 89.2, *p* = .106), and QOLS

($M_{completer}$ = 78.5, $M_{dropout}$ = 68.9, *p* = .177).

Treatment Acceptability

The TEI-SF was only administered to participants in the ACT condition at the

second session to avoid the confounding effect of treatment efficacy. The mean total

score was 25.9 (SD = 3.3) out of a total possible score of 35, indicating moderately high

treatment acceptability.

Treatment Adherence

Mean ratings for ACT processes were as follows: acceptance = 3.29 (SD = 1.16),

defusion = 2.76 (SD = 1.13), present moment awareness = 1.58 (SD = 0.60), self-as-

context = 1.16 (SD = 0.44), committed action = 2.76 (SD = 0.63), and values = 2.79 (SD

= 0.96). This suggests treatment focused most heavily on acceptance, defusion, values,

and committed action and these processes were covered several times in an in-depth

manner. Mean scores for cognitive restructuring, attribution of causal power to internal

experiences, and control/avoidance strategies were 1.00 (SD = 0), 1.03 (SD = 0.16), and

1.00 (SD = 0) respectively, indicating occurrence of ACT-inconsistent processes was

extremely rare. The mean rating for adherence to the ACT model was 4.68 (SD = 0.47)

and that for overall therapist quality was 5.00 (SD = 0). These results suggest therapy in

the present study was conducted in an ACT-consistent fashion and of excellent quality.

Outcomes of Interest

Means, standard deviations, and effect sizes for outcomes over time are presented

in Table 2.

Clinical Perfectionism (FMPS). Two of the three FMPS subscales showed a

significant interaction between condition and time: FMPS-CM and FMPS-DA. For

FMPS-CM, the conditions more strongly differed at posttreatment and follow-up (*p*s

< .001; see Table 3). That is, as shown in Figure 2 Panel A, there was a greater decrease

in scores in the ACT condition over time compared to the waitlist condition in which

scores remained relatively constant. For FMPS-DA, there were lower scores in the ACT

condition compared to the waitlist condition at posttreatment (*p* = .006) but not at one-

month follow-up (see Figure 2 Panel B). Conversely, the best-fitting model for FMPS-PS

only included time as a main effect; coefficients reflected a significant decrease in scores

from pretreatment to follow-up—but not from pretreatment to posttreatment—across

groups (*p* = .002; see Figure 2 Panel C).

Symptom distress and functional impairment (OQ-45). The condition by time

interaction was significant at both posttreatment and follow-up (*p* = .006 and *p* = .005

respectively), suggesting that the decrease in self-reported distress and impairment in the

ACT condition was maintained over time and greater than that in the waitlist condition (see Figure 2 Panel D).

Progress toward values (VQ). The interaction effect of time and condition was significant at posttreatment and follow-up ($p < .001$ and $p = .011$ respectively), with higher scores for valued action observed in the ACT condition at both timepoints (see Figure 2 Panel E).

Quality of life (QOLS). The interaction effect of time and condition was significant at posttreatment and follow-up ($p = .016$ and $p < .001$ respectively), with higher self-reported quality of life in the ACT condition at posttreatment and follow-up compared to the waitlist condition (see Figure 2 Panel F).

Psychological inflexibility. he interaction effect of time and condition was significant at posttreatment and follow-up ($p = .009$ and $p = .001$ respectively). Self-reported psychological inflexibility significantly decreased in the ACT condition relative to the waitlist condition at posttreatment and follow-up (see Figure 2 Panel G).

Self-compassion. The interaction between time and condition was significant for SCS scores at posttreatment and follow-up ($p < .001$ and $p = .002$ respectively), with the ACT condition showing greater self-reported self-compassion at both timepoints relative to the waitlist condition (see Figure 2 Panel H).

Clinically Significant and Reliable Change

Posttreatment. χ^2 tests indicated no significant between-group differences at posttreatment in the proportion of participants who demonstrated clinically significant change, reliable change, or overall improvement for FMPS-CM and OQ-45 (see Table 4). A higher proportion of participants in the ACT condition experienced clinically

significant change in quality of life compared to the waitlist condition (89% vs. 58%; *p* = .034). For concern over mistakes, 45% in the ACT condition showed clinically significant change, 65% showed reliable improvement, and 35% were considered recovered. These figures were 67%, 77%, and 53% respectively for distress and impairment, and 89%, 65%, and 59% respectively for quality of life.

One-month follow-up. There were significant between-group differences for reliable change (*p* = .012) and recovery status (*p* = .030) for the FMPS-CM, clinically significant change for the OQ-45 (*p* = .010), and reliable change for the QOLS (*p* = .025; see Table 4 for details). Between-group differences tended to indicate both a higher proportion of ACT participants showing positive change and a smaller proportion of ACT participants showing no change or worsening of outcomes compared to waitlist participants at follow-up. For concern over mistakes, 50% in the ACT condition showed clinically significant change, 56% showed reliable improvement, and 44% were attained recovered status. These figures were 88%, 69%, and 63% respectively for distress and impairment, and 88%, 63%, and 56% respectively for quality of life.

Discussion

Our findings indicate ACT was superior to a waitlist control condition on clinical perfectionism, psychological functioning, and processes of change from pretreatment to follow-up. Within-group improvement over time was significant for all outcomes, further supporting the efficacy of ACT with respect to clinical perfectionism and global outcomes. In addition, the observed effect sizes are comparable to those obtained from CBT treatment trials for clinical perfectionism (Egan et al., 2014; Handley et al., 2015). For example, a previous waitlist-controlled trial for individual CBT-P reported between-

group posttreatment Hedges' gs ranging from 0.49 to 1.16 for FMPS scales (Riley et al., 2007); corresponding effect sizes in the present study ranged from 0.42 to 1.05.

Our results indicate ACT—as administered in the present study—may be similarly efficacious to CBT for clinical perfectionism based on comparisons of observed effect sizes and more efficacious than a waitlist condition on the most clinically relevant outcomes tested. Not only are these findings consistent with previous research that has found ACT to be effective in treating related concerns like OCD (Twohig et al., 2010), mixed anxiety disorders (Arch et al., 2012), and social anxiety (Craske et al., 2014), they also suggest ACT may be a viable treatment option for individuals struggling with clinical perfectionism more globally. Future research could clarify how the efficacy of ACT compares to CBT-P in the same trial and identify moderators of treatment response. Such findings would provide insight into the replicability of our findings and empirical guidance for clinical decision making regarding which treatment to use for clinical perfectionism. In addition, testing the efficacy of ACT for other overarching maladaptive processes (e.g., rumination) may be warranted. Results from these studies could be used to facilitate distillation of ACT protocols to their core function-oriented components and streamline therapeutic practice. Furthermore, given the role of clinical perfectionism as a risk and maintenance factor in various presentations (Egan et al., 2011), it would also be prudent to examine if reductions in perfectionism specifically predict decreases in psychopathology and functional outcomes to provide further evidence supporting clinical perfectionism as a generalized maladaptive process.

More broadly, present findings provide evidence that a process-based approach—ACT in this case—can be useful for treating topographically diverse behavioral patterns

that share a common function (e.g., avoidance of feelings of inadequacy). The present

study represents a foray into the field of process-based care, which advocates a shift in

focus from symptoms to malleable processes of change that cohere across levels of

analysis, scientific disciplines, and worldviews in order to create more integrated

evidence-based models of treatment (Hayes & Hofmann, 2017). By focusing our research

and clinical efforts on mutable mechanisms of change, we can facilitate the development

of more parsimonious interventions designed to address a wide range of formally distinct

presentations by distilling them to core functional processes. Such a transition may

increase the efficiency of clinical training and psychological interventions, decreasing

therapeutic burden on providers and clients and enhancing the availability of mental

health resources (Hofmann & Hayes, 2018).

At the same time, we note that although doubting of actions did not significantly

differ between groups at follow-up (Hedges' g = -0.41), the ACT group reported

significantly less doubting of actions at posttreatment (Hedges' g = -0.74). The small

change in personal standards observed is also congruent with results from previous

treatment trials (Egan et al., 2014; Handley et al., 2015) and lack of significant group

differences (Hedges' g = -0.50 at posttreatment and -0.36 at follow-up) could have been

due to the slight decrease in the waitlist condition at follow-up (see Figure 2 Panel C).

The relatively small magnitude of change in personal standards is not unexpected from an

ACT perspective. Given ACT therapists are concerned about the function of private

events—including rules—rather than their frequency or content, it follows that a rule

does not need to change for responses to it to change. In other words, participants could

still have held high standards for themselves while practicing more flexible and adaptive

responses to these rules. This interpretation is supported by the observed improvement in

distress and impairment, quality of life, and psychological inflexibility in the ACT

condition over time. Moreover, having high personal standards has been consistently

linked to adaptive or healthy perfectionism (Bieling et al., 2004; Stoeber & Otto, 2006)

so they may not need to change for individuals to live a meaningful life.

In addition, gains in valued action at posttreatment were not maintained at follow-

up. One reason for this could be valued behaviors are more situationally dependent than

other indices of wellbeing, such as quality of life and self-compassion, and therefore

more difficult to maintain. External barriers (e.g., being physically ill, being given a

sudden work deadline) can readily impede one's ability to engage in specific actions. At

the same time, external barriers are often tied to difficult inner experiences (e.g., rushing

to meet a deadline to satisfy a perceived need to please others) and the capacity to persist

in meaningful behavior in the presence of these inner experiences is a critical piece of

psychological flexibility. Thus, future iterations of ACT for clinical perfectionism may

need to emphasize behavioral maintenance more in therapy to increase the likelihood of

sustained valued action.

Limitations

Our results should be interpreted in the context of study limitations. First, our

sample size was small. Use of multilevel analyses permitted use of all available data,

minimizing issues with power and biases from study attrition, but error variability could

still have obscured treatment effects, resulting in Type II error.

Second, data were not collected from waitlist participants who chose to receive

the intervention, which would have added power to within-group analyses. The reason for

this decision was we did not believe the data collected from these participants for within-group analyses (between-group comparisons would have been inappropriate given groups would not have been independent) justified the additional burden placed on participants who had already completed one round of research assessment and who had been on a 14-week waitlist.

Third, reliability analyses were not conducted for the screening measure used in the current study as screening data were collected prior to study enrollment. Thus, we were unable to ascertain the appropriateness of the DOCS Symmetry subscale for determining clinical status of our perfectionism sample. However, study eligibility was primarily evaluated using a clinical interview by a trained assessor and baseline perfectionism scores observed in our sample were similar to those reported in previous clinical trials on perfectionism, indicating we obtained a sample with clinically significant levels of perfectionism.

Fourth, our sample was homogenous (mostly White, college-aged, single, and LDS) and unrepresentative of population demographics, compromising generalizability of our findings. Furthermore, it is unclear if underlying processes necessarily replicate across dimensions of identity. It is possible marginalized individuals with a different set of contingencies in their history and current environment may have an alternative function for formally perfectionistic behaviors. If so, treatment would need to target that key function and the present protocol might not be applicable to these groups. For example, striving for high standards might be a response to consistent external doubts about personal abilities based on stereotypes rather than discomfort related to perceived

failure and treatment may focus on empowerment and increased awareness of systemic oppression rather than clinical perfectionism per se.

Fifth, although there are arguably advantages to using a waitlist control for initial pilot research evaluating new therapy applications (e.g., increasing power with smaller samples, reducing false negatives in early exploration; Gold et al., 2017), the waitlist condition did not rule out a variety of alternate method and common factors that might have accounted for treatment effects observed in this study (e.g., placebo and demand characteristics).

Sixth, dropout rate in our study was relatively high (35.7%) compared to those in previous perfectionism trials (10% to 22.2%; Egan et al., 2014; Riley et al., 2007) as well as the average dropout rate in ACT of 15.8% (Ong, Lee, & Twohig, 2018). There were several possible reasons for this. The additional incentive of course credit might have resulted in dropout once students received a sufficient number of credits. Anecdotally, therapists noted a high level of disengagement and subsequent dropout following awarding of credit for completion of the baseline assessment and early therapy sessions. Therapists also observed aspects of perfectionism (e.g., rigidity, avoidance) could have led to premature termination. For example, a few participants noted they were too busy with work to continue therapy. At the same time, the discrepancy between present dropout rate and that in other trials indicates high dropout is not unique to clinical perfectionism and dropout could have been lower in our sample. Therapists using a similar treatment may need to attend to factors contributing to dropout and explicitly address them in therapy to prevent early termination.

Seventh, we did not conduct reliability tests for SCID diagnoses because we did not have a second independent interviewer. Ideally, a second interviewer blind to the first interviewer's report should have conducted an independent assessment of diagnostic status. At the same time, given the process-based approach of the study intervention, the purpose of reporting DSM-5 diagnoses was to provide a more detailed sample description rather than to evaluate treatment efficacy. Thus, although it is a limitation of our study, lack of reliability testing should not influence interpretation of current findings.

Eighth, we did not preregister the current clinical trial, which may mar the credibility of our a priori hypotheses and subsequent findings as well as increase the probability of publication bias. Although we tested hypotheses stated in our research proposal, it would be prudent for researchers to preregister clinical trials to increase transparency in the research process and reduce potential reporting bias.

Finally, a longer follow-up period would have provided more information on the longevity of treatment gains. This could be particularly important in the case of clinical perfectionism given many aspects of its presentation are ego-syntonic. Moreover, maladaptive perfectionistic behavioral patterns tend to be longstanding and habitual, possibly rendering them more resistant to change and more prone to relapse.

Funding Source

References

A-Tjak, J. G. L., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A., & Emmelkamp, P. M. (2015). A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems. *Psychotherapy and Psychosomatics, 84*(1), 30-36. doi:10.1159/000365764

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., . . . Hale, L. R. (2010). Assessment of obsessive-compulsive symptom dimensions: development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment, 22*(1), 180-198. doi:10.1037/a0018260

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. doi:10.1037/a0028310

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software, 67*(1), 1–48. doi:10.18637/jss.v067.i01

Bieling, P. J., Israeli, A. L., & Antony, M. M. (2004). Is perfectionism good, bad, or both? Examining models of the perfectionism construct. *Personality and Individual Differences, 36*(6), 1373-1385. doi:10.1016/s0191-8869(03)00235-6

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . . Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: A revised measure of psychological inflexibility and

experiential avoidance. *Behavior Therapy, 42*(4), 676-688.

doi:10.1016/j.beth.2011.03.007

Burckhardt, C. S., & Anderson, K. L. (2003). The Quality of Life Scale (QOLS):

Reliability, validity, and utilization. *Health and Quality of Life Outcomes, 1*(60).

doi:10.1186/1477-7525-1-60

Chik, H. M., Whittal, M. L., & O'Neill, M. L. (2008). Perfectionism and treatment

outcome in obsessive-compulsive disorder. *Cognitive Therapy and Research,

32*(5), 676-688. doi:10.1007/s10608-007-9133-2

Craske, M. G., Niles, A. N., Burklund, L. J., Wolitzky-Taylor, K. B., Vilardaga, J. C.,

Arch, J. J., . . . Lieberman, M. D. (2014). Randomized controlled trial of cognitive

behavioral therapy and acceptance and commitment therapy for social phobia:

Outcomes and moderators. *Journal of Consulting and Clinical Psychology, 82*(6),

1034-1048. doi:10.1037/a0037212

Crosby, J. M., & Twohig, M. P. (2016). Acceptance and Commitment Therapy for

Problematic Internet Pornography Use: A Randomized Trial. *Behavior Therapy,

47*, 355-366. doi:10.1016/j.beth.2016.02.001

Egan, S. J., van Noort, E., Chee, A., Kane, R. T., Hoiles, K. J., Shafran, R., & Wade, T.

D. (2014). A randomised controlled trial of face to face versus pure online self-

help cognitive behavioural treatment for perfectionism. *Behaviour Research and

Therapy, 63*, 107-113. doi:10.1016/j.brat.2014.09.009

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic

process: A clinical review. *Clinical Psychology Review, 31*(2), 203-212.

doi:10.1016/j.cpr.2010.04.009

First, M. B., Williams, J. B. W., Karg, R. S., & Spitzer., R. L. (2016). *Structured Clinical Interview for DSM-5 Disorders, Clinician Version (SCID-5-CV)*. Arlington, VA: American Psychiatric Association.

Flanagan, J. C. (1978). A research approach to improving our quality of life. *American Psychologist, 33*(2), 138-147. doi:10.1037/0003-066X.33.2.138

Fledderus, M., Bohlmeijer, E. T., Pieterse, M. E., & Schreurs, K. M. (2012). Acceptance and commitment therapy as guided self-help for psychological distress and positive mental health: A randomized controlled trial. *Psychological Medicine, 42*(3), 485-495. doi:10.1017/s0033291711001206

Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A randomized controlled effectiveness trial of acceptance and commitment therapy and cognitive therapy for anxiety and depression. *Behavior Modification, 31*(6), 772-799. doi:10.1177/0145445507302202

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468. doi:10.1007/BF01172967

Frost, R. O., & Steketee, G. (1997). Perfectionism in obsessive-compulsive disorder patients. *Behaviour Research and Therapy, 35*(4), 291-296. doi:10.1016/S0005-7967(96)00108-8

Gold, S. M., Enck, P., Hasselmann, H., Friede, T., Hegerl, U., Mohr, D. C., & Otte, C. (2017). Control conditions for randomised trials of behavioural interventions in psychiatry: a decision framework. *The Lancet Psychiatry, 4*(9), 725-732. doi:10.1016/s2215-0366(17)30153-0

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled

    trial of group cognitive behavioural therapy for perfectionism. *Behaviour*

    Research and Therapy, 68, 37-47. doi:10.1016/j.brat.2015.02.006

Hayes, S. C., & Hofmann, S. G. (2017). The third wave of cognitive behavioral therapy

    and the rise of process-based care. *World Psychiatry, 16*(3), 245-246.

    doi:10.1002/wps.20442

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), 1-25. doi:10.1016/j.brat.2005.06.006

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and Commitment*

    Therapy, Second Edition: The Process and Practice of Mindful Change. New

    York, NY: Guilford Press.

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996).

    Experiential avoidance and behavioral disorders: A functional dimensional

    approach to diagnosis and treatment. *Journal of Counsulting and Clinical*

    Psychology, 64(6), 1152-1168. doi:10.1037/0022-006X.64.6.1152

Hofmann, S. G., & Asmundson, G. J. (2008). Acceptance and mindfulness-based

    therapy: New wave or old hat? *Clinical Psychology Review, 28*(1), 1-16.

    doi:10.1016/j.cpr.2007.09.003

Hofmann, S. G., & Hayes, S. C. (2018). The future of intervention science: Process-based

    therapy. *Clinical Psychological Science*, 1-14. doi:10.1177/2167702618772296

Jacobs, R. H., Silva, S. G., Reinecke, M. A., Curry, J. F., Ginsburg, G. S., Kratochvil, C.

    J., & March, J. S. (2009). Dysfunctional attitudes scale perfectionism: A predictor

and partial mediator of acute treatment outcome among clinically depressed

adolescents. *Journal of Clinical Child & Adolescent Psychology, 38*(6), 803-813.

doi:10.1080/15374410903259031

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to

defining meaningful change in psychotherapy research. *Journal of Counsulting*

and Clinical Psychology, 59(1), 12-19. doi:10.1037/0022-006X.59.1.12

Juarascio, A. S., Forman, E. M., & Herbert, J. D. (2010). Acceptance and commitment

therapy versus cognitive therapy for the treatment of comorbid eating pathology.

Behavior Modification, 34(2), 175-190. doi:10.1177/0145445510363472

Kelley, M. L., Heffer, R. W., Gresham, F. M., & Elliot, S. N. (1989). Development of a

modified Treatment Evaluation Inventory. *Journal of Psychopathology and*

Behavioral Assessment, 11(3), 235-247. doi:10.1007/BF00960495

Keyes, C. L. (2005). Mental illness and/or mental health? Investigating axioms of the

complete state model of health. *Journal of Consulting and Clinical Psychology,*

73(3), 539-548. doi:10.1037/0022-006X.73.3.539

Lambert, M. J., Burlingame, G. M., Umphress, V., Hansen, N. B., Vermeersch, D. A.,

Clouse, G. C., & Yanchar, S. C. (1996). The Reliability and Validity of the

Outcome Questionnaire. *Clinical Psychology & Psychotherapy, 3*(4), 249-258.

doi:10.1002/(SICI)1099-0879(199612)3:4<249::AID-CPP106>3.0.CO;2-S

Langeland, E., Wahl, A. K., Kristoffersen, K., Nortvedt, M. W., & Hanestad, B. R.

(2007). Quality of life among Norwegians with chronic mental health problems

living in the community versus the general population. *Community Mental Health*

Journal 43(4), 321-339. doi:10.1007/s10597-006-9076-1

Lee, E. B., Homan, K. J., Morrison, K. L., Ong, C. W., Levin, M. E., & Twohig, M. P.

    (2018). Acceptance and commitment therapy for trichotillomania: A randomized

    controlled trial of adults and adolescents. *Behavior Modification*.

    doi:10.1177/0145445518794366

Leifeld, P. (2013). texreg: Conversion of statistical model output in R to LaTeX and

    HTML tables. *Journal of Statistical Software, 55*(8), 1-24.

    doi:10.18637/jss.v055.i08

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2017). The relationship

    between perfectionism and psychopathology: A meta-analysis. *Journal of*

    Clinical Psychology, 73(10), 1301-1326. doi:10.1002/jclp.22435

Lloyd, S., Schmidt, U., Khondoker, M., & Tchanturia, K. (2015). Can Psychological

    Interventions Reduce Perfectionism? A Systematic Review and Meta-analysis.

    Behavioural and Cognitive Psychotherapy 43(6), 705-731.

    doi:10.1017/S1352465814000162

Moroz, M., & Dunkley, D. M. (2015). Self-critical perfectionism and depressive

    symptoms: Low self-esteem and experiential avoidance as mediators. *Personality*

    and Individual Differences, 87, 174-179. doi:10.1016/j.paid.2015.07.044

Moroz, M., & Dunkley, D. M. (2019). Self-critical perfectionism, experiential avoidance,

    and depressive and anxious symptoms over two years: A three-wave longitudinal

    study. *Behav Res Ther, 112*, 18-27. doi:10.1016/j.brat.2018.11.006

Neff, K. D. (2003). The development and validation of a scale to measure self-

    compassion. *Self and Identity, 2*(3), 223-250. doi:10.1080/15298860390209035

Ong, C. W., Lee, E. B., & Twohig, M. P. (2018). A meta-analysis of dropout rates in acceptance and commitment therapy. *Behaviour Research and Therapy, 104*, 14-33. doi:10.1016/j.brat.2018.02.004

Plumb, J. C., & Vilardaga, R. (2010). Assessing Treatment Integrity in Acceptance and Commitment Therapy: Strategies and Suggestions. *International Journal of Behavioral Consultation and Therapy, 6*(3), 263-295. doi:10.1037/h0100912

Powers, M. B., Zum Vorde Sive Vording, M. B., & Emmelkamp, P. M. G. (2009). Acceptance and commitment therapy: A meta-analytic review. *Psychotherapy and Psychosomatics, 78*(2), 73-80. doi:10.1159/000190790

R Core Team. (2015). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.

Riley, C., Lee, M., Cooper, Z., Fairburn, C. G., & Shafran, R. (2007). A randomised controlled trial of cognitive-behaviour therapy for clinical perfectionism: A preliminary study. *Behaviour Research and Therapy, 45*(9), 2221-2231. doi:10.1016/j.brat.2006.12.003

Rozental, A., Shafran, R., Wade, T., Egan, S., Nordgren, L. B., Carlbring, P., . . . Andersson, G. (2017). A randomized controlled trial of Internet-Based Cognitive Behavior Therapy for perfectionism including an investigation of outcome predictors. *Behaviour Research and Therapy, 95*, 79-86. doi:10.1016/j.brat.2017.05.015

RStudio Team. (2015). RStudio: Integrated development for R. from RStudio, Inc. http://www.rstudio.com/

Shafran, R., & Mansell, W. (2001). Perfectionism and psychopathology: A review of

 research and treatment. *Clinical Psychology Review, 21*(6), 879-906.

 doi:10.1016/S0272-7358(00)00072-6

Shafran, R., Wade, T. D., Egan, S. J., Kothari, R., Allcott-Watson, H., Carlbring, P., . . .

 Andersson, G. (2017). Is the devil in the detail? A randomised controlled trial of

 guided internet-based CBT for perfectionism. *Behaviour Research and Therapy,*

 95, 99-106. doi:10.1016/j.brat.2017.05.014

Smout, M., Davies, M., Burns, N., & Christie, A. (2014). Development of the Valuing

 Questionnaire (VQ). *Journal of Contextual Behavioral Science, 3*, 164-172.

 doi:10.1016/j.jcbs.2014.06.001

Steele, A. L., Waite, S., Egan, S. J., Finnigan, J., Handley, A., & Wade, T. D. (2013).

 Psycho-education and group cognitive-behavioural therapy for clinical

 perfectionism: A case-series evaluation. *Behavioural and Cognitive*

 Psychotherapy, 41(2), 129-143. doi:10.1017/S1352465812000628

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches,

 evidence, challenges. *Personality and Social Psychology Review, 10*(4), 295-319.

 doi:10.1207/s15327957pspr1004_2

Torchiano, M. (2017). effsize: Efficient Effect Size Computation. R package version

 0.7.1.   Retrieved from https://CRAN.R-project.org/package=effsize

Twohig, M. P., Abramowitz, J. S., Smith, B. M., Fabricant, L. E., Jacoby, R. J., Morrison,

 K. L., . . . Lederman, T. (2018). Adding acceptance and commitment therapy to

 exposure and response prevention for obsessive-compulsive disorder: A

 randomized controlled trial. *Behaviour Research and Therapy*.

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 versus progressive relaxation training for obsessive-

      compulsive disorder. *Journal of Consulting and Clinical Psychology, 78*(5), 705-

      716. doi:10.1037/a0020508

Welch, E., Miller, J. L., Ghaderi, A., & Vaillancourt, T. (2009). Does perfectionism

      mediate or moderate the relation between body dissatisfaction and disordered

      eating attitudes and behaviors? . *Eating Behaviors, 10*(3), 168-175.

      doi:10.1016/j.eatbeh.2009.05.002

Wickham, H. (2017). tidyverse: Easily install and load 'Tidyverse' packages. R package

      version 1.1.1.   Retrieved from http://CRAN.R-project.org/package=tidyverse

Table 1
Sample Descriptives

	Overall (N = 53)	ACT (n = 28)	Waitlist (n = 25)	p^a
Age	25.4 (12.3)	25.9 (13.9)	25.0 (10.5)	.790
Gender				.135
Female	39 (73.6%)	23 (82.1%)	16 (64%)	
Male	14 (26.4%)	5 (17.9%)	9 (36%)	
Ethnicity				.463
African American	1 (1.9%)	1 (3.6%)	0 (0%)	
Asian American	1 (1.9%)	0 (0%)	1 (4%)	
European American	45 (84.9%)	25 (89.3%)	20 (80%)	
Latinx/Hispanic	5 (9.4%)	2 (7.1%)	3 (12%)	
Other	1 (1.9%)	0 (0%)	1 (4%)	
Marital status				.421
Single	39 (73.6%)	22 (78.6%)	17 (68%)	
Married	12 (22.6%)	5 (17.9%)	7 (28%)	
Divorced	1 (1.9%)	1 (3.6%)	0 (0%)	
Remarried	1 (1.9%)	0 (0%)	1 (4%)	
Employment status				.611
Unemployed/not working	8 (15.1%)	4 (14.3%)	4 (16%)	
Working part-time	21 (39.6%)	10 (35.7%)	11 (44%)	
Working full-time	4 (7.5%)	1 (3.6%)	3 (12%)	
Full-time student	17 (32.1%)	11 (39.3%)	6 (24%)	
Retired	3 (5.7%)	2 (7.1%)	1 (4%)	
Education				.738
M.A./M.S. or equivalent	3 (5.7%)	2 (7.1%)	1 (4%)	
Some graduate school	1 (1.9%)	1 (3.6%)	0 (0%)	
B.A/B.S. or equivalent	3 (5.7%)	2 (7.1%)	1 (4%)	
Associate degree	11 (20.8%)	5 (17.9%)	6 (24%)	
Some college	26 (49.1%)	12 (42.9%)	14 (56%)	
High school diploma or equivalent	9 (17%)	6 (21.4%)	3 (12%)	
Religion				.359
Catholic	2 (3.8%)	0 (0%)	2 (8%)	
LDS	42 (79.2%)	23 (82.1%)	19 (76%)	
Protestant (Christian)	1 (1.9%)	0 (0%)	1 (4%)	
Other	1 (1.9%)	1 (3.6%)	0 (0%)	
None	7 (13.2%)	4 (14.3%)	3 (12%)	
Diagnosis				
Social anxiety disorder	12 (22.6%)	8 (28.6%)	4 (16%)	.275

Generalized anxiety disorder	31 (58.5%)	20 (71.4%)	11 (44%)	.043
Obsessive-compulsive disorder	23 (43.4%)	10 (35.7%)	13 (52%)	.232
Hoarding disorder	4 (7.5%)	3 (10.7%)	1 (4%)	.356
Body dysmorphic disorder	2 (3.8%)	1 (3.6%)	1 (4%)	.935
Excoriation disorder	2 (3.8%)	1 (3.6%)	1 (4%)	.935
Binge eating disorder	2 (3.8%)	1 (3.6%)	1 (4%)	.935
Obsessive-compulsive personality disorder	36 (67.9%)	21 (75%)	15 (60%)	.243

[a] Based on t-test for age and χ^2-test for all other demographic variables.

Note. ACT = acceptance and commitment therapy; LDS = The Church of Jesus Christ of Latter-day Saints.

Table 2

Means, Standard Deviations, and Effect Sizes at Pretreatment, Posttreatment, and One-Month Follow-Up

	ACT		Waitlist		Between Groups
	Mean (SD)	Hedges' g^a (95% CI)	Mean (SD)	Hedges' g^a (95% CI)	Hedges' g (95% CI)
FMPS-CM					
Pretreatment	33.2 (8.4)		32.4 (6.4)		
Posttreatment	25.1 (6.2)	-1.05 (-1.68, -0.42)	32.4 (7.5)	-0.01 (-0.63, 0.62)	-1.03 (-0.32, -1.73)
Follow-up	25.3 (8.9)	-0.91 (-1.57, -0.24)	33.2 (8.1)	0.11 (-0.57, 0.78)	-0.90 (-1.69, -0.12)
FMPS-DA					
Pretreatment	15.6 (3.5)		15.2 (2.4)		
Posttreatment	13.0 (3.4)	-0.74 (-1.35, -0.13)	15.6 (3.1)	0.15 (-0.47, 0.77)	-0.78 (-1.45, -0.11)
Follow-up	13.3 (3.4)	-0.64 (-1.29, 0.00)	14.8 (3.5)	-0.13 (-0.81, 0.55)	-0.41 (-1.17, 0.35)
FMPS-PS					
Pretreatment	28.1 (5.5)		28.1 (5.0)		
Posttreatment	25.7 (5.8)	-0.42 (-1.03, 0.18)	28.5 (5.2)	0.09 (-0.53, 0.71)	-0.50 (-1.17, 0.16)
Follow-up	24.9 (5.7)	-0.56 (-1.20, 0.09)	27.0 (5.4)	-0.21 (-0.89, 0.48)	-0.36 (-1.12, 0.39)
OQ-45					
Pretreatment	80.6 (21.7)		75.2 (19.0)		
Posttreatment	55.5 (15.9)	-1.26 (-1.93, -0.59)	68.3 (21.4)	-0.34 (-0.97, 0.30)	-0.67 (-1.36, 0.03)
Follow-up	56.8 (17.2)	-1.16 (-1.85, -0.47)	70.0 (23.0)	-0.25 (-0.93, 0.44)	-0.63 (-1.40, 0.14)
VQ-Progress					
Pretreatment	15.2 (6.5)		17.2 (3.1)		
Posttreatment	23.3 (4.4)	1.38 (0.71, 2.05)	17.4 (3.9)	0.06 (-0.55, 0.68)	1.39 (0.64, 2.13)
Follow-up	18.4 (7.0)	0.46 (-0.18, 1.10)	14.8 (5.3)	-0.59 (-1.28, 0.10)	0.57 (-0.20, 1.33)
QOLS					
Pretreatment	74.9 (15.7)		74.5 (11.8)		
Posttreatment	87.3 (12.9)	0.83 (0.19, 1.47)	76.7 (13.0)	0.18 (-0.44, 0.79)	0.80 (0.10, 1.49)
Follow-up	86.7 (13.9)	0.76 (0.11, 1.42)	72.9 (13.5)	-0.12 (-0.80, 0.55)	0.98 (0.18, 1.77)
AAQ-II					
Pretreatment	31.9 (8.3)		29.6 (8.0)		
Posttreatment	21.9 (6.2)	-1.31 (-1.98, -0.64)	26.9 (7.1)	-0.35 (-0.97, 0.26)	-0.73 (-1.42, -0.04)
Follow-up	21.2 (7.5)	-1.31 (-2.01, -0.62)	28.9 (10.0)	-0.09 (-0.76, 0.59)	-0.83 (-1.61, -0.05)
SCS					

Pretreatment	14.4 (3.7)		14.3 (3.1)		
Posttreatment	19.0 (3.1)	1.28 (0.60, 1.95)	15.4 (3.4)	0.36 (-0.27, 0.99)	1.06 (0.33, 1.80)
Follow-up	18.4 (3.9)	1.03 (0.36, 1.70)	14.4 (3.8)	0.04 (-0.65, 0.73)	1.00 (0.19, 1.81)

[a] Within-group effect sizes.

Note. ACT = acceptance and commitment therapy; SD = standard deviation; CI = confidence interval; FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; DA = Doubting of Actions; PS = Personal Standards; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale; AAQ-II = Acceptance and Action Questionnaire—II; SCS = Self-Compassion Scale.

Table 3

Coefficients for Best-Fitting Mixed Effects Models

	FMPS-CM	FMPS-DA	FMPS-PS	OQ-45	VQ-Progress	QOLS	AAQ-II	SCS
Intercept	33.25***	15.61***	28.10***	80.96***	15.25***	75.26***	32.06***	14.40***
	(1.38)	(0.60)	(0.74)	(3.70)	(0.96)	(2.64)	(1.44)	(0.63)
Condition[a]	-0.81	-0.29		-6.05	1.95	-0.78	-2.42	-0.12
	(2.02)	(0.88)		(5.40)	(1.40)	(3.84)	(2.09)	(0.91)
Posttreatment	-7.34***	-2.45***	-1.14	-21.07***	7.31***	8.36***	-9.08***	4.21***
	(1.36)	(0.61)	(0.62)	(3.98)	(1.28)	(2.10)	(1.71)	(0.59)
Follow-up	-6.81***	-2.10**	-2.21**	-19.01***	2.69*	7.64***	-9.54***	3.36***
	(1.48)	(0.66)	(0.68)	(4.11)	(1.33)	(2.16)	(1.78)	(0.61)
Condition × Posttreatment	7.50***	2.46**		16.00**	-7.13***	-7.19*	6.37**	-3.07***
	(1.98)	(0.88)		(5.65)	(1.80)	(2.91)	(2.38)	(0.83)
Condition × Follow-up	7.65***	1.17		17.32**	-5.05**	-11.31***	8.69***	-2.96***
	(2.17)	(0.97)		(5.99)	(1.95)	(3.13)	(2.58)	(0.90)
BIC	823.64	624.45	709.20	1029.79	758.11	929.47	833.60	600.57
Log likelihood	-392.64	-293.04	-342.63	-495.85	-359.90	-445.62	-397.69	-281.23
Number of observations	121	121	120	117	120	119	119	117
Number of participants	53	53	52	53	53	53	53	53

[a] Reference group is waitlist.

* *p* < .05. ** *p* < .01. *** *p* < .001.

Note. FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; DA = Doubting of Actions; PS = Personal Standards; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale; AAQ-II = Acceptance and Action Questionnaire—II; SCS = Self-Compassion Scale; AIC = Akaike information criterion; BIC = Bayesian information criterion.

Table 4
Clinically Significant and Reliable Change for Concern Over Mistakes, Distress and Impairment, and Quality of Life

	Posttreatment					One-Month Follow-up				
	ACT (n = 20)	Waitlist (n = 18)	χ^2	*df*	*p*	ACT (n = 16)	Waitlist (n = 14)	χ^2	*df*	*p*
FMPS-CM										
Clinically significant change			2.18	1	.140			1.4286	1	.232
Yes	9 (45%)	4 (22.2%)				8 (50%)	4 (28.6%)			
No	11 (55%)	14 (77.8%)				8 (50%)	10 (71.4%)			
Reliable change			4.60	2	.100			**8.8776**	**2**	**.012**
Improved	13 (65%)	7 (38.9%)				**9 (56.2%)**	**1 (7.1%)**			
No change	5 (25%)	4 (22.2%)				**4 (25%)**	**10 (71.4%)**			
Worsened	2 (10%)	7 (38.9%)				**3 (18.8%)**	**3 (21.4%)**			
Recovery status			4.80	3	.187			**8.978**	**3**	**.030**
Recovered	7 (35%)	3 (16.7%)				**7 (43.8%)**	**1 (7.1%)**			
Improved	6 (30%)	4 (22.2%)				**2 (12.5%)**	**0 (0%)**			
Unchanged	5 (25%)	4 (22.2%)				**4 (25%)**	**10 (71.4%)**			
Deteriorated	2 (10%)	7 (38.9%)				**3 (18.8%)**	**3 (21.4%)**			
OQ-45										
Clinically significant change			0.12	1	.729			**6.6964**	**1**	**.010**
Yes	12 (66.7%)	11 (61.1%)				**14 (87.5%)**	**6 (42.9%)**			
No	6 (33.3%)	7 (38.9%)				**2 (12.5%)**	**8 (57.1%)**			
Reliable change			5.86	2	.053			3.5611	2	.169
Improved	13 (76.5%)	6 (35.3%)				11 (68.8%)	5 (35.7%)			
No change	2 (11.8%)	5 (29.4%)				3 (18.8%)	4 (28.6%)			
Worsened	2 (11.8%)	6 (35.3%)				2 (12.5%)	5 (35.7%)			
Recovery status			5.88	3	.118			5.4219	3	.143
Recovered	9 (52.9%)	4 (23.5%)				10 (62.5%)	3 (21.4%)			

Improved	4 (23.5%)	2 (11.8%)				1 (6.2%)	2 (14.3%)			
Unchanged	2 (11.8%)	5 (29.4%)				3 (18.8%)	4 (28.6%)			
Deteriorated	2 (11.8%)	6 (35.3%)				2 (12.5%)	5 (35.7%)			
QOLS										
Clinically significant change			**4.50**	**1**	**.034**			2.2493	1	.134
Yes	**16 (88.9%)**	**11 (57.9%)**				14 (87.5%)	9 (64.3%)			
No	**2 (11.1%)**	**8 (42.1%)**				2 (12.5%)	5 (35.7%)			
Reliable change			5.97	2	.051			**7.4117**	**2**	**.025**
Improved	11 (64.7%)	5 (26.3%)				**10 (62.5%)**	**3 (21.4%)**			
No change	5 (29.4%)	9 (47.4%)				**4 (25%)**	**3 (21.4%)**			
Worsened	1 (5.9%)	5 (26.3%)				**2 (12.5%)**	**8 (57.1%)**			
Recovery status			6.29	3	.098			7.6435	3	.054
Recovered	10 (58.8%)	4 (21.1%)				9 (56.2%)	3 (21.4%)			
Improved	1 (5.9%)	1 (5.3%)				1 (6.2%)	0 (0%)			
Unchanged	5 (29.4%)	9 (47.4%)				4 (25%)	3 (21.4%)			
Deteriorated	1 (5.9%)	5 (26.3%)				2 (12.5%)	8 (57.1%)			

Note. Statistically significant between-group differences at $p < .05$ are bolded. ACT = acceptance and commitment therapy; FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; OQ-45 = Outcome Questionnaire-45.2; QOLS = Quality of Life Scale.
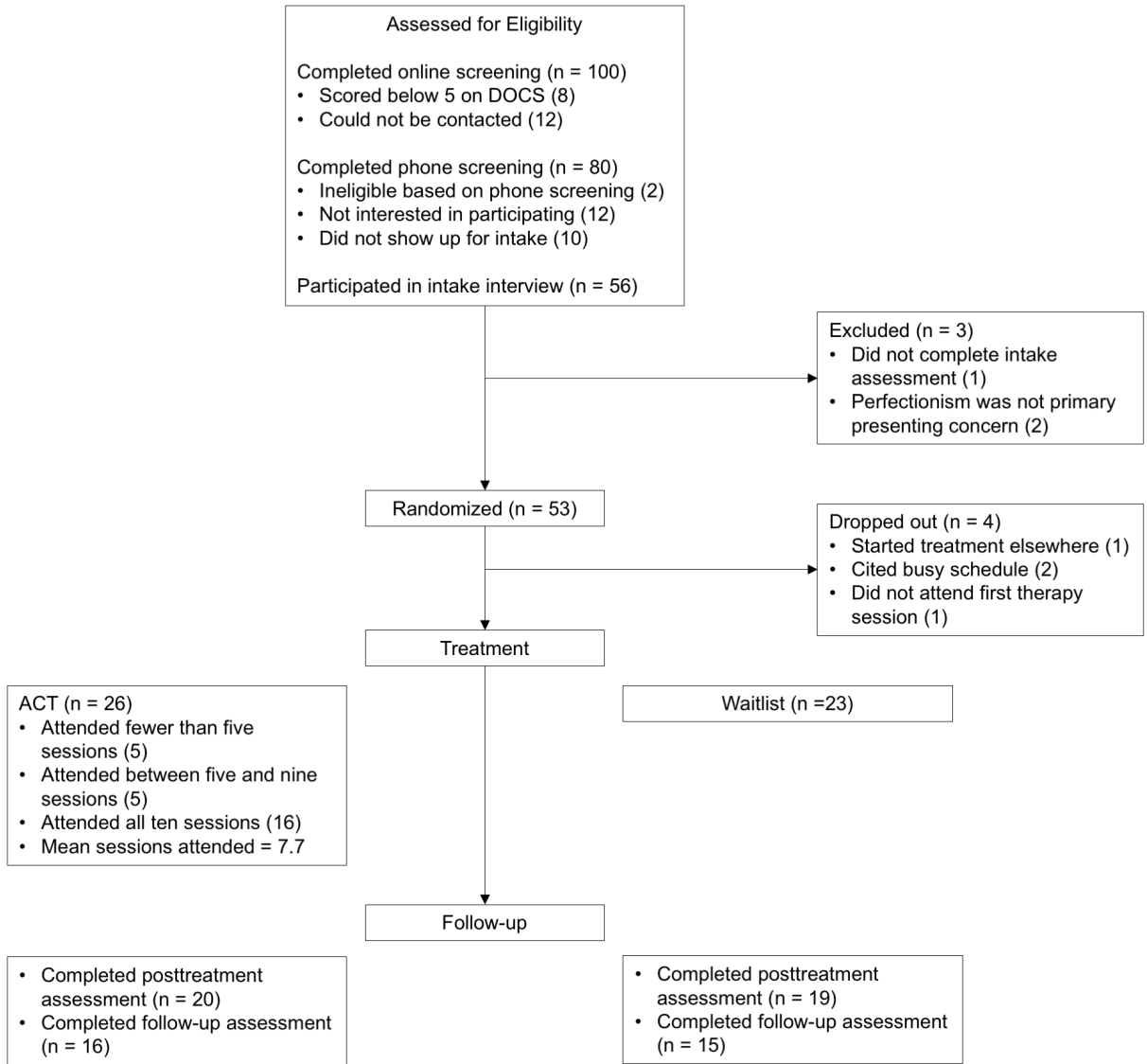
Figure 1. Flowchart depicting participant eligibility, dropout, and session attendance.
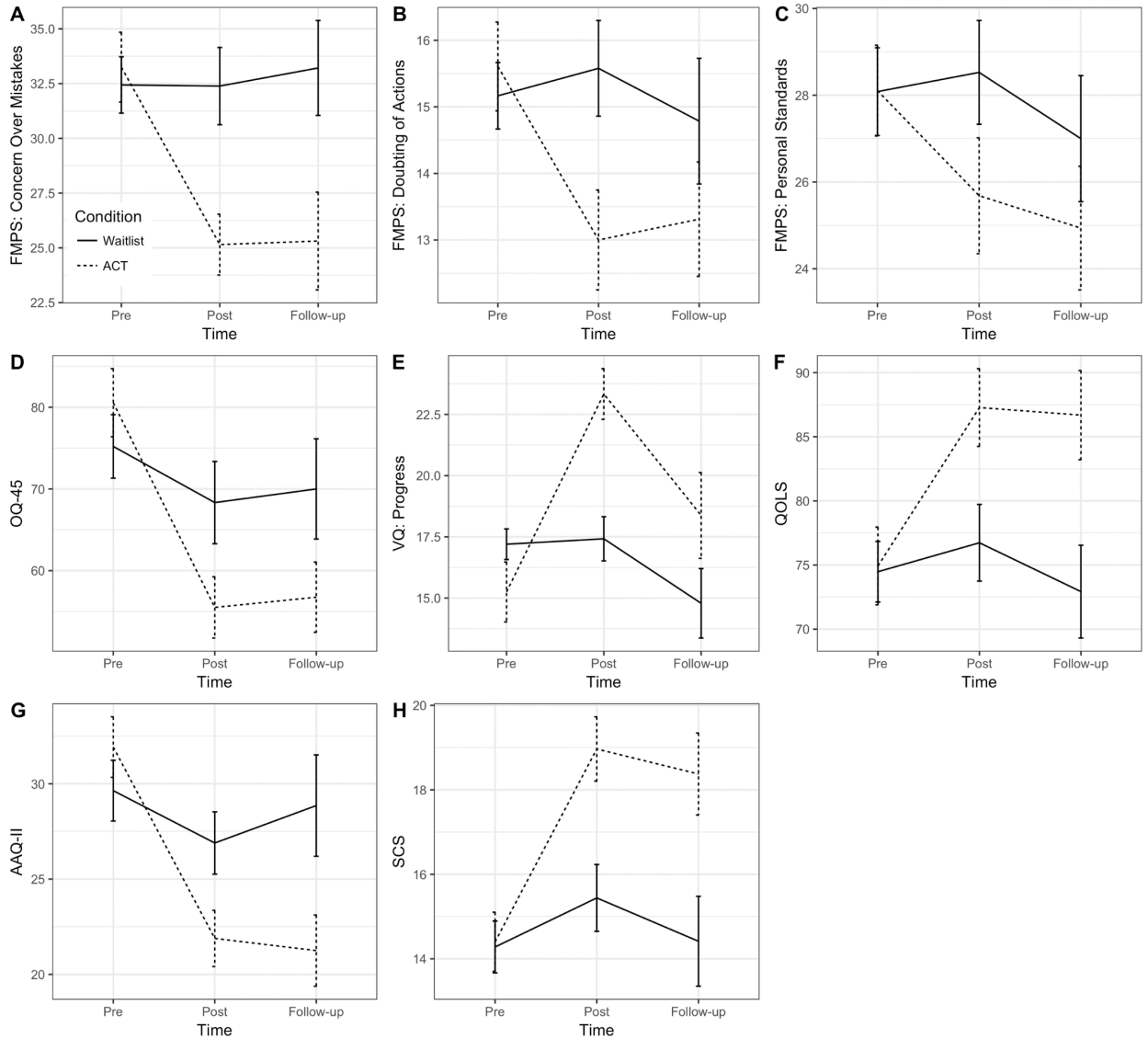
Figure 2. Plots of changes in outcomes over time. Vertical bars represent standard errors. ACT = acceptance and commitment therapy; FMPS = Frost Multidimensional Perfectionism Scale; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale; AAQ-II = Acceptance and Action Questionnaire—II; SCS = Self-Compassion Scale.

CHAPTER III

STUDY 2

The second study presented moderators and mediators of treatment response from the randomized controlled trial. The manuscript has been published in the *Journal of Contextual Behavioral Science*: https://doi.org/10.1016/j.jcbs.2019.06.005.

The Role of Psychological Inflexibility and Self-Compassion in

Acceptance and Commitment Therapy for Clinical Perfectionism

Clarissa W. Ong, M.S.

Jennifer L. Barney, M.S.

Tyson S. Barrett, Ph.D.

Eric B. Lee, M.A.

Michael E. Levin, Ph.D.

Michael P. Twohig, Ph.D.

Department of Psychology

Utah State University

Corresponding author:
Clarissa W. Ong
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810
(435) 797-8303
clarissa.ong@usu.edu

Funding Source

Abstract

The current study examined psychological inflexibility and self-compassion as theoretically relevant mediators and moderators of outcomes following acceptance and commitment therapy (ACT) for clinical perfectionism. Fifty-three participants with clinical perfectionism were randomized to either a 10-session ACT condition or a 14-week waitlist control condition (only 39 completed the posttreatment assessment). Outcomes tested include concern over mistakes, doubting of actions, personal standards, quality of life, symptom distress and functional impairment, and valued action. Multilevel modeling analyses showed reduced psychological inflexibility mediated the relationship between condition and higher quality of life and increased self-compassion mediated the relationship between condition and decreased concern over mistakes. No other mediation effects were observed. In addition, baseline psychological inflexibility differentially moderated outcomes depending on outcome tested; for example, lower baseline inflexibility predicted more improvement in quality of life whereas higher baseline inflexibility predicted more improvement in symptom distress and functional impairment. Participants with average baseline self-compassion tended to benefit the most from ACT. These findings clarify how psychological inflexibility and self-compassion influence outcomes following ACT for clinical perfectionism. Theoretical and clinical implications of ACT for clinical perfectionism are discussed.

Keywords: acceptance and commitment therapy, clinical perfectionism, psychological inflexibility, self-compassion, mediation, moderation

The Role of Psychological Inflexibility and Self-Compassion in

Acceptance and Commitment Therapy for Clinical Perfectionism

Perfectionism has been conceptualized as a multidimensional construct centered

on the pursuit of unrealistically high standards and self-criticism due to failure to meet

those standards (Limburg, Watson, Hagger, & Egan, 2017). Maladaptive or clinical

perfectionism describes continued pursuit of high standards despite negative

consequences to mental and/or physical well-being and believing self-worth is primarily

defined by achievement of these standards (Limburg et al., 2017; Shafran, Cooper, &

Fairburn, 2002). Clinical perfectionism can also be characterized by behaviors like

procrastination, premature termination of tasks, and social isolation, which are typically

motivated by fear of failure and concern about disappointing oneself and others (Flett &

Hewitt, 2002; Shafran & Mansell, 2001). That is, individuals with clinical perfectionism

may frequently avoid situations that entail striving for achievement of high standards and

that can result in feelings of failure and/or disappointment (Shafran & Mansell, 2001;

Weiner & Carton, 2012). Clinical perfectionism has been implicated as a risk and

maintaining factor for several forms of maladjustment and psychopathology including

depression and anxiety disorders (Egan, Wade, & Shafran, 2011; Limburg et al., 2017).

Despite topographical dissimilarities, the pursuit of achievement and premature

task termination behaviors described above functionally reflect attempts to control

unwanted internal experiences (e.g., feelings of inadequacy). That is, they are overt

instantiations of experiential avoidance (Hayes et al., 2004; Weiner & Carton, 2012).

Experiential avoidance is one aspect of the broader construct of psychological

inflexibility, which is defined as an inability to be open to present-moment experiences

and engagement in rigid behavioral patterns guided by psychological reactions instead of

chosen values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The inverse of

psychological inflexibility is psychological flexibility—the ability to fully and

nonjudgmentally contact the present moment and persist in or change behaviors in the

service of personal values (Hayes et al., 2006). Given the pervasive pattern of rigidity

underlying clinical perfectionism particularly with respect to rules and excessively high

standards, improving psychological flexibility may help these individuals respond to

inner experiences in ways that allow them to reengage in meaningful activities. For

example, when the thought "I'm not good enough" arises, flexible responding would

entail seeing the thought as a thought and choosing to act consistently with values in the

moment regardless of the internal experiences that may accompany the chosen behavior.

Psychological flexibility is explicitly targeted by acceptance and commitment

therapy (ACT), a cognitive-behavioral approach rooted in contextual behavioral science

(Hayes, Barnes-Holmes, & Wilson, 2012). Its overarching objective is to promote greater

quality of life by creating a context that trains more flexible ways of relating to internal

experiences regardless of their form and frequency (Hayes et al., 2006). Thus, the theory

underlying ACT hypothesizes changes in relevant outcomes are explained or *mediated* by

changes in psychological flexibility. Empirical evidence supports this hypothesis for

conditions related to clinical perfectionism including anxiety, depression, and obsessive-

compulsive disorder (OCD; Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Twohig,

Plumb Vilardaga, Levin, & Hayes, 2015).

Another process particularly relevant to clinical perfectionism is self-

compassion—treating oneself with kindness and nonjudgement in the face of difficult

experiences and recognizing such suffering is part of the "human-experience" (Barnard &

Curry, 2011; Neff, Kirkpatrick, & Rude, 2007). Self-compassion has been negatively

associated with maladaptive self-evaluative patterns such as experiencing distress due to

discrepancies between performance and personal standards (or maladaptive

perfectionism) as well as avoidant coping/procrastination (Neff, 2003), suggesting

deficits in self-compassion may be linked to clinical perfectionism. Furthermore, self-

criticism—the inverse of self-compassion—has been found to mediate the relationship

between unhealthy perfectionism and distress (James, Verplanken, & Rimes, 2015),

implicating self-criticism as a potential process that maintains poor outcomes in

perfectionism. Furthermore, self-compassion has been found to weaken the relationship

between maladaptive perfectionism and depression (Ferrari, Yap, Scott, Einstein, &

Ciarrochi, 2018), which could indicate its utility as a treatment target in clinical

perfectionism. Evidence suggests ACT can be used to increase self-compassion (XX,

2019; Yadavaia, Hayes, & Vilardaga, 2014). ACT may do so by encouraging

nonjudgmental observation of self-critical thoughts, self-empathy through strengthening

perspective taking, and self-acceptance (Yadavaia et al., 2014). Thus, self-compassion

could be another key mediator through which ACT affects changes in outcomes of

interest. That is, individuals who receive ACT may be able to improve their wellbeing by

intentionally adopting a compassionate stance toward their own difficult

experiences—without first having to change them—by recognizing such experiences as

part of being human (Neff & Tirch, 2013).

In addition to investigating *how* ACT produces therapeutic gains, it is also

important to identify variables that predict *who* benefits from ACT. Doing so could guide

treatment matching and increase the probability of positive treatment response. Given

ACT aims to increase psychological flexibility, it is theoretically plausible individuals

with more psychological inflexibility may show greater improvement than those with less

inflexibility as they have the most room to improve this skill. Conversely, individuals

with high psychological inflexibility may be more resistant to treatment. Accordingly,

empirical support for the moderating effect of psychological inflexibility in ACT is

mixed. Wolitzky-Taylor, Arch, Rosenfield, and Craske (2012) found individuals with

anxiety disorders tended to have better outcomes in ACT compared to CBT when

baseline psychological inflexibility was in the moderate range whereas Craske et al.

(2014) reported that higher baseline psychological inflexibility predicted better outcomes

for CBT relative to ACT for social anxiety. Considering the incongruent and preliminary

nature of such findings, more research is needed to clarify our understanding of how

baseline psychological inflexibility influences the effectiveness of ACT. Additionally,

given the theoretical and empirically demonstrated relationship between self-compassion

and perfectionism, investigating how baseline self-compassion influences treatment

performance may provide helpful information on which to base treatment

recommendations.

Data for the present study were drawn from a randomized controlled trial

comparing ACT to a waitlist control condition among individuals with clinical

perfectionism. In the trial, we found, relative to the waitlist condition, ACT resulted in

greater improvements in self-reported wellbeing, clinical perfectionism, psychological

inflexibility, and self-compassion over the course of the study (XX, 2019). Given

psychological inflexibility and self-compassion appear to be critical processes in ACT as

a treatment for clinical perfectionism, we tested whether improvements from ACT for

clinical perfectionism were mediated by decreases in psychological inflexibility and

increases in self-compassion. Understanding the active mechanisms underlying treatment

response may help to improve precision of future treatment iterations for clinical

perfectionism. We predicted improvement in psychological inflexibility and self-

compassion would mediate the relationship between condition and outcomes.

We also examined if baseline psychological inflexibility and self-compassion

moderated ACT outcomes. Identifying variables that influence treatment response may

clarify which therapeutic procedures are indicated given client profiles at baseline,

increasing intervention effectiveness and efficiency. We did not have a specific

prediction with respect to moderation given extant mixed findings for psychological

flexibility and lack of research on self-compassion as a moderator of treatment response

in ACT.

Method

Recruitment

Participants were recruited from a town in the western U.S. using newspaper

advertisements, flyers, and announcements in university classes. To be included in the

study, individuals needed to: (1) score at least five on the Dimensional Obsessive-

Compulsive Scale (DOCS) Symmetry subscale (Abramowitz et al., 2010), (2) report

significant distress and/or functional impairment related to clinical perfectionism based

on a clinical interview, (3) be willing to complete 10 sessions of therapy, (4) be

cognitively and physically able to complete intervention and assessments, (5) not be

currently seeking therapy for clinical perfectionism, and (6) be stable on any prescribed psychotropic medications for the past 30 days.

Participants

Sample description. The mean age of our sample was 25.4 (SD = 12.3). The majority of participants were self-identified female (73.6%), European American (84.9%), single (73.6%), and members of the Church of Jesus Christ of Latter-day Saints (LDS; 79.2%).

Participant flow. Fifty-six individuals participated in the baseline intake interview but three were excluded due to not completing the intake assessment (n = 1) and not reporting perfectionism as a primary presenting concern (n = 2). The remaining 53 eligible participants were randomized to a treatment or waitlist condition. Another four participants dropped out prior to their first post-baseline assessment, leaving 26 ACT participants and 23 waitlist participants. Of those 49 participants, 39 completed the posttreatment assessment and 31 completed the follow-up assessment. More details about participant flow and study design have been reported elsewhere (XX, 2019).

Procedures

Procedures were reviewed and approved by a university institutional review board. Participants signed an informed consent document prior to study participation. Participants in the treatment condition received 10 weekly sessions of ACT and participants in the waitlist condition began a 14-week waitlist. Study assessments were conducted at pretreatment, posttreatment, and one-month follow-up. Participants completed self-report measures at all assessment points.

The treatment protocol was modified from an ACT for OCD manual used in Twohig et al. (2010). It covered general assessment and orientation to therapy (Session 1), creative hopelessness (Session 2), acceptance/willingness (Sessions 3 and 4), defusion (Sessions 5 and 6), values and committed action (Sessions 7 and 8), and skills maintenance and relapse prevention (Sessions 9 and 10). An addendum to the manual instructed therapists to attend to aspects of clinical perfectionism that could alter treatment delivery: (1) distress may be more prominent than functional impairment, (2) some aspects of perfectionism may be adaptive (e.g., having high standards), and (3) elements of perfectionism may be ego-syntonic or values-consistent. The protocol addendum used in this study can be found here: https://www.utahact.com/treatment-protocols.html. The current protocol did not explicitly target self-compassion though it was addressed when relevant (e.g., practicing defusion from self-critical thoughts).

Measures

Screening measure.

Dimensional Obsessive-Compulsive Scale (DOCS)—Symmetry (Abramowitz et al., 2010). The DOCS symmetry subscale was used to screen for clinical perfectionism. It contains five items measuring severity of avoidance, distress, and interference due to a perceived need to make things "just right" (Abramowitz et al., 2010). Each item is scored from 0 to 4; higher scores reflect greater severity (Abramowitz et al., 2010). Individuals who scored at least five (just below the mean of 6.13 in an OCD sample; Abramowitz et al., 2010) were further assessed for eligibility during the intake assessment. This subscale has shown good to excellent internal consistency in clinical and unscreened samples and good convergent, divergent, and criterion validity (Abramowitz et al., 2010).

Outcome measures.

Frost Multidimensional Perfectionism Scale (FMPS; Frost, Marten, Lahart, & Rosenblate, 1990). Of the six FMPS subscales, the three most clinically relevant subscales were included in present analyses: Concern Over Mistakes (9 items); Doubts About Actions (4 items); and Personal Standards (7 items). These subscales have been used to evaluate outcomes in previous clinical trials (e.g., Egan et al., 2014; Handley, Egan, Kane, & Rees, 2015; Riley, Lee, Cooper, Fairburn, & Shafran, 2007). Items are scored from 1 to 5. Higher scores suggest higher levels of clinical perfectionism. This measure has demonstrated construct validity and adequate internal consistency (Frost et al., 1990). Our sample had good to excellent internal consistency across the three subscales (Cronbach's αs ranged from .85 to .94).

Outcome Questionnaire-45.2 (OQ-45; Lambert et al., 1996). The OQ-45 consists of 45 items and assesses symptom distress and functional impairment (Lambert et al., 1996). Items are rated from 0 to 4 with higher scores reflecting greater distress and/or impairment (Lambert et al., 1996). The OQ-45 has shown excellent internal consistency and good temporal stability and convergent validity (Lambert et al., 1996). Internal consistency was excellent in the current study ($\alpha = .94$).

Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003; Flanagan, 1978). We used the revised 16-item version of the QOLS (Burckhardt & Anderson, 2003) to evaluate overall satisfaction with quality of life. Items are scored from 1 to 7; higher scores indicate higher quality of life (Burckhardt & Anderson, 2003). The QOLS has shown reliability and convergent and divergent validity (Burckhardt & Anderson, 2003). Internal consistency was good in our sample ($\alpha = .89$).

Valuing Questionnaire (VQ)—Progress (Smout, Davies, Burns, & Christie, 2014). We used the Progress subscale of the VQ to measure behavioral progress toward personal values (Smout et al., 2014). Its five items are rated from 0 to 6. Higher scores indicate more valued action. The Progress subscale has shown convergent and incremental validity as well as good internal consistency (Smout et al., 2014). Internal reliability was good in our sample (α = .81). The VQ also contains an Obstruction subscale measuring interference with valued living related to experiential avoidance (Smout et al., 2014). Given we specifically wanted to measure behavioral enactment of values, the Obstruction subscale was not included in present analyses.

Process of change measures.

Acceptance and Action Questionnaire —II (AAQ-II; Bond et al., 2011). The AAQ-II contains seven items that collectively measure psychological inflexibility (Bond et al., 2011). Items are rated from 1 to 7 with higher scores reflecting greater psychological inflexibility. The AAQ-II has been found to have adequate reliability and validity in clinical and unscreened samples (Bond et al., 2011) and treatment sensitivity (e.g., Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012). Internal consistency was excellent in the present sample (α = .92).

Self-Compassion Scale (SCS; Neff, 2003). The SCS comprises 26 items assessing self-compassion. Items are rated from 1 to 5; higher scores indicate more self-compassion. A total sum score is calculated from six subscale scores: mindfulness, self-kindness, common humanity, over-identification, self-judgment, and isolation (the latter three are reverse-scored). The SCS has demonstrated excellent internal consistency and

convergent and divergent validity (Neff, 2003). Internal consistency was excellent in the current sample (α = .95).

Statistical Analyses

Data were collected from participants who completed pretreatment, posttreatment, and follow-up assessments including those who did not attend the 10 intervention sessions. All 53 participants who were randomized were included in multilevel analyses (i.e., moderation models, *b* and *c'* pathways in mediation models) as multilevel models allowed for inclusion of participants who did not complete the posttreatment or follow-up assessments. However, the regression models (to determine path *a* in our mediation analyses) only included participants who completed the posttreatment assessment (n = 39). Thus, moderation results were based on an intent-to-treat sample whereas mediation analyses were based on both participants who only completed the posttreatment assessment and the intent-to-treat sample. There were no significant differences in key demographic variables (e.g., age, gender, ethnicity, marital status, religion, income) between participants who completed versus did not complete the posttreatment assessment (*p*s > .05).

Linear mixed effects models (i.e., multilevel models) were used to test mediation and moderation effects of psychological inflexibility and self-compassion across time. In all mixed effects models, intercepts were allowed to vary by participant. Statistical analyses were conducted with R in RStudio (R Core Team, 2015; RStudio Team, 2015) using the following packages: tidyverse (Wickham, 2017), lme4 (Bates, Maechler, Bolker, & Walker, 2015), texreg (Leifeld, 2013), and DataCombine (Gandrud, 2016).

Mediation. To test for mediating effects of psychological inflexibility (AAQ-II) and self-compassion (SCS), we used lagged (time t-1 predicting time t) mixed effects models. Figure 1 is a schematic path diagram illustrating the lagged mediation pathways. To evaluate significance of the a path ($X_{t=1} \longrightarrow M_{t=2}$), we fit a regression model (i.e., a mixed effects model without any random effects) with the mediator at posttreatment, condition as the predictor, and the baseline mediator as the covariate. For the b and c' paths, the outcomes of interest were the specified outcome variables. Condition ($X_{t=1} \longrightarrow Y_{t=2,3}$) and the mediator ($M_{t=1,2} \longrightarrow Y_{t=2,3}$) were used to test the lagged effects of condition and the individual mediators controlling for the corresponding outcome variable at baseline.

Moderation. The moderating effect of baseline psychological inflexibility and self-compassion on the relationship between condition and outcomes over time was tested using a series of nested mixed effects models to determine the best-fitting model. The first included a two-way interaction between the variable of interest at baseline and condition (Model 1), the second included a two-way interaction between the variable at baseline and time (Model 2), and the third included a three-way interaction term of the variable at baseline, condition, and time (Model 3).

<div align="center">

Results

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Mediation Effects

Coefficients and model fit indices for the lagged mediation models for AAQ-II and SCS are presented in Tables 1 and 2 respectively.

Psychological inflexibility. Condition significantly predicted decreases in psychological inflexibility over time (a path; $p = .010$). It was also associated with less

concern over mistakes ($p < .001$), less doubting of actions ($p = .022$), greater quality of

life ($p < .001$), less symptom distress and functional impairment ($p = .003$), and more

valued action ($p < .001$), controlling for the lagged mediator (c' path). The only

significant b path was from AAQ-II to QOLS ($p = .028$), indicating psychological

inflexibility only mediated the relationship between condition and quality of life. That is,

decreases in psychological inflexibility might have partially explained how ACT

improved quality of life relative to the waitlist condition. Psychological inflexibility did

not mediate the effect of treatment on concern over mistakes, doubting of actions,

symptom distress and functional impairment, or valued action.

　　　　Self-compassion. Similar to the results for the AAQ-II, the a path and all c' paths

were significant in the lagged mediation models for SCS (ps $< .040$). Greater self-

compassion from pretreatment to posttreatment also significantly predicted reduction in

excessive concern over mistakes from posttreatment to follow-up (b path; $p = .023$),

suggesting self-compassion mediated the link between condition and excessive concern

over mistakes. In other words, decrease in concern over mistakes among participants in

the ACT condition was potentially due in part to an increase in self-compassion. Self-

compassion did not mediate the effect of treatment on doubting of actions, quality of life,

symptom distress and functional impairment, or valued action.

Moderation Effects

　　　　Psychological inflexibility. For baseline psychological inflexibility, the best-

fitting models (based on χ^2-difference tests) included the three-way interaction of time,

condition, and baseline psychological inflexibility (see Table 3). Figure 2 provides an

overview of how outcomes changed over time by condition and baseline psychological inflexibility.

For FMPS Concern Over Mistakes, participants with lower inflexibility at baseline tended to show greater decreases in scores over time in the ACT condition relative to the waitlist condition. That is, ACT tended to be more helpful for participants with lower inflexibility in the area of concern over mistakes especially when considering maintenance of gains from posttreatment to follow-up (see Figure 2, Panel A).

There were greater decreases in FMPS Doubts About Actions scores from pretreatment to posttreatment in the ACT condition when baseline inflexibility was higher compared to the waitlist condition (see Figure 2, Panel B). However, scores converged following posttreatment such that there were no differences between groups at follow-up among those with higher baseline inflexibility.

For the OQ-45, higher inflexibility predicted more improvement over time in the ACT condition even though symptom distress and functional impairment generally decreased regardless of level of inflexibility. Scores of participants in the waitlist condition remained relatively constant (see Figure 2, Panel C).

ACT participants generally showed an increase in valued action from pretreatment to posttreatment, with a greater magnitude of increase observed among those with higher inflexibility relative to the sample (see Figure 2, Panel D). Across conditions, participants showed a reduction in valued action from posttreatment to follow-up. Generally, scores of most participants either did not change or decreased from pretreatment to follow-up.

In terms of quality of life, participants with lower AAQ-II scores relative to the sample tended to perform better in the ACT condition than those in the waitlist condition (see Figure 2, Panel E). Participants with the highest levels of baseline inflexibility demonstrated similar trajectories for quality of life regardless of condition as demonstrated by the overlapping error bars between groups in Figure 2, Panel E.

Self-compassion. For self-compassion, the three-way interaction models produced the best fit with the exception of the model with FMPS Doubts About Actions as the outcome variable (see Table 4). Figure 3 provides an overview of how outcomes changed over time by condition and baseline self-compassion.

ACT was most effective for participants with average self-compassion scores relative to the sample with respect to concern over mistakes, symptom distress and functional impairment, valued action, and quality of life as evidenced by bigger differences between groups at posttreatment and follow-up (see Figure 3, Panels A, C, D, and E). In addition, self-reported valued action of participants with the lowest and highest self-compassion scores did not differ from that of waitlist participants at follow-up. For doubting of actions, the most parsimonious model only included an interaction between self-compassion and time, indicating the trajectory of doubting of actions over time depended on baseline levels of self-compassion but this effect did not differ between conditions. However, doubting of actions seemed to decrease more when self-compassion was higher in the ACT condition but not the waitlist condition (see Figure 3, Panel B). For symptom distress and functional impairment, participants with highest self-compassion relative to the sample also maintained and improved on treatment gains following termination of therapy (see Figure 3, Panel C). Although there was some

variation in patterns of outcomes over time, generally, participants with lower self-compassion scores at baseline responded more poorly to treatment and those whose scores were in the mid-range showed the greatest gains from treatment.

Discussion

Overall, our findings suggest psychological inflexibility and self-compassion had precise mediating effects on outcomes in that these processes of change only explained changes in specific variables (quality of life and concern over mistakes respectively). In addition, psychological inflexibility produced inconsistent moderation effects such that there was no clear answer as to whether ACT was more appropriate for participants with lower versus higher baseline inflexibility. However, the moderating influence of self-compassion was more consistent: participants with average levels of self-compassion tended to respond more favorably to ACT than the waitlist condition.

Mediation. Reduced psychological inflexibility mediated the relationship between condition and higher quality of life whereas increased self-compassion explained the relationship between condition and decreased concern over mistakes. No mediation effects were observed for other outcomes. These mediation findings suggest there may be unique specificity in the effect of individual processes of change on outcomes. For example, because practicing psychological flexibility is relevant to all forms of difficult inner experiences and not just presenting concerns (e.g., perfectionism), it is unsurprising the only significant mediation effect was found for a general index of wellbeing like quality of life. In fact, psychological flexibility has been linked to broad health outcomes (Kashdan & Rottenberg, 2010), supporting this interpretation.

Similarly, self-compassion can be considered an antidote to self-criticism (Neff, 2003) and self-criticism within perfectionism is most explicitly manifested in reactions to mistakes (e.g., "You are a failure because you made a mistake"). Thus, it is plausible the process most pertinent to allowing individuals to hold mistakes more lightly and be more forgiving toward themselves is self-compassion. Our mediation findings underscore the role of psychological inflexibility and self-compassion as mechanisms of change in ACT and directly link these therapeutic processes to improved outcomes, providing some support for the theory underlying ACT.

Nonetheless, we predicted psychological inflexibility and self-compassion would have mediated the relationship between condition and other outcomes as well. The lack of significant mediation effects on other outcome variables may be due to the small sample size such that only mediation effects with large enough magnitudes were found to be statistically significant. Despite this potential limitation in our findings, it also suggests the significant mediation effects observed in our study were relatively robust.

Moderation. Findings from our moderation analyses were mixed. ACT was generally more effective than a waitlist control when participants reported lower baseline psychological inflexibility for concern over mistakes and quality of life but more effective for higher baseline inflexibility for doubting of actions (only from pretreatment to posttreatment), distress and impairment, and valued action (only from pretreatment to posttreatment). Thus, it seems the moderating influence of baseline psychological inflexibility depended on the outcome of interest. The result that higher baseline inflexibility led to better outcomes (specifically for doubting of actions, symptom distress and functional impairment, and valued action) is consistent with the interpretation that

ACT leads to behavioral change by addressing a skills deficit in adaptive responding to unpleasant internal experiences.

The reason lower baseline psychological inflexibility was associated greater improvement in concern over mistakes and quality of life following ACT could be concern over mistakes—a hallmark trait in clinical perfectionism—and quality of life might have been especially resistant to change when inflexibility was high to begin with. Hence, a 10-session course of ACT appears to be inadequate for maintaining global gains in clinical perfectionism when baseline inflexibility is high. The inconsistency of these interaction effects is congruent with the extant literature on the moderating effect of baseline psychological inflexibility in ACT (Craske et al., 2014; Wolitzky-Taylor et al., 2012) and further underscore the intricate interplay among baseline presentation, response to treatment over time, and outcome domain tested.

Clearly, the question of whether ACT is more effective for specific levels of baseline inflexibility does not yet have an empirically informed answer. Our findings provide some explanation for inconsistent findings. First, the moderation effect of baseline inflexibility depended on the type of outcome tested. Thus, clarifying which dependent variable is of greatest clinical interest is critical. Second, the effect of baseline inflexibility on response to ACT could be non-linear such that improvement over the course of ACT may not be uniform as baseline inflexibility increases or decreases (see Figure 2). Instead, there may be ranges of inflexibility at pretreatment in which individuals are most likely to benefit from ACT, complicating how we conceptualize this relationship.

A meta-analytic approach may provide a more reliable aggregate picture of moderation effects though previous meta-analyses show consistent moderators across clinical trials are rare (e.g., Olatunji, Davis, Powers, & Smits, 2013; Schneider, Arch, & Wolitzky-Taylor, 2015). In particular, psychological inflexibility may be difficult to measure with a brief assessment given its complex and context-sensitive nature. Thus, expanding our focus on other potential moderators that can be measured with greater accuracy could increase coherence of the current knowledge base on treatment moderators. Despite lack of clarity in the extant literature, it is important clinical researchers continue to seek to identify useful treatment moderators using reliable and valid assessment and appropriate statistical methods because doing so would improve treatment recommendations for individuals seeking mental health services and increase the likelihood they receive the most helpful intervention.

With respect to baseline self-compassion as a moderator of treatment response, it appeared participants with low self-compassion at baseline did not see much improvement from treatment as they demonstrated significant overlap in outcomes with waitlist participants. Generally, participants who started off with self-compassion in the middle range relative to the sample showed the most improvement from ACT; this subgroup had bigger between-condition differences compared to the subgroup with the highest levels of baseline self-compassion. These findings suggest individuals with low self-compassion and for whom perfectionistic patterns might be more entrenched might on average be less likely to benefit from ACT. For example, even though participants with low self-compassion at baseline reported more valued action and less concern over mistakes following ACT, these gains were not maintained at follow-up. A longer course

of therapy or an explicit focus on self-compassion might be needed to sustain improvement. Furthermore, there might have been a ceiling effect for treatment response among participants with high self-compassion at baseline. It is possible this subgroup represented the most highly functioning participants given they generally reported less concern over mistakes and symptom severity as well as higher valued action and quality of life. This would explain why differences between conditions were smaller in this subgroup. At the same time, there were still posttreatment and follow-up differences between conditions, indicating participants with high self-compassion and who met study criteria for clinical perfectionism still benefited from receiving ACT.

Limitations

First, the study sample was homogeneous consisting mostly of White college-aged adults who identified as LDS, limiting generalizability of our findings. For example, scrupulosity might have additionally influenced the presentation of clinical perfectionism among LDS participants (Allen & Wang, 2014), possibly differentiating the function of perfectionistic behaviors in this subgroup (e.g., more faith-driven). Second, we used an inactive control condition so we were unable to test moderation and mediation effects in ACT relative to an active psychotherapy such as CBT. Thus, it is unclear if the effects observed are due to receipt of psychotherapy or if they are unique to ACT. Third, we only tested two processes of change: psychological inflexibility and self-compassion. Examining the influence of other processes of change like anxiety sensitivity or specific components of psychological flexibility (e.g., cognitive defusion; Arch, Wolitzky-Taylor, Eifert, & Craske, 2012) may refine our understanding of how therapy leads to improvement in outcomes. Fourth, there is evidence the AAQ-II lacks discriminant

validity and performs less well than its context-specific counterparts when used for a specific area of concern (Houghton et al., 2014; Ong, Lee, Levin, & Twohig, 2019; Tyndall et al., 2018; Wolgast, 2014) so it might not have been a sufficiently sensitive measure to detect changes in psychological inflexibility in the present study. Fifth, it is possible the moderation patterns observed reflected regression to the mean given participants with higher baseline inflexibility also tended to have higher baseline severity scores in the outcome domains tested (see Figure 2). Replication of findings with larger sample sizes might help to disentangle effects related to moderation and regression to the mean. Sixth, our small sample size could have obscured "real" moderation and/or mediation effects (i.e., Type II error). Although the use of multilevel models allowed us to use all data points observed, tests of similar research questions with more power (e.g., bigger sample size, more assessment points) are needed to verify current results and interpretations. Having more assessment points throughout the intervention (e.g., session data) would have permitted a more fine-grained examination of processes of change in ACT for clinical perfectionism and more robust conclusions about the mediating role of hypothesized mechanisms of change. Finally, rate of dropout was high in the current study. This could have biased findings as participants with more severe clinical perfectionism might have been excluded from our analyses. The high dropout could have been an artifact of our recruitment method (yielding mostly students) or poor acceptability of the intervention. Regardless, clinicians using ACT with similar populations may try to reduce attrition by explicitly incorporating motivational strategies or emphasizing valued action.

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C.,

Losardo, D., . . . Hale, L. R. (2010). Assessment of obsessive-compulsive

symptom dimensions: development and evaluation of the Dimensional Obsessive-

Compulsive Scale. *Psychological Assessment, 22*(1), 180-198.

doi:10.1037/a0018260

Allen, G. E. K., & Wang, K. T. (2014). Examining religious commitment, perfectionism,

scrupulosity, and well-being among LDS individuals. *Psychology of Religion and

Spirituality, 6*(3), 257-264. doi:10.1037/a0035197

Arch, J. J., Wolitzky-Taylor, K. B., Eifert, G. H., & Craske, M. G. (2012). Longitudinal

treatment mediation of traditional cognitive behavioral therapy and acceptance

and commitment therapy for anxiety disorders. *Behaviour Research Therapy,

50*(7-8), 469-478. doi:10.1016/j.brat.2012.04.007

Barnard, L. K., & Curry, J. F. (2011). Self-compassion: Conceptualizations, correlates, &

interventions. *Review of General Psychology, 15*(4), 289-303.

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects

Models Using lme4. *Journal of Statistical Software, 67*(1), 1–48.

doi:10.18637/jss.v067.i01

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . .

Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and

Action Questionnaire-II: A revised measure of psychological inflexibility and

experiential avoidance. *Behavior Therapy, 42*(4), 676-688.

doi:10.1016/j.beth.2011.03.007

Burckhardt, C. S., & Anderson, K. L. (2003). The Quality of Life Scale (QOLS):

Reliability, validity, and utilization. *Health and Quality of Life Outcomes, 1*(60).

doi:10.1186/1477-7525-1-60

Craske, M. G., Niles, A. N., Burklund, L. J., Wolitzky-Taylor, K. B., Vilardaga, J. C.,

Arch, J. J., . . . Lieberman, M. D. (2014). Randomized controlled trial of cognitive

behavioral therapy and acceptance and commitment therapy for social phobia:

Outcomes and moderators. *Journal of Consulting and Clinical Psychology, 82*(6),

1034-1048. doi:10.1037/a0037212

Egan, S. J., van Noort, E., Chee, A., Kane, R. T., Hoiles, K. J., Shafran, R., & Wade, T.

D. (2014). A randomised controlled trial of face to face versus pure online self-

help cognitive behavioural treatment for perfectionism. *Behaviour Research and

Therapy, 63*, 107-113. doi:10.1016/j.brat.2014.09.009

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic

process: A clinical review. *Clinical Psychology Review, 31*(2), 203-212.

doi:10.1016/j.cpr.2010.04.009

Ferrari, M., Yap, K., Scott, N., Einstein, D. A., & Ciarrochi, J. (2018). Self-compassion

moderates the perfectionism and depression link in both adolescence and

adulthood. *PLoS One, 13*(2), e0192022. doi:10.1371/journal.pone.0192022

Flanagan, J. C. (1978). A research approach to improving our quality of life. *American

Psychologist, 33*(2), 138-147. doi:10.1037/0003-066X.33.2.138

Fledderus, M., Bohlmeijer, E. T., Pieterse, M. E., & Schreurs, K. M. (2012). Acceptance

and commitment therapy as guided self-help for psychological distress and

positive mental health: A randomized controlled trial. *Psychological Medicine, 42*(3), 485-495. doi:10.1017/s0033291711001206

Flett, G. L., & Hewitt, P. L. (2002). Perfectionism and maladjustment: An overview of theoretical, definitional, and treatment issues. In G. L. Flett & P. L. Hewitt (Eds.), *Perfectionism: Theory, research, and treatment* (pp. 5-31). Washington, DC: American Psychological Association.

Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A randomized controlled effectiveness trial of acceptance and commitment therapy and cognitive therapy for anxiety and depression. *Behavior Modification, 31*(6), 772-799. doi:10.1177/0145445507302202

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468. doi:10.1007/BF01172967

Gandrud, C. (Producer). (2016). DataCombine: Tools for easily combining and cleaning data sets. *R package version 0.2.21*. Retrieved from https://CRAN.R-project.org/package=DataCombine

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled trial of group cognitive behavioural therapy for perfectionism. *Behaviour Research and Therapy, 68*, 37-47. doi:10.1016/j.brat.2015.02.006

Hayes, S. C., Barnes-Holmes, D., & Wilson, K. G. (2012). Contextual Behavioral Science: Creating a science more adequate to the challenge of the human condition. *Journal of Contextual Behavioral Science, 1*(1-2), 1-16. doi:10.1016/j.jcbs.2012.09.004

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), 1-25. doi:10.1016/j.brat.2005.06.006

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. doi:10.1007/BF03395492

Houghton, D. C., Compton, S. N., Twohig, M. P., Saunders, S. M., Franklin, M. E., Neal-Barnett, A. M., . . . Woods, D. W. (2014). Measuring the role of psychological inflexibility in trichotillomania. *Psychiatry Research, 220*(1-2), 356-361. doi:10.1016/j.psychres.2014.08.003

James, K., Verplanken, B., & Rimes, K. A. (2015). Self-criticism as a mediator in the relationship between unhealthy perfectionism and distress. *Personality and Individual Differences, 79*, 123-128. doi:10.1016/j.paid.2015.01.030

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review, 30*(7), 865-878. doi:10.1016/j.cpr.2010.03.001

Lambert, M. J., Burlingame, G. M., Umphress, V., Hansen, N. B., Vermeersch, D. A., Clouse, G. C., & Yanchar, S. C. (1996). The Reliability and Validity of the Outcome Questionnaire. *Clinical Psychology & Psychotherapy, 3*(4), 249-258. doi:10.1002/(SICI)1099-0879(199612)3:4<249::AID-CPP106>3.0.CO;2-S

Leifeld, P. (2013). texreg: Conversion of statistical model output in R to LaTeX and

HTML tables. *Journal of Statistical Software, 55*(8), 1-24.

doi:10.18637/jss.v055.i08

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2017). The relationship

between perfectionism and psychopathology: A meta-analysis. *Journal of

Clinical Psychology, 73*(10), 1301-1326. doi:10.1002/jclp.22435

Neff, K. D. (2003). The development and validation of a scale to measure self-

compassion. *Self and Identity, 2*(3), 223-250. doi:10.1080/15298860390209035

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive

psychological functioning. *Journal of Research in Personality, 41*(1), 139-154.

doi:10.1016/j.jrp.2006.03.004

Neff, K. D., & Tirch, D. (2013). Self-compassion and ACT. In T. B. Kashdan & J.

Ciarrochi (Eds.), *Mindfulness, acceptance, and positive psychology: The seven

foundations of well-being* (pp. 78-106). Oakland, CA: New Harbinger.

Olatunji, B. O., Davis, M. L., Powers, M. B., & Smits, J. A. (2013). Cognitive-behavioral

therapy for obsessive-compulsive disorder: A meta-analysis of treatment outcome

and moderators. *Journal of Psychiatric Research, 47*(1), 33-41.

doi:10.1016/j.jpsychires.2012.08.020

Ong, C. W., Lee, E. B., Levin, M. E., & Twohig, M. P. (2019). A review of AAQ

variants and other context-specific measures of psychological flexibility. *Journal

of Contextual Behavioral Science*. doi:10.1016/j.jcbs.2019.02.007

R Core Team. (2015). *R: A language and environment for statistical computing*. Vienna,

Austria: R Foundation for Statistical Computing.

Riley, C., Lee, M., Cooper, Z., Fairburn, C. G., & Shafran, R. (2007). A randomised controlled trial of cognitive-behaviour therapy for clinical perfectionism: A preliminary study. *Behaviour Research and Therapy, 45*(9), 2221-2231. doi:10.1016/j.brat.2006.12.003

RStudio Team. (2015). RStudio: Integrated development for R. from RStudio, Inc. http://www.rstudio.com/

Schneider, R. L., Arch, J. J., & Wolitzky-Taylor, K. B. (2015). The state of personalized treatment for anxiety disorders: A systematic review of treatment moderators. *Clinical Psychology Review, 38*, 39-54. doi:10.1016/j.cpr.2015.02.004

Shafran, R., Cooper, Z., & Fairburn, C. G. (2002). Clinical perfectionism: A cognitive– behavioural analysis. *Behaviour Research and Therapy, 40*(7), 773-791. doi:10.1016/S0005-7967(01)00059-6

Shafran, R., & Mansell, W. (2001). Perfectionism and psychopathology: A review of research and treatment. *Clinical Psychology Review, 21*(6), 879-906. doi:10.1016/S0272-7358(00)00072-6

Smout, M., Davies, M., Burns, N., & Christie, A. (2014). Development of the Valuing Questionnaire (VQ). *Journal of Contextual Behavioral Science, 3*, 164-172. doi:10.1016/j.jcbs.2014.06.001

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 versus progressive relaxation training for obsessive-compulsive disorder. *Journal of Consulting and Clinical Psychology, 78*(5), 705-716. doi:10.1037/a0020508

Twohig, M. P., Plumb Vilardaga, J. C., Levin, M. E., & Hayes, S. C. (2015). Changes in psychological flexibility during acceptance and commitment therapy for obsessive compulsive disorder. *Journal of Contextual Behavioral Science, 4*(3), 196-202. doi:10.1016/j.jcbs.2015.07.001

Tyndall, I., Waldeck, D., Pancani, L., Whelan, R., Roche, B., & Dawson, D. L. (2018). The Acceptance and Action Questionnaire-II (AAQ-II) as a measure of experiential avoidance: Concerns over discriminant validity. *Journal of Contextual Behavioral Science*. doi:10.1016/j.jcbs.2018.09.005

Weiner, B. A., & Carton, J. S. (2012). Avoidant coping: A mediator of maladaptive perfectionism and test anxiety. *Personality and Individual Differences, 52*(5), 632-636. doi:10.1016/j.paid.2011.12.009

Wickham, H. (2017). tidyverse: Easily install and load 'Tidyverse' packages. R package version 1.1.1.

Wolgast, M. (2014). What does the Acceptance and Action Questionnaire (AAQ-II) really measure? *Behavior Therapy, 45*, 831-839. doi:10.1016/j.beth.2014.07.002

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. doi:10.1037/a0029418

Yadavaia, J. E., Hayes, S. C., & Vilardaga, R. (2014). Using acceptance and commitment therapy to increase self-compassion: A randomized controlled trial. *Journal of Contextual Behavioral Science, 3*, 248-257. doi:10.1016/j.jcbs.2014.09.002

Table 1

Coefficients From Lagged Mixed Effects Models With AAQ-II as Mediator

	AAQ-II	FMPS-CM	FMPS-DA	QOLS	OQ-45	VQ-Progress
Intercept	16.76***	14.10***	5.63**	0.67	37.66***	6.81
	(3.77)	(4.04)	(2.06)	(9.88)	(9.88)	(3.97)
Condition[a] (*a* path)	-5.49*					
	(2.01)					
Condition[a] (*c'* path)		-7.14***	-1.77*	**9.58***	-16.11**	5.08***
		(1.75)	(0.74)	**(2.54)**	(4.99)	(1.38)
Lagged AAQ-II (*b* path)		0.03	-0.03	**0.27***	-0.37	0.08
		(0.07)	(0.04)	**(0.12)**	(0.21)	(0.08)
DV at baseline (covariate)	0.34**	0.55***	0.66***	0.88***	0.59***	0.42**
	(0.12)	(0.12)	(0.13)	(0.11)	(0.13)	(0.16)
BIC		439.24	333.92	479.07	537.13	427.81
Log likelihood		-207.01	-154.39	-227.01	-256.14	-201.33
N	36	38	38	36	34	37

[a] Reference group was waitlist.

*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 2

Coefficients From Lagged Mixed Effects Models With SCS as Mediator

	SCS	FMPS-CM	FMPS-DA	QOLS	OQ-45	VQ-Progress
Intercept	5.93***	26.10***	6.02*	14.28	16.27	10.64**
	(1.57)	(6.05)	(2.57)	(8.73)	(13.45)	(3.50)
Condition[a] (*a* path)	3.17***					
	(0.74)					
Condition[a] (*c'* path)		**-6.45*****	-1.64*	9.14***	-17.22***	5.32***
		(1.64)	(0.77)	(2.66)	(4.98)	(1.42)
Lagged SCS (*b* path)		**-0.48***	-0.05	-0.24	0.82	-0.13
		(0.20)	(0.09)	(0.31)	(0.51)	(0.18)
DV at baseline (covariate)	0.66***	0.42***	0.62***	0.84***	0.58***	0.44**
	(0.10)	(0.12)	(0.13)	(0.11)	(0.12)	(0.15)
BIC		433.50	335.06	486.15	536.29	426.78
Log likelihood		-204.14	-154.96	-230.55	-255.72	-200.82
N	35	38	38	36	34	37

Note. BIC = Bayesian information criterion; FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; DA = Doubting of Actions; OQ-45 = Outcome Questionnaire-45.2; SCS = Self-Compassion Scale; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale.

[a] Reference group was waitlist.

*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 3

Mixed Effects Model Fit Indices for Outcomes of Interest With AAQ-II as Moderator

	AIC	BIC	Log likelihood	χ^2	χ^2 difference	*df*	*p*
FMPS-CM							
Model 1	781.74	798.36	-384.87	769.74			
Model 2	780.93	803.09	-382.46	764.93	4.81	2	.090
Model 3	**766.78**	**805.57**	**-369.39**	**738.78**	**26.15**	**6**	**< .001**
FMPS-DA							
Model 1	581.11	597.73	-284.56	569.11			
Model 2	575.96	598.13	-279.98	559.96	9.15	2	.010
Model 3	**571.02**	**609.81**	**-271.51**	**543.02**	**16.94**	**6**	**.010**
OQ-45							
Model 1	987.28	1003.7	-487.64	975.28			
Model 2	964.93	986.82	-474.47	948.93	26.35	2	< .001
Model 3	**962.83**	**1001.13**	**-467.41**	**934.83**	**14.11**	**6**	**.028**
VQ Progress							
Model 1	729.52	746.1	-358.76	717.52			
Model 2	720.86	742.95	-352.43	704.86	12.67	2	.002
Model 3	**705.76**	**744.43**	**-338.88**	**677.76**	**27.09**	**6**	**< .001**
QOLS							
Model 1	896.17	912.69	-442.09	884.17			
Model 2	890.88	912.91	-437.44	874.88	9.29	2	.010
Model 3	**884.18**	**922.73**	**-428.09**	**856.18**	**18.70**	**6**	**.005**

Note. AAQ-II = Acceptance and Action Questionnaire – II; AIC = Akaike information criterion; BIC = Bayesian information criterion; FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; DA = Doubting of Actions; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale. Model 1 included a two-way interaction term for baseline inflexibility and condition; Model 2 included a two-way interaction term for baseline inflexibility and time; and Model 3 included a three-way interaction term for baseline inflexibility, condition, and time.

Table 4

Mixed Effects Model Fit Indices for Outcomes of Interest With SCS as Moderator

	AIC	BIC	Log likelihood	χ^2	χ^2 difference	*df*	*p*
FMPS-CM							
Model 1	786.92	803.69	-387.46	774.92			
Model 2	781.34	803.71	-382.67	765.34	9.57	2	.008
Model 3	**769.01**	**808.15**	**-370.51**	**741.01**	**24.33**	**6**	**<.001**
FMPS-DA							
Model 1	609.79	626.56	-298.89	597.79			
Model 2	**603.03**	**625.39**	**-293.51**	**587.03**	**10.76**	**2**	**0.005**
Model 3	604	643.14	-288	576	11.03	6	0.087
OQ-45							
Model 1	1027.66	1044.2	-507.83	1015.66			
Model 2	1002.5	1024.6	-493.25	986.5	29.16	2	<.001
Model 3	**999.79**	**1038.5**	**-485.9**	**971.79**	**14.71**	**6**	**0.023**
VQ Progress							
Model 1	753.16	769.89	-370.58	741.16			
Model 2	739.8	762.1	-361.9	723.8	17.37	2	<.001
Model 3	**729.84**	**768.87**	**-350.92**	**701.84**	**21.95**	**6**	**0.001**
QOLS							
Model 1	919.33	936	-453.66	907.33			
Model 2	912.53	934.76	-448.26	896.53	10.80	2	0.005
Model 3	**907.17**	**946.08**	**-439.58**	**879.17**	**17.36**	**6**	**0.008**

Note. SCS = Self-Compassion Scale; AIC = Akaike information criterion; BIC = Bayesian information criterion; FMPS = Frost Multidimensional Perfectionism Scale; CM = Concern Over Mistakes; DA = Doubting of Actions; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale. Model 1 included a two-way interaction term for baseline self-compassion and condition; Model 2 included a two-way interaction term for baseline self-compassion and time; and Model 3 included a three-way interaction term for baseline self-compassion, condition, and time.
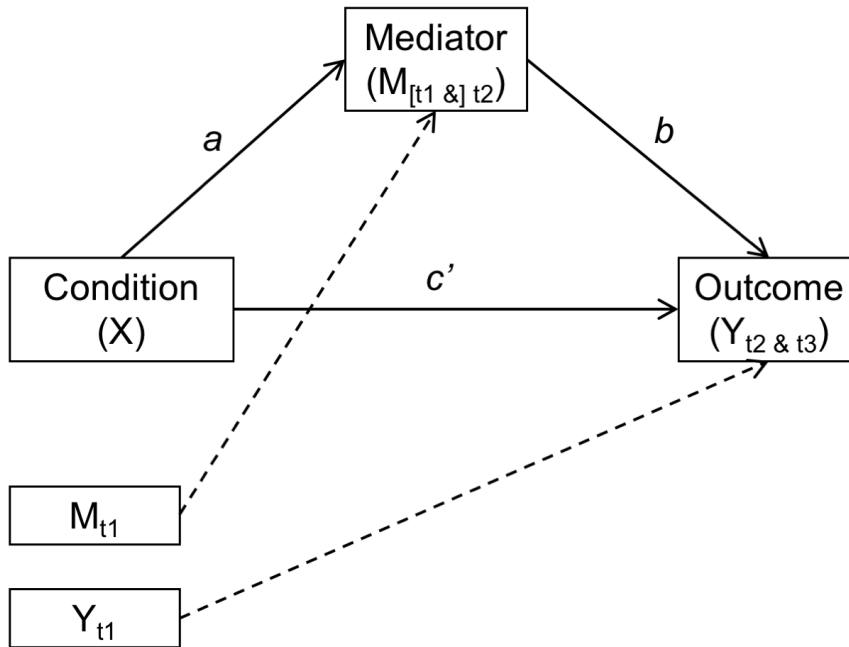
Figure 1. Schematic representation of lagged mediation model. The *a* path was estimated using a regression model with the mediator at posttreatment (t2) as the outcome variable and condition and mediator at baseline (t1) as predictors. Baseline (t1) and posttreatment (t2) scores of the mediator (Acceptance and Action Questionnaire — II or Self-Compassion Scale) were used to predict posttreatment (t2) and follow-up (t3) scores of the outcome variables (Frost Multidimensional Perfectionism Scale (FMPS) Concern Over Mistakes, FMPS Doubting, Quality of Life Scale, Outcome Questionnaire-45.2, and Valuing Questionnaire Progress).
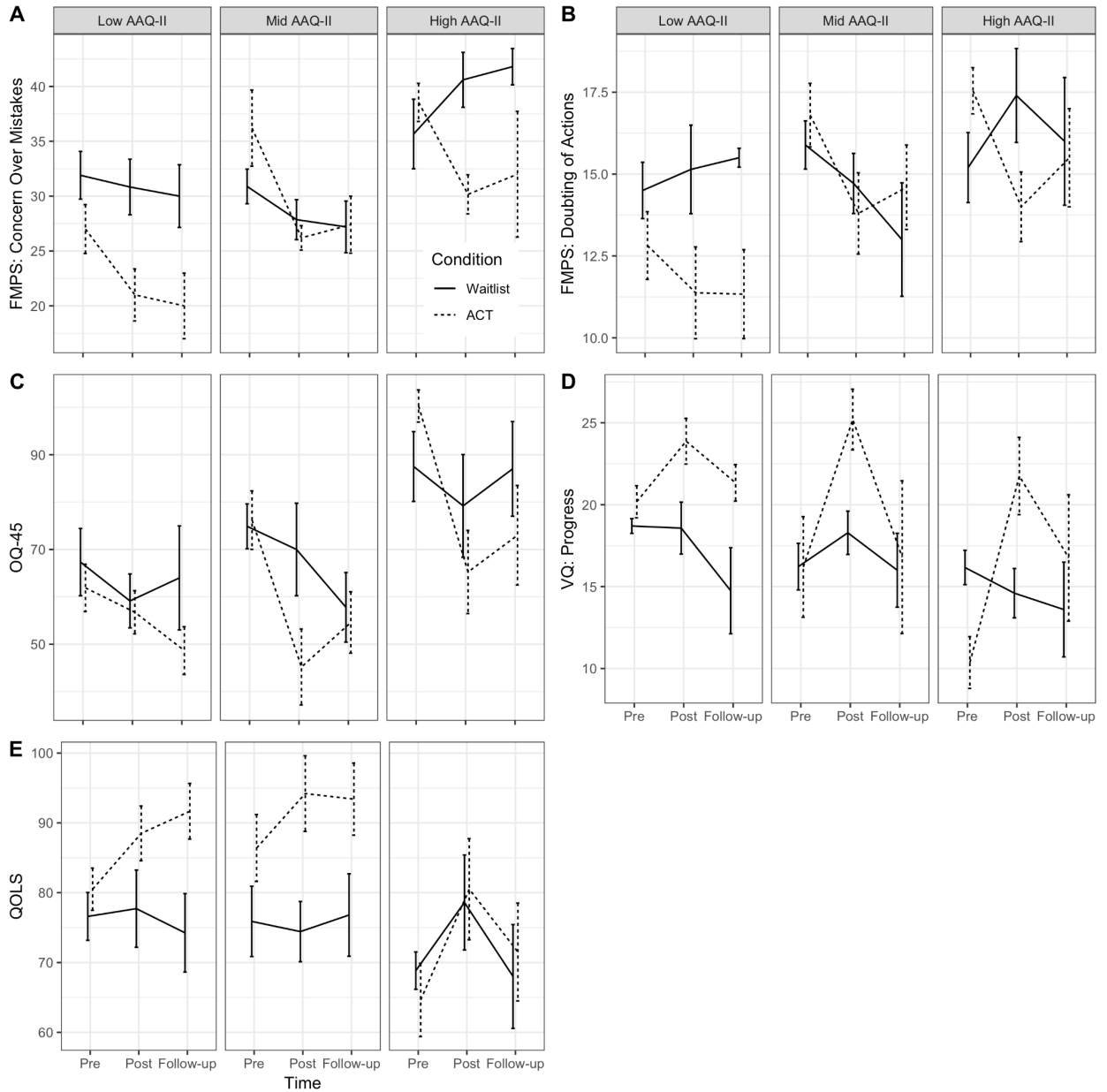
Figure 2. Plots depicting mean scores of outcomes over time by condition and baseline psychological inflexibility (Acceptance and Action Questionnaire – II; AAQ-II). Low, mid, and high groups reflect bins with an approximately equal number of participants. FMPS = Frost Multidimensional Perfectionism Scale; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale.

Figure 3. Plots depicting mean scores of outcomes over time by condition and baseline self-compassion (Self-Compassion Scale; SCS). Low, mid, and high groups reflect bins with an approximately equal number of participants. FMPS = Frost Multidimensional Perfectionism Scale; OQ-45 = Outcome Questionnaire-45.2; VQ = Valuing Questionnaire; QOLS = Quality of Life Scale.
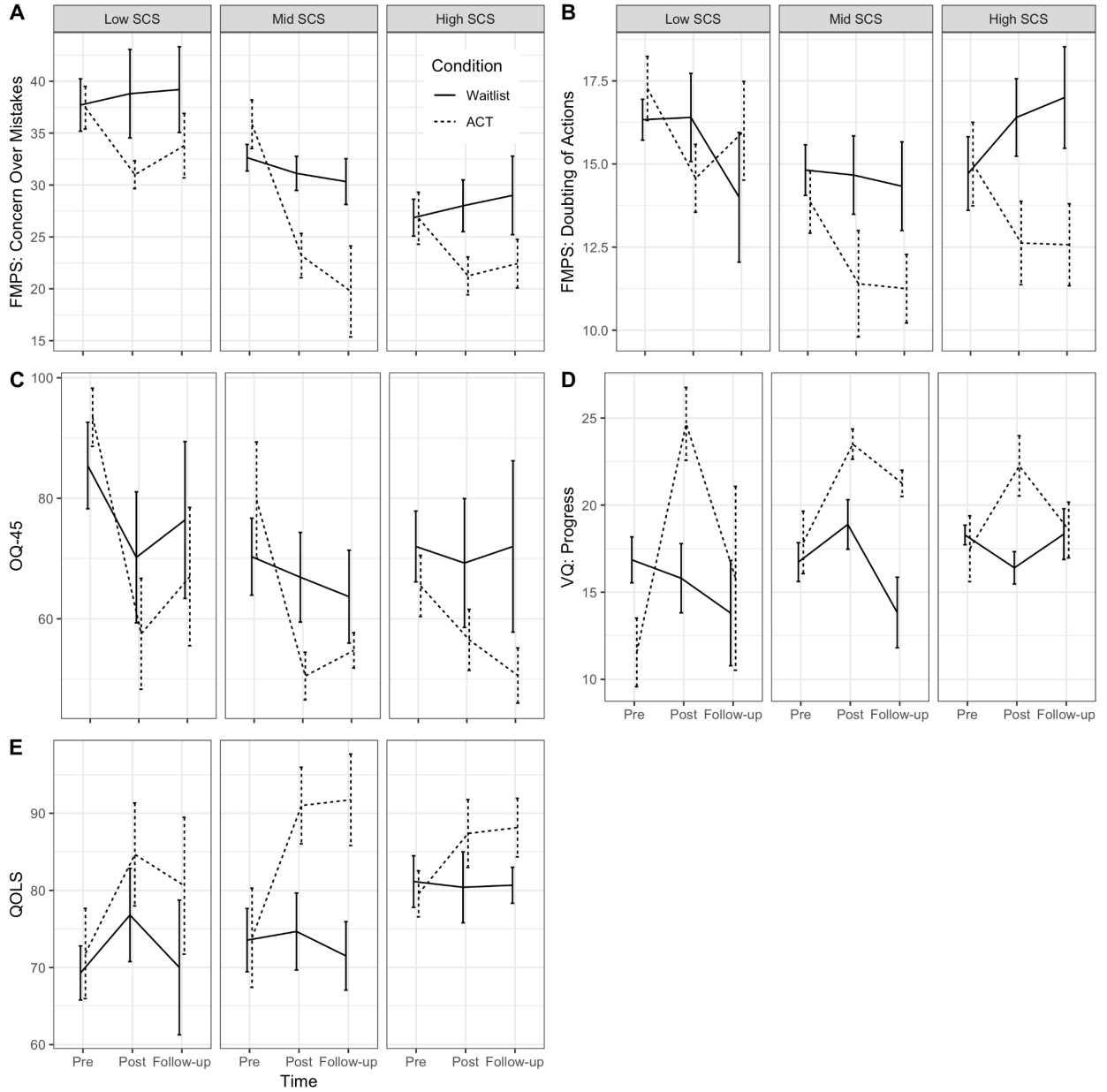
CHAPTER IV

STUDY 3

The third study presents neurological data from the randomized controlled trial. The manuscript is currently under preparation and the most recent draft is appended below.

Effect of Acceptance and Commitment Therapy on

Neurological Functioning in Clinical Perfectionism

Clarissa W. Ong, M.S.

Allison S. Hancock

Tyson S. Barrett, Ph.D.

Eric B. Lee, M.S.

Nick Wan, Ph.D.

Ronald B. Gillam, Ph.D.

Michael E. Levin, Ph.D.

Michael P. Twohig, Ph.D.

Utah State University

Abstract

Clinical perfectionism is associated with various psychopathologies and cognitive

processes including error processing, performance monitoring, and emotion regulation.

This study analyzed neurological data from a randomized controlled trial for clinical

perfectionism that compared acceptance and commitment therapy (ACT) to a waitlist

control condition. The objectives were to assess the effect of ACT on neurological

functioning among 29 individuals with clinical perfectionism and the relationship

between neurological changes and self-report outcomes. Participants underwent a

functional near-infrared spectroscopy assessment during which they completed

behavioral tasks designed to elicit error detection and error generation and self-report

measures at pretreatment and posttreatment. Activation in brain regions of interest (i.e.,

dorsolateral prefrontal cortex, medial prefrontal cortex, and right inferior parietal lobe)

were analyzed using mixed effects models. Pre-post changes for neural and self-report

outcomes were examined with bivariate correlations. In all areas, we found reductions or

smaller increases in neural activation from pretest to posttest in the ACT condition

compared to the waitlist condition, which showed increases over time for active

experimental tasks. This pattern of results suggests greater cognitive processing

efficiency and muted neural responding to previously emotionally salient stimuli

following ACT. No significant correlations were observed between neurological and self-

report changes. Our findings tentatively support the hypothesized processes of change

posited by the theory underlying ACT while highlighting the complexity of the brain-

behavior relationship and need for more precise methodology. Limitations include lack of

an alternative treatment condition and insufficient power to conduct moderation analyses.

Keywords: acceptance and commitment therapy, perfectionism, neurological,

functional near-infrared spectroscopy

Effect of Acceptance and Commitment Therapy on

Neurological Functioning in Clinical Perfectionism

Clinical perfectionism is characterized by rigid striving for unrealistically high

personal standards and experiencing distress when these standards are not met (Shafran &

Mansell, 2001). It is a risk and maintenance factor in clinical conditions like obsessive-

compulsive disorder (OCD), depression, eating disorders, and anxiety disorders (Egan,

Wade, & Shafran, 2011). Given its role in the development and maintenance of a range of

diagnoses and to poorer treatment outcomes (Egan et al., 2014), explicitly targeting

clinical perfectionism—rather than diagnoses—may be an efficient way to improve

treatment response by addressing the maladaptive process or function underlying

topographically dissimilar behaviors.

Clinical trials focused on clinical perfectionism have found support for cognitive-

behavioral therapy (CBT; Riley, Lee, Cooper, Fairburn, & Shafran, 2007; Shafran et al.,

2017) and acceptance and commitment therapy (ACT; Ong, Lee, et al., 2019) for self-

report outcomes. ACT is a modern acceptance-based CBT that aims to improve

psychological flexibility, which is the ability to be open to internal experience as they

occur in the present moment while intentionally choosing to engage in personally

meaningful activities (Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

The treatment literature for clinical perfectionism to date has not examined the

effect of psychotherapy on neurological indices like activation in specific brain regions.

Understanding how psychotherapy influences neurological patterns is important because

it gives insight into potential neural mechanisms associated with perfectionistic behaviors

and treatment for clinical perfectionism that could then be used to refine existing

interventions. For example, neurological data may point to pertinent processes of change—like changes in executive functioning abilities—that cannot be easily detected with self-report measures and may provide guidance as to elements of treatment on which to focus or deemphasize depending on neurological shifts observed. Thus, collecting neurological data not only clarifies the relationship between neurological processes and overt behaviors but also functions as a means to test theory-driven hypotheses about how treatment works. Furthermore, neural activation represents assessment data on another level of scientific analysis, facilitating interdisciplinary coherence in the psychological treatment literature and providing depth to existing conceptualizations of the presentation and treatment of clinical perfectionism (Hayes, Barnes-Holmes, & Wilson, 2012). Yet, to our knowledge, no studies have examined neurological activation among individuals with clinical perfectionism who have received psychological treatment.

Acceptance-Based Interventions and Neurological Functioning

Researchers have investigated the effect of ACT on neurological indices among individuals with public speaking anxiety (Glassman et al., 2016), disordered gambling (Dixon, Wilson, & Habib, 2016), chronic pain (Smallwood, Potter, & Robin, 2016), and fibromyalgia (Jensen et al., 2012). Glassman et al. (2016) found less activation in the left dorsolateral prefrontal cortex (DLPFC) among individuals who received a 90-minute acceptance-based behavioral treatment (ABBT) whereas those who received traditional CBT showed higher activation in the left DLPFC, which is associated with speech production and impulse control. This finding suggests CBT strategies might have tapped more cognitive resources than acceptance-based strategies possibly related to use of cognitive reappraisal strategies (Glassman et al., 2016). Furthermore, it is possible

decreased DLPFC activation in the ABBT group reflected less need to inhibit

impulses—consistent with use of acceptance strategies. In addition, because overt speech

production during a public speaking behavioral task was not different between groups,

the decreased DLPFC activation in the ABBT group relative to the CBT group might

have been related to less internal self-talk, which is also consistent with non-reactive

responses associated with acceptance. Similar neurological findings were observed in a

sample of patients with opioid addiction and chronic pain during painful stimulation after

receiving eight sessions of ACT (Smallwood et al., 2016). Participants in the study

demonstrated decreased activation in the inferior parietal lobe (IPL) and superior

temporal gyrus compared to those who received health education, indicating muted

neural responsiveness to painful stimuli following a course of ACT (Smallwood et al.,

2016). Decreased activation in the IPL and supramarginal gyrus (SMG) has also been

observed during distraction from negative (i.e., low valence, high arousal)—but not

neutral—stimuli among individuals with borderline personality disorder who had

received dialectical behavior therapy (DBT; Winter et al., 2017). Similar to results from

Smallwood et al. (2016), the reduced activity in the IPL and SMG during distraction from

negative content suggests less reactivity to aversive stimuli following receipt of an

acceptance- and mindfulness-based treatment like DBT (Winter et al., 2017).

     In contrast, other studies on the effect of ACT on neurological functioning have

found increased brain activation in regions of interest. For example, Dixon et al. (2016)

found increased activation in frontal and parietal brain regions including the right IPL

among college students with disordered gambling when they were presented with

winning stimuli (i.e., matching images on a jackpot machine) after receiving eight weekly

sessions of ACT. Dixon et al. (2016) posited increased activation specific to winning

stimuli could have been due to perception of additional verbal meaning of winning

stimuli (e.g., loss of time spent with family). In addition, Jensen et al. (2012) found

higher activation in the ventrolateral prefrontal cortex and lateral orbitofrontal cortex

(OFC) among patients with fibromyalgia who completed 12 group sessions of ACT

versus a waitlist condition. Both regions are associated with executive functioning,

suggesting ACT resulted in new processing of pain stimuli that might have required more

cognitive resources. Mindfulness training has also been found to improve emotional

conflict resolution during executive processing through increased activation in the

dorsolateral prefrontal cortex (DLPFC) and response inhibition during negative valence

processing through increased activation in the medial prefrontal cortex (MPFC; Allen et

al., 2012). These results point to acceptance and mindfulness relying on recruitment of

cognitive resources whereas findings discussed in the preceding paragraph support

decreased cognitive burden when acceptance and mindfulness are used.

One way to reconcile these ostensibly discrepant findings on changes in brain

activation is to consider level of success of acceptance and mindfulness practice as a

moderator of the effect of intervention of neurological activity. That is, as individuals

progress toward consistent practice of mindfulness, acceptance, and self-compassion,

relevant brain regions (e.g., MPFC, DLPFC) may initially show increased activation due

to greater cognitive engagement as new concepts are applied (Stevens, Gauthier-Braham,

& Bush, 2018). However, decreased activation may be expected over time as individuals

successfully disengage from the cognitive burden of regulating emotionally salient

stimuli (Stevens et al., 2018). This hypothesized trajectory of neural processes may

explain why studies reported both increased and decreased activation associated with

improved behavioral outcomes following ACT as practice of mindfulness skills may be a

more precise predictor of changes in brain activation rather than receipt of ACT.

Another possible moderator is the valence or content of stimuli to which

participants were exposed (Pergamin-Hight, Naim, Bakermans-Kranenburg, van

IJzendoorn, & Bar-Haim, 2015). For example, whereas Smallwood et al. (2016) found

decreased activation in the IPL in response to pain stimuli that were previously aversive,

Dixon et al. (2016) observed increased activation in the right IPL in response to winning

stimuli that were previously appetitive. Given the inherent complexity of neurological

functioning and difficulty identifying consistent neural correlates of emotional responses

even with highly controlled experimental paradigms (Murphy, Nimmo-Smith, &

Lawrence, 2003), it is unsurprising to observe incongruence in the extant literature.

Nonetheless, the mixed findings may reflect lack of consistency in neurological

assessment methods (e.g., task complexity, experimental protocols, stimuli presented)

and underscore a need for more data to clarify the effect of ACT of neurological indices.

Clinical Perfectionism and Neurological Functioning

Neuroimaging data acquired using functional magnetic resonance imaging (fMRI)

and magnetic resonance imaging (MRI) suggest perfectionistic qualities are associated

with activation in brain regions responsible for error processing, performance monitoring,

cognitive control, and emotion regulation including the DLPFC, MPFC, and SMG (Barke

et al., 2017; Longe et al., 2010; Wu et al., 2017). DLPFC activation was positively

associated with self-reported self-criticism, indicating self-criticism may entail greater

error processing and behavioral inhibition (Longe et al., 2010). Whereas, MPFC

activation has been found to be related to self-referential processing especially in relation to negative affectivity (D'Argembeau et al., 2007; Lemogne et al., 2011; Modinos, Ormel, & Aleman, 2009), making it particularly relevant to self-critical thoughts and evaluative concerns frequently observed in clinical perfectionism.

The direction of the correlation between perfectionism and neural response depends on type of perfectionistic presentation (Barke et al., 2017), indicating possible heterogeneity in neurological profiles among individuals with clinical perfectionism. In other words, we may not expect uniform neurological responses to similar tasks and stimuli even among individuals who meet criteria for clinical perfectionism, further complicating neurological assessment in this population and highlighting the need to examine moderators in sufficiently powered studies. For example, perfectionistic responses may be characterized by increased cognitive load related to more intense error processing (possibly similar to rumination; Cooney, Joormann, Eugene, Dennis, & Gotlib, 2010) or avoidance of performance monitoring to prevent evaluative worries. Alternatively, they may manifest as decreased cognitive burden related to non-avoidance of error processing (Barke et al., 2017). Thus, the neural mechanisms underlying perfectionistic behaviors appear to be diverse and understanding the moderators and predictors influencing these processes could inform conceptualization of and interventions for clinical perfectionism.

Emotion Regulation and Neurological Functioning

Activation in prefrontal regions including the DLPFC and MPFC have been linked to use of cognitive and emotion regulation strategies such as suppression and reappraisal (Ochsner & Gross, 2005; Quirk & Beer, 2006). The dorsomedial prefrontal

cortex (DMPFC) has also been found to respond to the expectation of unfamiliar or

negative stimuli following receipt of mindfulness instruction (Lutz et al., 2014),

supporting its role in use of emotion regulation strategies more broadly. These findings

implicate the prefrontal cortex in intentional coping responses to meaningful stimuli. In

addition, the IPL has been implicated in perspective taking and empathy (Decety &

Jackson, 2006; Ruby & Decety, 2003). Given self-compassion—an antidote to self-

criticism—may rely on self-directed empathy (Neff, 2003), the IPL could be activated

during use of self-compassion strategies.

At the same time, higher levels of mindfulness have been negatively correlated

with DMPFC activation (Lutz et al., 2014), suggesting practice of mindfulness may lead

to more efficient emotion regulation or fewer cognitive resources spent on emotionally

salient stimuli—consistent with the neural mindfulness trajectory posited by Stevens et

al. (2018).

Treatment Outcomes and Neurological Functioning

Neurological functioning is commonly examined under controlled laboratory

conditions with specific cognitive tasks, yielding internally valid findings that can be

compared across samples and studies (Berkman & Falk, 2013). Yet, the ecological

relevance of neurological data cannot be ascertained from such experimental designs.

Understanding the relationship between neural activation and clinically relevant variables

is important because it clarifies the practical utility of such data (e.g., what does it mean

for behavioral outcomes if brain activation decreases at the end of treatment?).

Baseline neural activity has been found to predict clinical outcomes including

treatment response and relapse (Berkman & Falk, 2013; Ritchey, Dolcos, Eddington,

Strauman, & Cabeza, 2011), suggesting it moderates treatment outcomes. Moreover,

changes in brain activation over the course of CBT have been associated with

agoraphobic symptom reduction over the same period of time (Kircher et al., 2013) and

lower depression scores at posttreatment (Rubin-Falcone et al., 2018), showing neural

shifts over time may also be meaningful correlates of symptom reduction. These results

indicate neurological data may have ecological validity in that they correlate with

clinically relevant outcomes, providing coherence across levels of analysis and potential

support to theoretical processes of change.

Functional Near-Infrared Spectroscopy (fNIRS)

fNIRS is a non-invasive neuroimaging technology that assesses cortical

hemodynamic responding in real-time by measuring changes in oxygenated and

deoxygenated hemoglobin using near-infrared spectroscopy (Ferrari & Quaresima, 2012;

Quaresima & Ferrari, 2016). Its primary advantages include (1) reliance on low-cost,

portable equipment and (2) mobility afforded to participant during assessment, expanding

the range of experimental tasks that can be performed (Quaresima & Ferrari, 2016). Thus,

the fNIRS is particularly suitable to neurological investigations using relatively common

tasks (e.g., writing) that may not be feasible with other neuroimaging methods such as

fMRI.

Present Study

The present study used neurological data collected from a randomized controlled

trial that tested the efficacy of ACT for clinical perfectionism relative to a 14-week

waitlist control group (Ong, Lee, et al., 2019). fNIRS was used to assess neurological

functioning in predetermined regions of interest including the left and right DLPFC,

MPFC, and IPL during tasks designed to elicit error detection and error generation. The first objective of this study was to evaluate the effect of ACT on neurological functioning from pre- to posttreatment among individuals with clinical perfectionism. We predicted there would be decreases in DLPFC and MPFC activation and increases in IPL activation in the ACT group compared to the waitlist group from pre- to posttreatment. The second objective was to assess the strength of the correlation between changes in neural activation from pre- to posttreatment and changes in self-reported outcomes from pre- to posttreatment. We predicted DLPFC and MPFC activation would be negatively correlated with improvement in self-report outcomes and IPL activation would be positively correlated with improvement in self-report outcomes.

Method

Participants

Participants were recruited from a western U.S. town with newspaper and online advertisements, flyers, and class announcements. Recruitment materials stated individuals needed to be struggling with "procrastination, spending a lot of time planning/organizing, and difficulty starting/completing tasks because [of a] need to get them exactly right." Inclusion criteria for the fNIRS assessment were: (1) righthandedness (to avoid the confounding influence of handedness on neuroimaging results; Cuzzocreo et al., 2009; Klöppel et al., 2007), (2) scalp conditions allowed reliable fNIRS data recording (hair pigmentation and density affect light transmission; Khan et al., 2012; McIntosh, Shahani, Boulton, & McCulloch, 2010), (3) score of at least five on the Dimensional Obsessive-Compulsive Scale (DOCS) Symmetry subscale (Abramowitz et al., 2010), (4) significant distress and/or functional impairment associated with clinical

perfectionism based on a clinical interview, (5) willingness to complete 10 sessions of

therapy, (6) cognitive and physical ability to complete study procedures, (7) not currently

seeking therapy for clinical perfectionism, and (8) no change in psychotropic medication

in the past 30 days. Fifty-three participants enrolled in the clinical trial but failure to meet

criteria (1) and (2) and dropout led to exclusion of 24 participants from current analyses.

Ultimately, 29 participants (14 in ACT condition, 15 in waitlist condition) completed the

fNIRS assessment at pretreatment and posttreatment.

Study Procedures

Procedures were approved by a university institutional review board and

participants signed an informed consent document prior to study participation. Following

screening procedures (i.e., DOCS Symmetry administered online and phone interview),

participants completed a pretreatment assessment that included the fNIRS and self-report

measures. Participants determined to be eligible for the study were randomly assigned to

either the treatment (10 sessions of ACT) or the control (14-week waitlist) condition.

fNIRS assessment was conducted at pre- and post-treatment and self-report measures

were administered at pretreatment, posttreatment, and one-month follow-up. Further

details on study methodology are available in a previous publication (Ong, Lee, et al.,

2019). In the study, participants in the ACT condition showed greater improvements over

time in clinical perfectionism (concern over mistakes), symptom distress and functional

impairment, quality of life, progress toward valued living, psychological inflexibility, and

self-compassion compared to those in the waitlist condition (Ong, Lee, et al., 2019).

Neurological Assessment

Data collection. Participants were seated 50 cm away from a 46×28-cm computer

screen on which task instructions were presented using E-Prime 2.0 (Schneider, Eschman, & Zuccolotto, 2002) prior to the start of the fNIRS assessment. Following delivery of instructions, two trained researchers fit a fNIRS cap to participants' head before initiating the experimental tasks.

Participants completed three experimental behavioral tasks: editing (editing passages with errors), mirror image tracing (tracing the mirror image of a geometric shape), and circle tracing (tracing a circle counterclockwise). The two tasks designed to elicit error detection and error generation relevant to clinical perfectionism were editing and mirror image tracing respectively. Circle tracing served as a simple mechanical control task that could have elicited error making but without explicit task expectations and requiring as much cognitive effort as editing and mirror image tracing. In other words, we wanted to ensure the active behavioral tasks (i.e., editing, mirror image tracing) actually engaged deliberate perfectionistic tendencies and cognitive striving relative to the simpler circle tracing task.

The experiment consisted of two blocks with each block containing three two-minute tasks (i.e., editing, mirror image tracing, and circle tracing). Within the blocks, each task was separated by a 15-second inter-stimulus interval (ISI), which was a fixed cross displayed on the screen. Rest periods were placed before each block and after the final block. During rest periods, participants were instructed to look at the fixed cross in the middle of the screen. Task order was randomized to minimize potential order effects. A flow diagram illustrating the fNIRS procedures are provided in Figure 1.

fNIRS data were acquired using a Hitachi ETG-4000 system with each probe set adapted to a 3×5 44-channel montage. Channels between each transmitter and receiver

were placed with reference to the 10-20 system. The two probe sets were placed on the

front and right side of the head, with the center probe lined up with the nasion (see Figure

2). Prior to recording, a NIRS gain quality check was performed to ensure data

acquisition was neither under-gained nor over-gained according to the Hitachi ETG-4000

calibration guidelines (Hitachi Medical Group, Tokyo). Data were recorded at 695 and

830 nm.

Polhemus PATRIOT digitizer channel registration analyses were used to select

regions of interest (ROIs). After the assessment was completed, participants were

instructed to keep the cap on while researchers carefully removed the optodes.

Measurements in centimeters were taken (1) from the left auricular lobule to the right

auricular lobule over the top of the head and (2) from the nasion to the inion over the top

of the head. Once the location of the center of the scalp was determined, a magnet was

positioned on it. Participants were moved so the inion was 10 cm away from the

transmitter. Using the Polhemus stylus, five head base reference points were measured:

nasion, left tragus, right tragus, inion, and CZ (center point of head). ROIs were the left

DLPFC, right DLPFC, MPFC, and IPL. All channels with 50% or greater area overlap

within a region were averaged together based on MRIcro registration (Rorden & Brett,

2000).

Data preprocessing. Data were filtered using wavelet MDL (Gaussian low-pass

FWHM at 4s; Brigadoi et al., 2014) and precolored and prewhitened using NIRS-SPM

(Ye, Tak, Jang, Jung, & Jang, 2009). The signal analyzed is based on the following

formula:

$$\frac{TASK - \overline{isi}}{rms} \times 100$$

A baseline correction was performed by removing the mean of the 15-second local ISI

before each task from the signal. This was then normalized by the square root of the

signal power of the entire channel. Following this, each channel was visually inspected.

NIRS-SPM registration process report (Ye et al., 2009) was used to determine the

channels for each participant. Channel selection for each ROI was established

using a >50% channel overlap threshold. The period of the waveforms needed to

calculate area under the curve (AUC) was determined for each task per

participant individually as per Wan, Hancock, Moon, and Gillam (2018).

Screening Measure

  Dimensional Obsessive-Compulsive Scale (DOCS)—Symmetry (Abramowitz

et al., 2010). The DOCS-Symmetry subscale evaluates severity of avoidance, distress,

and interference due to a perceived need to make things "just right" (Abramowitz et al.,

2010). Its five items are scored from 0 to 4 (anchors vary) with higher scores indicating

higher severity (Abramowitz et al., 2010). Example items include: "When you have the

feeling of something being "not just right," how distressed or anxious did you become?"

and "To what extent has your daily routine (work, school, self-care, social life) been

disrupted by the feeling of things being 'not just right,' and efforts to put things in order

or make them feel right?" Individuals who scored at least five (just below the mean of

6.13 [SD = 5.50] in an OCD sample; Abramowitz et al., 2010) were invited to a baseline

assessment session to determine study eligibility. A more liberal screening cutoff was

selected given the heterogeneous topographical presentation of clinical perfectionism and

further assessment with a clinical interview. This subscale has shown good to excellent

internal consistency in both clinical and nonclinical samples and convergent, divergent

and criterion validity (Abramowitz et al., 2010).

Self-Report Assessment

Demographic information. The self-report assessment included questions on age, gender, marital status, ethnicity, highest education level achieved, religion, and annual household income.

Frost Multidimensional Perfectionism Scale: Concern Over Mistakes Subscale (FMPS-CM; Frost, Marten, Lahart, & Rosenblate, 1990). The FMPS-CM contains nine items and assesses maladaptive responses to mistakes and perceiving mistakes as indicative of personal failure. Items are scored from 1 (*strongly disagree*) to 5 (*strongly agree*) with higher scores indicating more concern over mistakes. Example items include: "If I fail at work/school, I am a failure as a person" and "I should be upset if I make a mistake." This measure has shown construct validity and adequate internal consistency (Frost et al., 1990) with the FMPS-CM demonstrating treatment sensitivity (Egan et al., 2014; Handley, Egan, Kane, & Rees, 2015). Internal consistency was excellent in our sample (Cronbach's α = .93 at pretreatment and .92 at posttreatment).

Outcome Questionnaire-45.2 (OQ-45; Lambert et al., 1996). The OQ-45 measures symptom distress and functional impairment (Lambert et al., 1996). Its 45 items are scored from 0 (*always*) to 4 (*never*). Higher scores indicate greater distress and/or impairment (Lambert et al., 1996). The OQ-45 has shown excellent internal consistency, good temporal stability, and convergent validity (Lambert et al., 1996). Internal consistency was good to excellent in this sample (Cronbach's α = .89 at pretreatment and .92 at posttreatment).

Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003; Flanagan,

1978). The revised 16-item version of the QOLS (Burckhardt & Anderson, 2003)

evaluates overall satisfaction with quality of life in various domains including material

comforts, health, relationships, work, and recreation. Each item is rated from 1 (*terrible*)

to 7 (*delighted*). Higher scores reflect greater quality of life (Burckhardt & Anderson,

2003). The QOLS has demonstrated reliability and convergent and divergent validity

(Burckhardt & Anderson, 2003). Current internal reliability was acceptable to good

(Cronbach's α = .73 at pretreatment and .89 at posttreatment).

Valuing Questionnaire: Progress Subscale (VQ-Progress; Smout, Davies,

Burns, & Christie, 2014). The VQ-Progress measures progress toward personal values.

Items are rated from 0 (*not at all true*) to 6 (*completely true*); higher scores indicate more

valued action (Smout et al., 2014). Example items include: "I worked toward my goals

even if I didn't feel motivated to" and "I made progress in the areas of my life I care most

about." The VQ-Progress has shown good internal consistency and convergent and

incremental validity (Smout et al., 2014). Present internal consistency was poor to good

(Cronbach's α = .50 at pretreatment and .88 at posttreatment).

Acceptance and Action Questionnaire — II (AAQ-II; Bond et al., 2011). The

AAQ-II assesses psychological inflexibility, the inverse of psychological flexibility,

which is the hypothesized process of change in ACT (Hayes et al., 2006). Its seven items

are scored from 1 (*never true*) to 7 (*always true*). Higher scores reflect more

psychological inflexibility. Example items include: "I worry about not being able to

control my worries and feelings" and "emotions cause problems in my life." The AAQ-II

has shown adequate reliability and validity in clinical and nonclinical samples (Bond et

al., 2011). Internal consistency was good in our sample (Cronbach's α = .89 at

pretreatment and .84 at posttreatment).

Self-Compassion Scale (SCS; Neff, 2003). The SCS measures self-compassion with 26 items scored from 1 (*almost never*) to 5 (*almost always*). It assesses the domains of mindfulness, self-kindness, common humanity, over-identification, self-judgment, and isolation. Example items include: "I'm kind to myself when I'm experiencing suffering" and "I'm tolerant of my own flaws and inadequacies." The SCS has demonstrated excellent internal consistency and convergent and divergent validity (Neff, 2003). Internal consistency was unacceptable to questionable in our sample (Cronbach's α = .66 at pretreatment and .37 at posttreatment).

Statistical Analyses

Multilevel modeling. Linear mixed effects models were used to assess the AUC for total hemoglobin for each region of interest separately. The final models were built hierarchically, starting from the full model with three-way interactions (condition × time × task) to more parsimonious models. To select the final models for each region, likelihood ratio tests assessed for differences between more complex models and more parsimonious models. That is, we compared models with a three-way interaction to models with each two-way interaction. If there was no significant difference (at α = .05) between the models, the more parsimonious model was compared to an even more parsimonious model. This produced four final models, one for each region of interest.

The random effects structure in the mixed effects models was selected based on the design of the experiment using the "maximal" approach (Barr, Levy, Scheepers, & Tily, 2013). This involved a random intercept by individual participant within each time (pretest or posttest), thereby allowing the model to flexibly handle the repeated-measures

design. The residuals of the final models were checked for irregularities that could impact

conclusions.

Pre-post correlations. Variables were created for posttreatment outcomes

controlling for pretreatment scores for: (1) AUC values per active task (i.e., editing,

mirror image tracing) per region of interest (i.e., left DLPFC, right DLPFC, MPFC, IPL)

and (2) self-report outcomes for which significant improvement was observed (i.e.,

FMPS-CM, OQ-45, QOLS, VQ-Progress, and AAQ-II). Bivariate Pearson correlation

coefficients were calculated to determine the strength of the relationship between pre- to

posttreatment changes in neural activity and pre- to posttreatment changes in self-report

measures. Due to missing data, 24 participants (12 in ACT, 12 in waitlist) were included

in these analyses.

Results

Sample Description

Of the 29 participants who completed the fNIRS assessment at both time points,

65.5% identified as female, 86.2% as European American/White, and 82.8% as members

of The Church of Jesus Christ of the Latter-day Saints. The mean age of the sample was

26.6 years (SD = 13.1). There were no statistically significant differences between groups

on any demographic variables. Descriptive statistics of the sample by condition are

presented in Table 1.

Mixed Effects Models

The best-fitting models included the three-way interaction for right DLPFC ($p =$

.005) and significant two-way interactions for the left DLPFC, MPFC, and IPL ($ps <$

.009). Table 2 shows the estimated coefficients, standard errors, and p-values (based on

Satterthwaite approximation of degrees of freedom) for the final models.

Neural activation for the ACT condition at posttest was generally reduced

compared to— or approximately equal to—that at pretest for both the left and right

DLPFC (see Figure 3, panels a and b) for the active experimental tasks (i.e., editing,

mirror image tracing). This general trend of decreased activation was not the case for the

waitlist condition, with both tasks showing an increase in activation from pretest to

posttest. A similar interaction was observed for left DLPFC activation for the circle

tracing task (decrease in ACT and no change in waitlist) though trends from pretest to

posttest overlapped for all other regions of interest, suggesting the circle tracing task did

not elicit as much perfectionistic cognitive engagement as the active experimental tasks,

as was expected.

For MPFC and IPL activation in the active tasks, the pattern from pretest to

posttest for treatment was less consistent (see Figure 3, panels c and d). In the ACT

condition, neural activation was lower or remained approximately the same at posttest for

the active tasks. Again, however, the waitlist group often showed increased activation (or

remained approximately the same).

Pre-Post Correlations

Correlation coefficients and corresponding *p*-values are presented in Table 3.

There were no significant correlations between any of the variables tested ($ps > .10$). That

is, changes in neural activation in regions of interest were not associated with changes in

self-report outcomes.

Discussion

We found decreased activation in the left and right DLPFC for active

experimental tasks (i.e., editing, mirror image tracing) in the ACT condition in contrast to increased activation in the waitlist condition. This pattern is consistent with mindfulness research examining neurological outcomes and supports the hypothesis that an acceptance- and mindfulness-based intervention can lead to more efficient cognitive processing and reduced responsivity to previously emotionally salient stimuli (e.g., fear of making mistakes; Lutz et al., 2014; Stevens et al., 2018). Given the DLPFC has been associated with self-criticism and emotion regulation strategies like cognitive reappraisal (i.e., changing the meaning of emotionally salient stimuli; Longe et al., 2010; Ochsner & Gross, 2005), the decreased activation observed in the ACT condition relative to the waitlist condition indirectly corroborates the hypothesized processes of change through which ACT effects meaningful change. Specifically, that ACT teaches clients to notice thoughts as thoughts instead of buying into or arguing with them and to put less effort into controlling feelings by simply allowing them to be present without fighting with them. If clients use these skills successfully, we would predict less activation in the DLPFC as was observed in this study.

The same general pattern of relatively less activation in the ACT condition was also observed in the MPFC. However, whereas activation decreased for editing in the ACT condition (compared to increased in the waitlist condition), both conditions showed increased activation for the mirror image tracing task with the ACT group showing a smaller increase (see Figure 3, panel c). The MPFC has been linked to evaluative self-referential processing, negative self-relevant stimuli, self-reflection, and rumination (Cooney et al., 2010; D'Argembeau et al., 2007; Lemogne et al., 2011; Modinos et al., 2009), which means it is likely implicated in self-criticism. Thus, less increased

activation in the ACT condition may indicate less cognitive resources spent on negative

self-focused processing relative to the waitlist group.

The discrepant patterns observed between the editing and mirror image tracing

tasks are consistent with extant research on the task-dependent nature of neurological

activation (Simmonds, Pekar, & Mostofsky, 2008) but it is unclear which factors

differentiated the effects of tasks used in the present study on the MPFC. Given the

MPFC is also associated with perspective taking (D'Argembeau et al., 2007), it is

possible use of a mirror image elicited MPFC activation related to perspective taking

(i.e., adopting the perspective of the mirror image of one's hand) and participants were

able to recruit this strategy more successfully during their second attempt at

posttreatment, leading to an overall increase in MPFC activation across groups. However,

this explanation is speculative, and more research is needed to clarify the specific task

parameters influencing MPFC activation.

For the IPL, there were no group differences for the editing task whereas

activation remained constant in the ACT condition for the mirror task in contrast to

increased in the waitlist condition. The lack of a predictable pattern is consistent with

previous research that found IPL activation is variable and highly context-dependent even

after receiving the same type of intervention (Dixon et al., 2016; Smallwood et al., 2016).

Still, given our presentation of aversive stimuli through error-prone tasks, we would have

expected decreased activation as had been demonstrated in a previous study by

Smallwood et al. (2016). Instead, we observed a smaller increase in activation in the ACT

condition and for only one of two experimental tasks. A key reason we examined the IPL

was to see if ACT would produce neural changes in perspective taking and empathy

(Decety & Jackson, 2006; Ruby & Decety, 2003), which could be linked to self-compassion. However, the experimental tasks might have not provided appropriate stimuli to prompt perspective taking as it relates to increased empathy. Rather, our results suggest the experimental tasks might have been more suited to the assessment of emotion regulation, self-referential processing, and rumination as manifested in the DLPFC and MPFC.

Despite the somewhat inconsistent patterns across tasks and regions of interest, our findings generally favor decreases or relatively smaller increases in activation in the DLPFC, MPFC, and IPL, which broadly suggest greater cognitive efficiency in response to error-prone tasks and reduced responsivity to emotionally salient stimuli. Admittedly, the lack of precision of our findings—possibly related to individual variability, naturally occurring noise in neurological data, or multiple task parameters (Simmonds et al., 2008)—tempers our confidence in these conclusions and warrant replication attempts. Nonetheless, they tentatively support the hypothesis that ACT targets specific acceptance and mindfulness processes of change, corroborating self-report data (Ong, Barney, et al., 2019) and the theoretical framework underlying ACT.

At the same time, although we found changes in neural activation following treatment, similar to other ACT studies (e.g., Dixon et al., 2016; Glassman et al., 2016), these neurological changes over time were not correlated with improvements in self-report outcomes (Ong, Lee, et al., 2019) contrasting previous findings that showed neural changes were associated with symptom reduction (Kircher et al., 2013; Rubin-Falcone et al., 2018). It is possible the neurological shifts in the current investigation imprecisely measured underlying processes of change given lack of access to subcortical structures

(e.g., anterior cingulate) with fNIRS methodology. Further, combined with the small available sample size, there might have been insufficient power to detect true correlations between neurological changes and self-reported improvement. At the same time, these discrepant results underscore the complex nature of the brain-behavior relationship and the need for greater precision in measurement and control in study design to elucidate the multifaceted ways in which brain activation relates to behavioral outcomes.

Limitations

The lack of an active comparison condition (e.g., CBT) makes it impossible to determine if neural changes were specific to ACT or general to psychotherapy even though neural differences between ACT and CBT have been observed in previous research (Glassman et al., 2016). In addition, randomization did not successfully control for neurological variability among individuals such that group means were not statistically equivalent at baseline. Although the use of mixed effects models with random intercepts statistically accounted for these differences, having equivalent groups at pretreatment would have provided a stronger test of experimental effects. In addition, we did not evaluate task performance though our interpretation of results assumes task performance was similar between groups as there was no reason to predict otherwise. Yet, it is possible the decreased neural activation in the ACT group was linked to poorer task performance rather than greater cognitive efficiency. Finally, the current study was underpowered to identify potential moderators of neurological performance, precluding these analyses. Hence, our findings could have obscured divergent patterns in our sample and significant effects on an idiographic level of analysis. Given the complexity and variability— within and across individuals—inherent in neurological functioning, future

research should strive to be adequately powered to conduct moderation analyses (e.g.,

more participants, greater experimental control).

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., . . . Hale, L. R. (2010). Assessment of obsessive-compulsive symptom dimensions: Development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment, 22*(1), 180-198. doi:10.1037/a0018260

Allen, M., Dietz, M., Blair, K. S., van Beek, M., Rees, G., Vestergaard-Poulsen, P., . . . Roepstorff, A. (2012). Cognitive-affective neural plasticity following active-controlled mindfulness intervention. *The Journal of Neuroscience, 32*(44), 15601-15610. doi:10.1523/JNEUROSCI.2957-12.2012

Barke, A., Bode, S., Dechent, P., Schmidt-Samoa, C., Van Heer, C., & Stahl, J. (2017). To err is (perfectly) human: Behavioural and neural correlates of error processing and perfectionism. *Social Cognitive and Affective Neuroscience, 12*(10), 1647-1657. doi:10.1093/scan/nsx082

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language, 68*(3). doi:10.1016/j.jml.2012.11.001

Berkman, E. T., & Falk, E. B. (2013). Beyond brain mapping: Using neural measures to predict real-world outcomes. *Current Directions in Psychological Science, 22*(1), 45-50. doi:10.1177/0963721412469394

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . . Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: A revised measure of psychological inflexibility and

experiential avoidance. *Behavior Therapy, 42*(4), 676-688.

doi:10.1016/j.beth.2011.03.007

Brigadoi, S., Ceccherini, L., Cutini, S., Scarpa, F., Scatturin, P., Selb, J., . . . Cooper, R. J.

(2014). Motion artifacts in functional near-infrared spectroscopy: A comparison

of motion correction techniques applied to real cognitive data. *Neuroimage, 85*,

181-191. doi:10.1016/j.neuroimage.2013.04.082

Burckhardt, C. S., & Anderson, K. L. (2003). The Quality of Life Scale (QOLS):

Reliability, validity, and utilization. *Health and Quality of Life Outcomes, 1*(60).

doi:10.1186/1477-7525-1-60

Cooney, R. E., Joormann, J., Eugene, F., Dennis, E. L., & Gotlib, I. H. (2010). Neural

correlates of rumination in depression. *Cognitive, Affective, & Behavioral

Neuroscience, 10*(4), 470-478. doi:10.3758/CABN.10.4.470

Cuzzocreo, J. L., Yassa, M. A., Verduzco, G., Honeycutt, N. A., Scott, D. J., & Bassett,

S. S. (2009). Effect of handedness on fMRI activation in the medial temporal lobe

during an auditory verbal memory task. *Human Brain Mapping, 30*(4), 1271-

1278. doi:10.1002/hbm.20596

D'Argembeau, A., Ruby, P., Collette, F., Degueldre, C., Balteau, E., Luxen, A., . . .

Salmon, E. (2007). Distinct regions of the medial prefrontal cortex are associated

with self-referential processing and perspective taking. *Journal of Cognitive

Neuroscience, 19*(6), 935-944. doi:10.1162/jocn.2007.19.6.935

Decety, J., & Jackson, P. L. (2006). A social-neuroscience perspective on empathy.

Current Directions in Psychological Science, 15(2), 54-58. doi:10.1111/j.0963-

7214.2006.00406.x

Dixon, M. R., Wilson, A. N., & Habib, R. (2016). Neurological evidence of acceptance

and commitment therapy effectiveness in college-age gamblers. *Journal of*

Contextual Behavioral Science, 5(2), 80-88. doi:10.1016/j.jcbs.2016.04.004

Egan, S. J., van Noort, E., Chee, A., Kane, R. T., Hoiles, K. J., Shafran, R., & Wade, T.

D. (2014). A randomised controlled trial of face to face versus pure online self-

help cognitive behavioural treatment for perfectionism. *Behaviour Research and*

Therapy, 63, 107-113. doi:10.1016/j.brat.2014.09.009

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic

process: A clinical review. *Clinical Psychology Review, 31*(2), 203-212.

doi:10.1016/j.cpr.2010.04.009

Ferrari, M., & Quaresima, V. (2012). A brief review on the history of human functional

near-infrared spectroscopy (fNIRS) development and fields of application.

Neuroimage, 63(2), 921-935. doi:10.1016/j.neuroimage.2012.03.049

Flanagan, J. C. (1978). A research approach to improving our quality of life. *American*

Psychologist, 33(2), 138-147. doi:10.1037/0003-066X.33.2.138

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of

perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468.

doi:10.1007/BF01172967

Glassman, L. H., Forman, E. M., Herbert, J. D., Bradley, L. E., Foster, E. E., Izzetoglu,

M., & Ruocco, A. C. (2016). The effects of a brief acceptance-based behavioral

treatment versus traditional cognitive-behavioral treatment for public speaking

anxiety. *Behavior Modification, 40*(5), 748-776. doi:10.1177/0145445516629939

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled

trial of group cognitive behavioural therapy for perfectionism. *Behaviour*

Research and Therapy, 68, 37-47. doi:10.1016/j.brat.2015.02.006

Hayes, S. C., Barnes-Holmes, D., & Wilson, K. G. (2012). Contextual Behavioral

Science: Creating a science more adequate to the challenge of the human

condition. *Journal of Contextual Behavioral Science, 1*(1-2), 1-16.

doi:10.1016/j.jcbs.2012.09.004

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), 1-25. doi:10.1016/j.brat.2005.06.006

Jensen, K. B., Kosek, E., Wicksell, R., Kemani, M., Olsson, G., Merle, J. V., . . . Ingvar,

M. (2012). Cognitive Behavioral Therapy increases pain-evoked activation of the

prefrontal cortex in patients with fibromyalgia. *Pain, 153*(7), 1495-1503.

doi:10.1016/j.pain.2012.04.010

Khan, B., Chester, W., Francis, R., Tian, F., Delgado, M. R., Liu, H., . . . Alexandrakis,

G. (2012). Improving optical contact for functional near-infrared brain

spectroscopy and imaging with brush optodes. *Biomedical Optics Express, 3*(5),

878-898. doi:10.1364/BOE.3.000878

Kircher, T., Arolt, V., Jansen, A., Pyka, M., Reinhardt, I., Kellermann, T., . . . Straube, B.

(2013). Effect of cognitive-behavioral therapy on neural correlates of fear

conditioning in panic disorder. *Biological Psychiatry, 73*(1), 93-101.

doi:10.1016/j.biopsych.2012.07.026

Klöppel, S., van Eimeren, T., Glauche, V., Vongerichten, A., Münchau, A., Frackowiak,

R. S. J., . . . Siebner, H. R. (2007). The effect of handedness on cortical motor

activation during simple bilateral movements. *Neuroimage, 34*(1), 274-280.

doi:10.1016/j.neuroimage.2006.08.038

Lambert, M. J., Burlingame, G. M., Umphress, V., Hansen, N. B., Vermeersch, D. A.,

Clouse, G. C., & Yanchar, S. C. (1996). The reliability and validity of the

Outcome Questionnaire. *Clinical Psychology & Psychotherapy, 3*(4), 249-258.

doi:10.1002/(SICI)1099-0879(199612)3:4<249::AID-CPP106>3.0.CO;2-S

Lemogne, C., Gorwood, P., Bergouignan, L., Pelissolo, A., Lehericy, S., & Fossati, P.

(2011). Negative affectivity, self-referential processing and the cortical midline

structures. *Social Cognitive and Affective Neuroscience, 6*(4), 426-433.

doi:10.1093/scan/nsq049

Longe, O., Maratos, F. A., Gilbert, P., Evans, G., Volker, F., Rockliff, H., & Rippon, G.

(2010). Having a word with yourself: Neural correlates of self-criticism and self-

reassurance. *Neuroimage, 49*(2), 1849-1856.

doi:10.1016/j.neuroimage.2009.09.019

Lutz, J., Herwig, U., Opialla, S., Hittmeyer, A., Jancke, L., Rufer, M., . . . Bruhl, A. B.

(2014). Mindfulness and emotion regulation--an fMRI study. *Social Cognitive

and Affective Neuroscience, 9*(6), 776-785. doi:10.1093/scan/nst043

McIntosh, M. A., Shahani, U., Boulton, R. G., & McCulloch, D. L. (2010). Absolute

quantification of oxygenated hemoglobin within the visual cortex with functional

near infrared spectroscopy (fNIRS). *Investigative Ophthalmology & Visual

Science, 51*(9), 4856-4860. doi:10.1167/iovs.09-4940

Modinos, G., Ormel, J., & Aleman, A. (2009). Activation of anterior insula during self-

reflection. *PLoS One, 4*(2), e4618. doi:10.1371/journal.pone.0004618

Murphy, F. C., Nimmo-Smith, I., & Lawrence, A. D. (2003). Functional neuroanatomy of

emotions: A meta-analysis. *Cognitive, Affective, & Behavioral Neuroscience, 3*(3), 207-233. doi:10.3758/CABN.3.3.207

Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*(3), 223-250. doi:10.1080/15298860390209035

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9*(5), 242-249. doi:10.1016/j.tics.2005.03.010

Ong, C. W., Barney, J. L., Barrett, T. S., Lee, E. B., Levin, M. E., & Twohig, M. P. (2019). The role of psychological inflexibility and self-compassion in acceptance and commitment therapy for clinical perfectionism. *Journal of Contextual Behavioral Science, 13*, 7-16. doi:10.1016/j.jcbs.2019.06.005

Ong, C. W., Lee, E. B., Krafft, J., Terry, C. L., Barrett, T. S., Levin, M. E., & Twohig, M. P. (2019). A randomized controlled trial of acceptance and commitment therapy for clinical perfectionism. *Journal of Obsessive-Compulsive and Related Disorders, 22*. doi:10.1016/j.jocrd.2019.100444

Pergamin-Hight, L., Naim, R., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Bar-Haim, Y. (2015). Content specificity of attention bias to threat in anxiety disorders: A meta-analysis. *Clinical Psychology Review, 35*, 10-18. doi:10.1016/j.cpr.2014.10.005

Quaresima, V., & Ferrari, M. (2016). Functional near-infrared spectroscopy (fNIRS) for assessing cerebral cortex function during human behavior in natural/social situations: A concise review. *Organizational Research Methods, 22*(1), 46-68. doi:10.1177/1094428116658959

Quirk, G. J., & Beer, J. S. (2006). Prefrontal involvement in the regulation of emotion: Convergence of rat and human studies. *Current Opinion in Neurobiology, 16*(6), 723-727. doi:10.1016/j.conb.2006.07.004

Riley, C., Lee, M., Cooper, Z., Fairburn, C. G., & Shafran, R. (2007). A randomised controlled trial of cognitive-behaviour therapy for clinical perfectionism: A preliminary study. *Behaviour Research and Therapy, 45*(9), 2221-2231. doi:10.1016/j.brat.2006.12.003

Ritchey, M., Dolcos, F., Eddington, K. M., Strauman, T. J., & Cabeza, R. (2011). Neural correlates of emotional processing in depression: Changes with cognitive behavioral therapy and predictors of treatment response. *Journal of Psychiatric Research, 45*(5), 577-587. doi:10.1016/j.jpsychires.2010.09.007

Rorden, C., & Brett, M. (2000). Stereotaxic display of brain lesions. *Behavioural Neurology, 12*(4), 191-200. doi:10.1155/2000/421719

Rubin-Falcone, H., Weber, J., Kishon, R., Ochsner, K., Delaparte, L., Dore, B., . . . Miller, J. M. (2018). Longitudinal effects of cognitive behavioral therapy for depression on the neural correlates of emotion regulation. *Psychiatry Research: Neuroimaging, 271*, 82-90. doi:10.1016/j.pscychresns.2017.11.002

Ruby, P., & Decety, J. (2003). What you believe versus what you think they believe: A neuroimaging study of conceptual perspective-taking. *European Journal of Neuroscience, 17*(11), 2475-2480. doi:10.1046/j.1460-9568.2003.02673.x

Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-Prime User's Guide*. Pittsburgh, PA: Psychology Software Tools Inc.

Shafran, R., & Mansell, W. (2001). Perfectionism and psychopathology: A review of

research and treatment. *Clinical Psychology Review, 21*(6), 879-906. doi:10.1016/S0272-7358(00)00072-6

Shafran, R., Wade, T. D., Egan, S. J., Kothari, R., Allcott-Watson, H., Carlbring, P., . . . Andersson, G. (2017). Is the devil in the detail? A randomised controlled trial of guided internet-based CBT for perfectionism. *Behaviour Research and Therapy, 95*, 99-106. doi:10.1016/j.brat.2017.05.014

Simmonds, D. J., Pekar, J. J., & Mostofsky, S. H. (2008). Meta-analysis of Go/No-go tasks demonstrating that fMRI activation associated with response inhibition is task-dependent. *Neuropsychologia, 46*(1), 224-232. doi:10.1016/j.neuropsychologia.2007.07.015

Smallwood, R. F., Potter, J. S., & Robin, D. A. (2016). Neurophysiological mechanisms in acceptance and commitment therapy in opioid-addicted patients with chronic pain. *Psychiatry Research: Neuroimaging, 250*, 12-14. doi:10.1016/j.pscychresns.2016.03.001

Smout, M., Davies, M., Burns, N., & Christie, A. (2014). Development of the Valuing Questionnaire (VQ). *Journal of Contextual Behavioral Science, 3*, 164-172. doi:10.1016/j.jcbs.2014.06.001

Stevens, L., Gauthier-Braham, M., & Bush, B. (2018). The brain that longs to care for itself: The current neuroscience of self-compassion *The Neuroscience of Empathy, Compassion, and Self-Compassion* (pp. 91-120).

Wan, N., Hancock, A. S., Moon, T. K., & Gillam, R. B. (2018). A functional near-infrared spectroscopic investigation of speech production during reading. *Human Brain Mapping, 39*(3), 1428-1437. doi:10.1002/hbm.23932

Winter, D., Niedtfeld, I., Schmitt, R., Bohus, M., Schmahl, C., & Herpertz, S. C. (2017). Neural correlates of distraction in borderline personality disorder before and after dialectical behavior therapy. *European Archives of Psychiatry and Clinical Neuroscience, 267*(1), 51-62. doi:10.1007/s00406-016-0689-2

Wu, D., Wang, K., Wei, D., Chen, Q., Du, X., Yang, J., & Qiu, J. (2017). Perfectionism mediated the relationship between brain structure variation and negative emotion in a nonclinical sample. *Cognitive, Affective, & Behavioral Neuroscience, 17*(1), 211-223. doi:10.3758/s13415-016-0474-8

Ye, J. C., Tak, S., Jang, K. E., Jung, J., & Jang, J. (2009). NIRS-SPM: Statistical parametric mapping for near-infrared spectroscopy. *Neuroimage, 44*(2), 428-447. doi:10.1016/j.neuroimage.2008.08.036

Table 1
Sample Descriptives

	Waitlist (n = 15)	ACT (n = 14)	
	Mean (SD)/Frequency (%)		p^a
Age	23.1 (4.4)	30.4 (17.9)	.156
Gender			.299
Female	8 (53.3%)	11 (78.6%)	
Male	7 (46.7%)	3 (21.4%)	
Marital status			.480
Single	10 (66.7%)	10 (71.4%)	
Married	5 (33.3%)	3 (21.4%)	
Divorced	0 (0%)	1 (7.1%)	
Ethnicity			.642
European American	12 (80%)	13 (92.9%)	
Latinx/Hispanic	3 (20%)	1 (7.1%)	
Education			.440
M.A./M.S. or equivalent	0 (0%)	2 (14.3%)	
Some graduate school	0 (0%)	1 (7.1%)	
B.A/B.S. or equivalent	1 (6.7%)	1 (7.1%)	
Associate degree	3 (20%)	4 (28.6%)	
Some college	8 (53.3%)	5 (35.7%)	
High school diploma or equivalent	3 (20%)	1 (7.1%)	
Religion			.512
Catholic	1 (6.7%)	0 (0%)	
LDS	12 (80%)	12 (85.7%)	
Other	0 (0%)	1 (7.1%)	
None	2 (13.3%)	1 (7.1%)	
Annual household income			.543
$50,000 or higher	4 (26.7%)	4 (28.6%)	
$40,001 to 50,000	0 (0%)	1 (7.1%)	
$30,001 to 40,000	1 (6.7%)	3 (21.4%)	
$20,001 to 30,000	2 (13.3%)	0 (0%)	
$15,001 to 20,000	3 (20%)	3 (21.4%)	
$10,001 to 15,000	1 (6.7%)	0 (0%)	
$5,001 to 10,000	1 (6.7%)	0 (0%)	
$5,000 or less	3 (20%)	3 (21.4%)	

[a] Based on t-test or χ^2-test depending on nature of dependent variable (continuous or categorical).

Table 2

Results of the Final Mixed Effects Models for Each Region of Interest

	Estimate	SE	*p*
Left DLPFC			
Condition (Waitlist)			
Treatment	-78.9	175.9	.654
Task (Rest)			
Edit	616.0	155.2	<.001
Mirror	1266.1	155.2	<.001
Circle	981.5	155.2	<.001
Posttest	254.2	178.5	.157
Two-Way Interactions			
Condition × Task (Edit)	120.1	183.3	.513
Condition × Task (Mirror)	7.2	183.3	.969
Condition × Task (Circle)	683.3	183.3	<.001
Condition × Posttest	-389.5	193.8	.048
Task (Edit) × Posttest	-114.2	183.3	.533
Task (Mirror) × Posttest	57.8	183.3	.753
Task (Circle) × Posttest	-528.3	183.3	.004
Right DLPFC			
Condition (Waitlist)			
Treatment	-339.0	230.9	.143
Task (Rest)			
Edit	289.4	205.4	.159
Mirror	681.9	205.4	<.001
Circle	1063.7	205.4	<.001
Posttest	144.8	236.2	.540
Two-Way Interactions			
Condition × Task (Edit)	544.2	297.6	.068
Condition × Task (Mirror)	717.8	297.6	.016
Condition × Task (Circle)	241.9	297.6	.416
Condition × Posttest	429.7	341.1	.209
Task (Edit) × Posttest	138.3	303.1	.648
Task (Mirror) × Posttest	422.4	303.1	.164
Task (Circle) × Posttest	-936.1	303.1	.002
Three-Way Interactions			
Condition × Task (Edit) × Posttest	-983.7	443.0	.027
Condition × Task (Mirror) × Posttest	-1283.4	443.0	.004
Condition × Task (Circle) × Posttest	-56.3	443.0	.899
MPFC			
Condition (Waitlist)			
Treatment	-110.7	152.5	.469
Task (Rest)			
Edit	436.8	128.6	<.001
Mirror	626.5	128.6	<.001

Circle	644.0	128.6	<.001
Posttest	175.1	151.1	.250
Two-Way Interactions			
Condition × Task (Edit)	110.8	152.2	.467
Condition × Task (Mirror)	333.0	152.2	.029
Condition × Task (Circle)	254.1	152.2	.095
Condition × Posttest	-186.0	166.1	.270
Task (Edit) × Posttest	-151.5	151.9	.319
Task (Mirror) × Posttest	346.0	151.9	.023
Task (Circle) × Posttest	-11.7	151.9	.939
IPL			
Condition (Waitlist)			
Treatment	-125.5	191.2	.512
Task (Rest)			
Edit	897.5	167.2	<.001
Mirror	739.6	167.2	<.001
Circle	805.3	167.2	<.001
Posttest	193.8	182.1	.290
Two-Way Interactions			
Condition × Task (Edit)	-261.4	192.2	.174
Condition × Task (Mirror)	105.8	192.2	.582
Condition × Task (Circle)	71.2	192.2	.711
Condition × Posttest	-295.8	194.3	.137
Task (Edit) × Posttest	108.8	192.4	.572
Task (Mirror) × Posttest	253.0	192.4	.189
Task (Circle) × Posttest	-499.0	192.4	.010

Note. Model intercept not reported.

Table 3

Bivariate Correlations Between Changes in Neural Activation and Changes in Self-Report Outcomes

	FMPS-CM	OQ-45	QOLS	VQ-Progress	SCS	AAQ-II
Editing						
LDLPFC	0.15 (.50)	-0.07 (.73)	0.17 (.43)	-0.14 (.53)	-0.08 (.70)	0.06 (.77)
RDLPFC	-0.09 (.68)	0.01 (.96)	-0.09 (.68)	-0.02 (.92)	0.11 (.62)	0 (.99)
MPFC	0.23 (.28)	0.05 (.82)	-0.09 (.69)	-0.27 (.19)	-0.31 (.14)	0.09 (.68)
IPL	0 (.99)	-0.02 (.94)	-0.1 (.63)	-0.17 (.44)	0.07 (.75)	0.02 (.92)
Mirror Image Tracing						
LDLPFC	0.08 (.70)	-0.13 (.53)	0.26 (.22)	0.08 (.72)	0.16 (.44)	-0.01 (.97)
RDLPFC	0.05 (.83)	-0.14 (.51)	-0.25 (.23)	0.03 (.90)	0.12 (.59)	-0.13 (.53)
MPFC	-0.26 (.22)	-0.07 (.75)	0.06 (.78)	0.09 (.68)	0.21 (.32)	-0.15 (.47)
IPL	0.29 (.16)	0.11 (.60)	0 (.99)	-0.24 (.25)	0.05 (.81)	0.2 (.36)

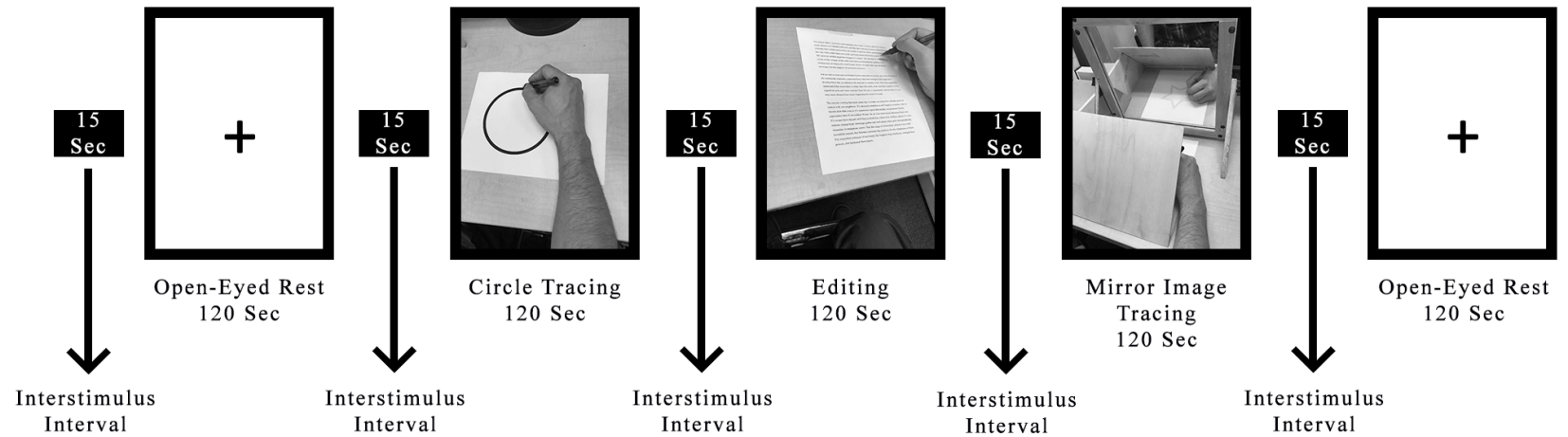*Note*. Associated *p*-values are provided in parentheses.

Figure 1. Flow diagram of fNIRS experimental procedures. Task order was randomized to minimize potential order effects. Participants completed the illustrated set of procedures twice (i.e., each task was performed twice) at each assessment point (pretreatment, posttreatment).
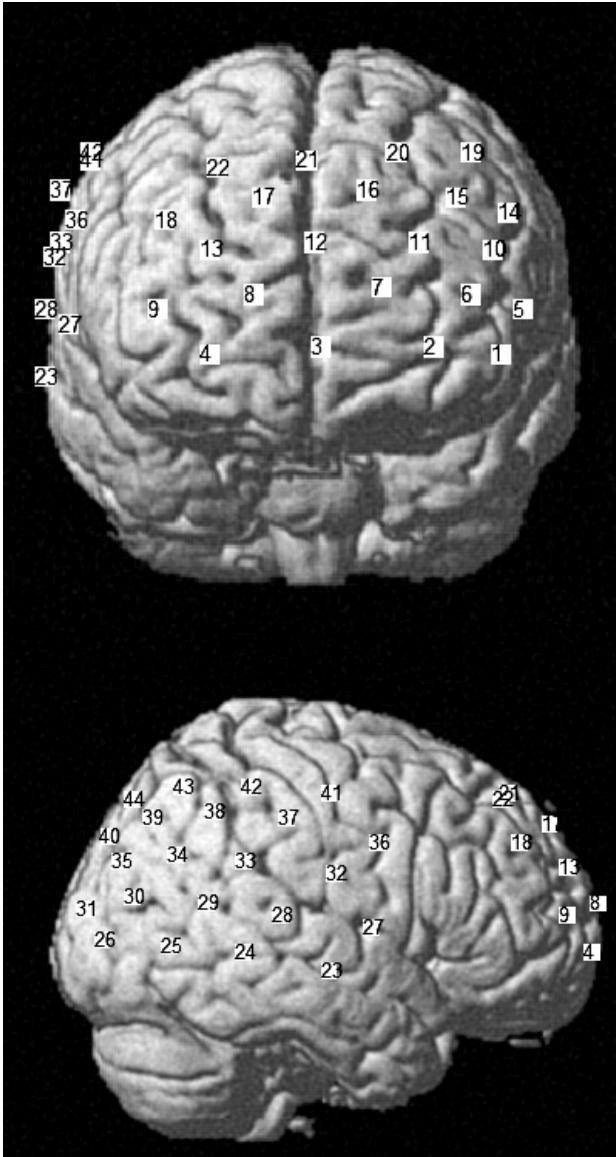
Figure 2. Placement of optodes and corresponding channel locations on front (top image) and right side (bottom image) of the head.
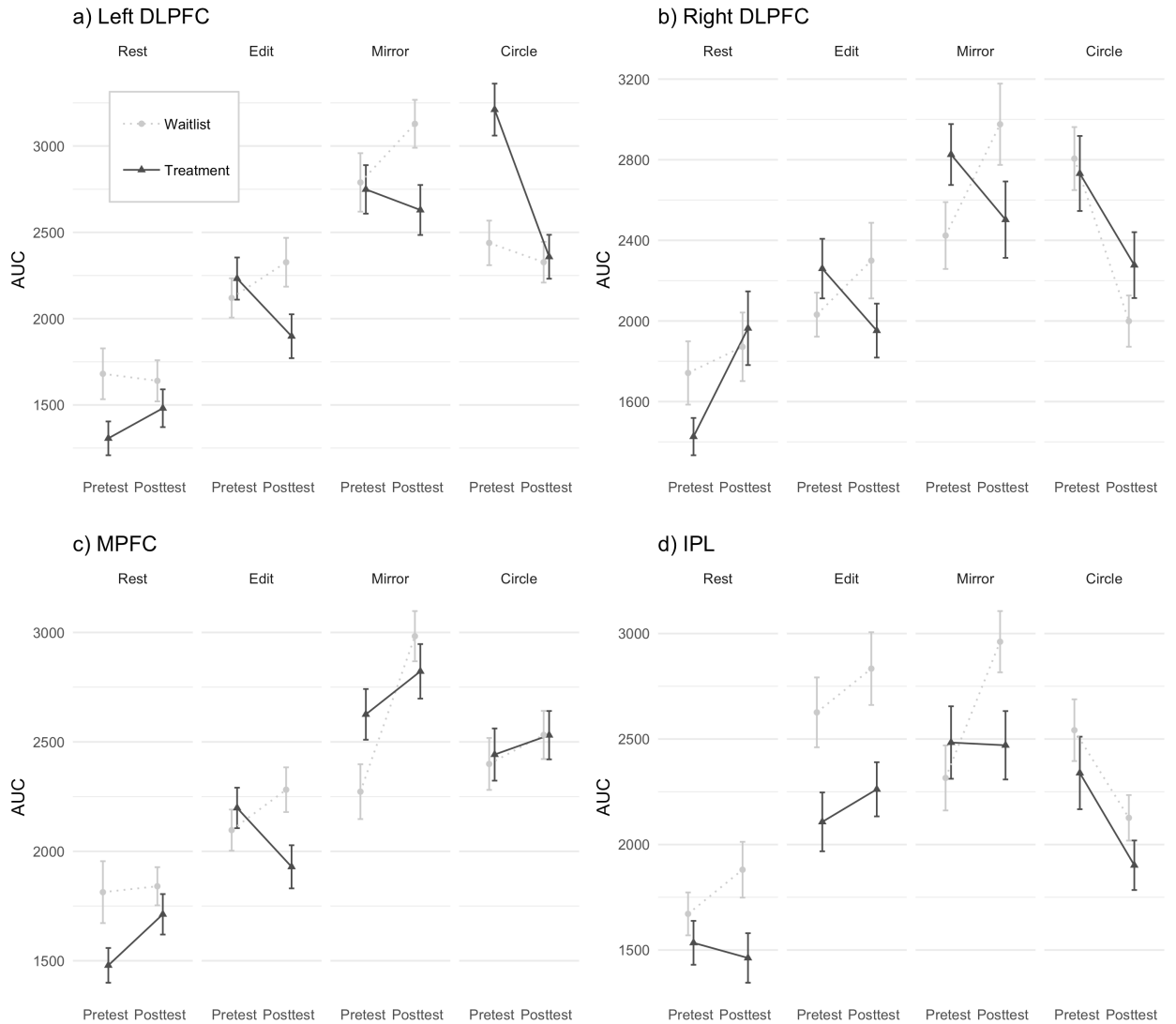
Figure 3. Group means and standard errors of the AUC of total hemoglobin for each of the interactions with condition. Each panel represents the significant interactions for each region of interest with panels a to d representing the left DLPFC, right DLPFC, MPFC, and IPL respectively. The interactions with condition are shown at each time point by task for each region of interest.

REFERENCES

A-Tjak, J. G. L., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A., & Emmelkamp,

P. M. (2015). A meta-analysis of the efficacy of acceptance and commitment

therapy for clinically relevant mental and physical health problems.

Psychotherapy and Psychosomatics, 84(1), 30-36. doi:10.1159/000365764

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C.,

Losardo, D., . . . Hale, L. R. (2010). Assessment of obsessive-compulsive

symptom dimensions: development and evaluation of the Dimensional Obsessive-

Compulsive Scale. *Psychological Assessment, 22*(1), 180-198.

doi:10.1037/a0018260

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. doi:10.1037/a0028310

Arch, J. J., Wolitzky-Taylor, K. B., Eifert, G. H., & Craske, M. G. (2012). Longitudinal

treatment mediation of traditional cognitive behavioral therapy and acceptance

and commitment therapy for anxiety disorders. *Behaviour Research Therapy,

50*(7-8), 469-478. doi:10.1016/j.brat.2012.04.007

Barnard, L. K., & Curry, J. F. (2011). Self-compassion: Conceptualizations, correlates, &

interventions. *Review of General Psychology, 15*(4), 289-303.

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects

Models Using lme4. *Journal of Statistical Software, 67*(1), 1–48.

doi:10.18637/jss.v067.i01

Bieling, P. J., Israeli, A. L., & Antony, M. M. (2004). Is perfectionism good, bad, or

    both? Examining models of the perfectionism construct. *Personality and*

    Individual Differences, 36(6), 1373-1385. doi:10.1016/s0191-8869(03)00235-6

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . .

    Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and

    Action Questionnaire-II: A revised measure of psychological inflexibility and

    experiential avoidance. *Behavior Therapy, 42*(4), 676-688.

    doi:10.1016/j.beth.2011.03.007

Burckhardt, C. S., & Anderson, K. L. (2003). The Quality of Life Scale (QOLS):

    Reliability, Validity, and Utilization. *Health and Quality of Life Outcomes, 1*(60).

    doi:10.1186/1477-7525-1-60

Chik, H. M., Whittal, M. L., & O'Neill, M. L. (2008). Perfectionism and treatment

    outcome in obsessive-compulsive disorder. *Cognitive Therapy and Research,*

    32(5), 676-688. doi:10.1007/s10608-007-9133-2

Craske, M. G., Niles, A. N., Burklund, L. J., Wolitzky-Taylor, K. B., Vilardaga, J. C.,

    Arch, J. J., . . . Lieberman, M. D. (2014). Randomized controlled trial of cognitive

    behavioral therapy and acceptance and commitment therapy for social phobia:

    Outcomes and moderators. *Journal of Consulting and Clinical Psychology, 82*(6),

    1034-1048. doi:10.1037/a0037212

Crosby, J. M., & Twohig, M. P. (2016). Acceptance and Commitment Therapy for

    Problematic Internet Pornography Use: A Randomized Trial. *Behavior Therapy,*

    47, 355-366. doi:10.1016/j.beth.2016.02.001

Egan, S. J., van Noort, E., Chee, A., Kane, R. T., Hoiles, K. J., Shafran, R., & Wade, T.

D. (2014). A randomised controlled trial of face to face versus pure online self-help cognitive behavioural treatment for perfectionism. *Behaviour Research and Therapy, 63*, 107-113. doi:10.1016/j.brat.2014.09.009

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic process: A clinical review. *Clinical Psychology Review, 31*(2), 203-212. doi:10.1016/j.cpr.2010.04.009

First, M. B., Williams, J. B. W., Karg, R. S., & Spitzer., R. L. (2016). *Structured Clinical Interview for DSM-5 Disorders, Clinician Version (SCID-5-CV)*. Arlington, VA: American Psychiatric Association.

Flanagan, J. C. (1978). A research approach to improving our quality of life. *American Psychologist, 33*(2), 138-147. doi:10.1037/0003-066X.33.2.138

Fledderus, M., Bohlmeijer, E. T., Pieterse, M. E., & Schreurs, K. M. (2012). Acceptance and commitment therapy as guided self-help for psychological distress and positive mental health: A randomized controlled trial. *Psychological Medicine, 42*(3), 485-495. doi:10.1017/s0033291711001206

Flett, G. L., & Hewitt, P. L. (2002). Perfectionism and maladjustment: An overview of theoretical, definitional, and treatment issues. In G. L. Flett & P. L. Hewitt (Eds.), *Perfectionism: Theory, research, and treatment* (pp. 5-31). Washington, DC: American Psychological Association.

Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A Randomized Controlled Effectiveness Trial of Acceptance and Commitment Therapy and Cognitive Therapy for Anxiety and Depression. *Behavior Modification, 31*(6), 772-799. doi:10.1177/0145445507302202

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of

    perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468.

    doi:10.1007/BF01172967

Frost, R. O., & Steketee, G. (1997). Perfectionism in obsessive-compulsive disorder

    patients. *Behaviour Research and Therapy, 35*(4), 291-296. doi:10.1016/S0005-

    7967(96)00108-8

Gandrud, C. (Producer). (2016). DataCombine: Tools for easily combining and cleaning

    data sets. *R package version 0.2.21*. Retrieved from https://CRAN.R-

    project.org/package=DataCombine

Gold, S. M., Enck, P., Hasselmann, H., Friede, T., Hegerl, U., Mohr, D. C., & Otte, C.

    (2017). Control conditions for randomised trials of behavioural interventions in

    psychiatry: a decision framework. *The Lancet Psychiatry, 4*(9), 725-732.

    doi:10.1016/s2215-0366(17)30153-0

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled

    trial of group cognitive behavioural therapy for perfectionism. *Behaviour*

    Research and Therapy, 68, 37-47. doi:10.1016/j.brat.2015.02.006

Hayes, S. C., Barnes-Holmes, D., & Wilson, K. G. (2012). Contextual Behavioral

    Science: Creating a science more adequate to the challenge of the human

    condition. *Journal of Contextual Behavioral Science, 1*(1-2), 1-16.

    doi:10.1016/j.jcbs.2012.09.004

Hayes, S. C., & Hofmann, S. G. (2017). The third wave of cognitive behavioral therapy

    and the rise of process-based care. *World Psychiatry, 16*(3), 245-246.

    doi:10.1002/wps.20442

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), 1-25. doi:10.1016/j.brat.2005.06.006

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. doi:10.1007/BF03395492

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and Commitment Therapy, Second Edition: The Process and Practice of Mindful Change*. New York, NY: Guilford Press.

Hofmann, S. G., & Hayes, S. C. (2018). The future of intervention science: Process-based therapy. *Clinical Psychological Science*, 1-14. doi:10.1177/2167702618772296

Houghton, D. C., Compton, S. N., Twohig, M. P., Saunders, S. M., Franklin, M. E., Neal-Barnett, A. M., . . . Woods, D. W. (2014). Measuring the role of psychological inflexibility in Trichotillomania. *Psychiatry Research, 220*(1-2), 356-361. doi:10.1016/j.psychres.2014.08.003

Jacobs, R. H., Silva, S. G., Reinecke, M. A., Curry, J. F., Ginsburg, G. S., Kratochvil, C. J., & March, J. S. (2009). Dysfunctional attitudes scale perfectionism: A predictor and partial mediator of acute treatment outcome among clinically depressed adolescents. *Journal of Clinical Child & Adolescent Psychology, 38*(6), 803-813. doi:10.1080/15374410903259031

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Counsulting*

and Clinical Psychology, 59(1), 12-19. doi:10.1037/0022-006X.59.1.12

James, K., Verplanken, B., & RImes, K. A. (2015). Self-criticism as a mediator in the

relationship between unhealthy perfectionism and distress. *Personality and*

Individual Differences, 79, 123-128. doi:10.1016/j.paid.2015.01.030

Juarascio, A. S., Forman, E. M., & Herbert, J. D. (2010). Acceptance and commitment

therapy versus cognitive therapy for the treatment of comorbid eating pathology.

Behavior Modification, 34(2), 175-190. doi:10.1177/0145445510363472

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental

aspect of health. *Clinical Psychology Review, 30*(7), 865-878.

doi:10.1016/j.cpr.2010.03.001

Kelley, M. L., Heffer, R. W., Gresham, F. M., & Elliot, S. N. (1989). Development of a

modified Treatment Evaluation Inventory. *Journal of Psychopathology and*

Behavioral Assessment, 11(3), 235-247. doi:10.1007/BF00960495

Lambert, M. J., Burlingame, G. M., Umphress, V., Hansen, N. B., Vermeersch, D. A.,

Clouse, G. C., & Yanchar, S. C. (1996). The Reliability and Validity of the

Outcome Questionnaire. *Clinical Psychology & Psychotherapy, 3*(4), 249-258.

doi:10.1002/(SICI)1099-0879(199612)3:4<249::AID-CPP106>3.0.CO;2-S

Langeland, E., Wahl, A. K., Kristoffersen, K., Nortvedt, M. W., & Hanestad, B. R.

(2007). Quality of life among Norwegians with chronic mental health problems

living in the community versus the general population. *Community Mental Health*

Journal 43(4), 321-339. doi:10.1007/s10597-006-9076-1

Lee, E. B., Homan, K. J., Morrison, K. L., Ong, C. W., Levin, M. E., & Twohig, M. P.

(2018). Acceptance and commitment therapy for trichotillomania: A randomized

controlled trial of adults and adolescents. *Behavior Modification*.

doi:10.1177/0145445518794366

Leifeld, P. (2013). texreg: Conversion of statistical model output in R to LaTeX and

HTML tables. *Journal of Statistical Software, 55*(8), 1-24.

doi:10.18637/jss.v055.i08

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. doi:10.1016/j.beth.2012.05.003

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2017). The relationship

between perfectionism and psychopathology: A meta-analysis. *Journal of Clinical

Psychology, 73*(10), 1301-1326. doi:10.1002/jclp.22435

Lloyd, S., Schmidt, U., Khondoker, M., & Tchanturia, K. (2015). Can Psychological

Interventions Reduce Perfectionism? A Systematic Review and Meta-analysis.

Behavioural and Cognitive Psychotherapy 43(6), 705-731.

doi:10.1017/S1352465814000162

Moroz, M., & Dunkley, D. M. (2015). Self-critical perfectionism and depressive

symptoms: Low self-esteem and experiential avoidance as mediators. *Personality

and Individual Differences, 87*, 174-179. doi:10.1016/j.paid.2015.07.044

Moroz, M., & Dunkley, D. M. (2019). Self-critical perfectionism, experiential avoidance,

and depressive and anxious symptoms over two years: A three-wave longitudinal

study. *Behav Res Ther, 112*, 18-27. doi:10.1016/j.brat.2018.11.006

Neff, K. D. (2003). The development and validation of a scale to measure self-

compassion. *Self and Identity, 2*(3), 223-250. doi:10.1080/15298860390209035

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive

psychological functioning. *Journal of Research in Personality, 41*(1), 139-154.

doi:10.1016/j.jrp.2006.03.004

Neff, K. D., & Tirch, D. (2013). Self-compassion and ACT. In T. B. Kashdan & J.

Ciarrochi (Eds.), *Mindfulness, acceptance, and positive psychology: The seven*

foundations of well-being (pp. 78-106). Oakland, CA: New Harbinger.

Ong, C. W., Lee, E. B., & Twohig, M. P. (2018). A meta-analysis of dropout rates in

acceptance and commitment therapy. *Behaviour Research and Therapy, 104*, 14-

33. doi:10.1016/j.brat.2018.02.004

Plumb, J. C., & Vilardaga, R. (2010). Assessing Treatment Integrity in Acceptance and

Commitment Therapy: Strategies and Suggestions. *International Journal of*

Behavioral Consultation and Therapy, 6(3), 263-295. doi:10.1037/h0100912

Powers, M. B., Zum Vorde Sive Vording, M. B., & Emmelkamp, P. M. G. (2009).

Acceptance and commitment therapy: A meta-analytic review. *Psychotherapy*

and Psychosomatics, 78(2), 73-80. doi:10.1159/000190790

R Core Team. (2015). *R: A language and environment for statistical computing*. Vienna,

Austria: R Foundation for Statistical Computing.

Riley, C., Lee, M., Cooper, Z., Fairburn, C. G., & Shafran, R. (2007). A randomised

controlled trial of cognitive-behaviour therapy for clinical perfectionism: a

preliminary study. *Behaviour Research and Therapy, 45*(9), 2221-2231.

doi:10.1016/j.brat.2006.12.003

Rozental, A., Shafran, R., Wade, T., Egan, S., Nordgren, L. B., Carlbring, P., . . .

Andersson, G. (2017). A randomized controlled trial of Internet-Based Cognitive

Behavior Therapy for perfectionism including an investigation of outcome

predictors. *Behaviour Research and Therapy, 95*, 79-86.

doi:10.1016/j.brat.2017.05.015

RStudio Team. (2015). RStudio: Integrated development for R. from RStudio, Inc.

http://www.rstudio.com/

Shafran, R., Cooper, Z., & Fairburn, C. G. (2002). Clinical perfectionism: A cognitive–

behavioural analysis. *Behaviour Research and Therapy, 40*(7), 773-791.

doi:10.1016/S0005-7967(01)00059-6

Shafran, R., & Mansell, W. (2001). Perfectionism and psychopathology: A review of

research and treatment. *Clinical Psychology Review, 21*(6), 879-906.

doi:10.1016/S0272-7358(00)00072-6

Shafran, R., Wade, T. D., Egan, S. J., Kothari, R., Allcott-Watson, H., Carlbring, P., . . .

Andersson, G. (2017). Is the devil in the detail? A randomised controlled trial of

guided internet-based CBT for perfectionism. *Behaviour Research and Therapy,

95*, 99-106. doi:10.1016/j.brat.2017.05.014

Smout, M., Davies, M., Burns, N., & Christie, A. (2014). Development of the Valuing

Questionnaire (VQ). *Journal of Contextual Behavioral Science, 3*, 164-172.

doi:10.1016/j.jcbs.2014.06.001

Steele, A. L., Waite, S., Egan, S. J., Finnigan, J., Handley, A., & Wade, T. D. (2013).

Psycho-education and group cognitive-behavioural therapy for clinical

perfectionism: A case-series evaluation. *Behavioural and Cognitive

Psychotherapy, 41*(2), 129-143. doi:10.1017/S1352465812000628

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches,

> evidence, challenges. *Personality and Social Psychology Review, 10*(4), 295-319.

> doi:10.1207/s15327957pspr1004_2

Twohig, M. P., Abramowitz, J. S., Smith, B. M., Fabricant, L. E., Jacoby, R. J., Morrison,

> K. L., . . . Lederman, T. (2018). Adding acceptance and commitment therapy to

> exposure and response prevention for obsessive-compulsive disorder: A

> randomized controlled trial. *Behaviour Research and Therapy*.

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 versus progressive relaxation training for obsessive-

> compulsive disorder. *Journal of Consulting and Clinical Psychology, 78*(5), 705-

> 716. doi:10.1037/a0020508

Twohig, M. P., Plumb Vilardaga, J. C., Levin, M. E., & Hayes, S. C. (2015). Changes in

> psychological flexibility during acceptance and commitment therapy for obsessive

> compulsive disorder. *Journal of Contextual Behavioral Science, 4*(3), 196-202.

> doi:10.1016/j.jcbs.2015.07.001

Tyndall, I., Waldeck, D., Pancani, L., Whelan, R., Roche, B., & Dawson, D. L. (2018).

> The Acceptance and Action Questionnaire-II (AAQ-II) as a measure of

> experiential avoidance: Concerns over discriminant validity. *Journal of

> Contextual Behavioral Science*. doi:10.1016/j.jcbs.2018.09.005

Weiner, B. A., & Carton, J. S. (2012). Avoidant coping: A mediator of maladaptive

> perfectionism and test anxiety. *Personality and Individual Differences, 52*(5),

> 632-636. doi:10.1016/j.paid.2011.12.009

Welch, E., Miller, J. L., Ghaderi, A., & Vaillancourt, T. (2009). Does perfectionism

    mediate or moderate the relation between body dissatisfaction and disordered

    eating attitudes and behaviors? . *Eating Behaviors, 10*(3), 168-175.

    doi:10.1016/j.eatbeh.2009.05.002

Wickham, H. (2017a). tidyverse: Easily install and load 'Tidyverse' packages. R package

    version 1.1.1.

Wickham, H. (2017b). tidyverse: Easily install and load 'Tidyverse' packages. R package

    version 1.1.1.   Retrieved from http://CRAN.R-project.org/package=tidyverse

Wolgast, M. (2014). What Does the Acceptance and Action Questionnaire (AAQ-II)

    Really Measure? *Behavior Therapy, 45*, 831-839. doi:10.1016/j.beth.2014.07.002

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.

    doi:10.1037/a0029418

Yadavaia, J. E., Hayes, S. C., & Vilardaga, R. (2014). Using acceptance and commitment

    therapy to increase self-compassion: A randomized controlled trial. *Journal of

    Contextual Behavioral Science, 3*, 248-257. doi:10.1016/j.jcbs.2014.09.002

APPENDICES

Appendix A

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Author:	Clarissa W. Ong,Eric B. Lee,Jennifer Krafft,Carina L. Terry,Tyson S. Barrett,Michael E. Levin,Michael P. Twohig
Publication:	Journal of Obsessive-Compulsive and Related Disorders
Publisher:	Elsevier
Date:	July 2019

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Appendix B

Permission to Reprint Study 2

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Title:	The role of psychological inflexibility and self-compassion in acceptance and commitment therapy for clinical perfectionism
Author:	Clarissa W. Ong,Jennifer L. Barney,Tyson S. Barrett,Eric B. Lee,Michael E. Levin,Michael P. Twohig
Publication:	Journal of Contextual Behavioral Science
Publisher:	Elsevier
Date:	July 2019

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Appendix C

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Allison S. Hancock
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810

Dear Ms. Hancock,

I am requesting your permission to include your work on a manuscript in my dissertation for the Department of Psychology at Utah State University. Your authorship is clearly stated in my dissertation, consistent with the order in our submitted manuscript.

Please indicate your approval of this request by signing on the line provided at the end of this letter. Thank you.

Sincerely,

Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

_____

I hereby give permission to Clarissa W. Ong to reprint the following material in her dissertation:

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October 16, 2019

Tyson S. Barrett, Ph.D.
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810

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Sincerely,

Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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October 16, 2019

Eric B. Lee, Ph.D.
Institute of Living
Anxiety Disorders Center
Hartford Hospital
Hartford, CT 06119

Dear Dr. Lee,

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Department of Psychology at Utah State University. Your authorship is clearly stated in my
dissertation, consistent with the order in our submitted manuscript.

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letter. Thank you.

Sincerely,

Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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October 16, 2019

Nick Wan
Cincinnati Reds
100 Joe Nuxhall Way 3rd Floor
Cincinnati, OH 45202

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Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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Signature: _____

October 16, 2019

Ronald B. Gillam, Ph.D.
Department of Communicative Disorders and Deaf Education
Utah State University
1000 Old Main Hill
Logan, UT 84322-1000

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Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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October 16, 2019

Michael E. Levin, Ph.D.
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810

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Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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Signature: _____

October 16, 2019

Michael P. Twohig, Ph.D.
Department of Psychology
Utah State University
2810 Old Main Hill
Logan, UT 84322-2810

Dear Dr. Twohig,

I am requesting your permission to include your work on a manuscript in my dissertation for the
Department of Psychology at Utah State University. Your authorship is clearly stated in my
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Clarissa W. Ong, M.S.
Department of Psychology
Utah State University
Phone: (718) 312-2755
Email: clarissa.ong@usu.edu

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Twohig, M. P. (2019). *Effect of acceptance and commitment therapy on neurological functioning
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Signature: _____

CURRICULUM VITAE

Clarissa W. Ong

CONTACT INFORMATION

Address	2810 Old Main Hill
	Department of Psychology
	Utah State University
	Logan, UT 84322-2810
Cell	(718) 312-2755
Office	(435) 797-8303
Email	clarissa.ong@usu.edu
Skype	clarissaongw

EDUCATION

2015-
Utah State University, Logan, UT
Ph.D. in Psychology (Anticipated 2021)
Combined Program in Clinical/Counseling Psychology (APA-accredited)
Dissertation title: *Treating Clinical Perfectionism Using Acceptance and Commitment Therapy*
Chair: Michael P. Twohig, Ph.D.

2015-2018
Utah State University, Logan, UT
M.S. in Psychology
Combined Program in Clinical/Counseling Psychology (APA-accredited)
Thesis title: *Effect of Acceptance Versus Psychoeducation on Hoarding*
Chair: Michael P. Twohig, Ph.D.

2010-2013
Smith College, Northampton, MA
B.A. in Psychology
Minor in East Asian Languages and Literatures
Thesis title: *Discarding Behavior and Habituation of Distress in Hoarding Disorder*
Chair: Randy O. Frost, Ph.D.

CLINICAL EXPERIENCE

2019-
Student Therapist
Behavioral Health Clinic, Logan, UT
Supervisor: Michael P. Twohig, Ph.D.
- Student-athlete population
- GAD, social anxiety, depression, adjustment disorder
- Semi-structured clinical interviews, individual therapy

- ACT, ERP, behavioral activation
Total hours = 149.5; direct contact hours = 80.5

2019-	***Research Therapist*** **ACT Research Group, Utah State University**, Logan, UT *Supervisor: Michael P. Twohig, Ph.D.* Project title: A multiple-baseline investigation of ACT for hoarding disorder

- Adult community population with hoarding disorder
- Individual ACT delivered in-person and online
Total hours = 113.5; direct contact hours = 69

2018-	***Research Therapist*** **ACT Research Group, Utah State University**, Logan, UT *Supervisor: Michael P. Twohig, Ph.D.* Project title: An ACT skills group and mobile app for worry

- Adult community population with GAD
- Group ACT
Total hours = 29.5; direct contact hours = 24

2018-	***Research Therapist*** **ACT Research Group, Utah State University**, Logan, UT *Supervisor: Michael P. Twohig, Ph.D.* Project title: A randomized controlled trial of online-delivered acceptance-based behavior therapy for adolescents with trichotillomania

- Adolescent community population with trichotillomania
- Individual ACT and HRT delivered via Zoom
Total hours = 142; direct contact hours = 58

2018-2019	***Student Therapist*** **Avalon Hills Eating Disorder Specialists**, Logan, UT *Supervisor: Tera Lensegrav-Benson, Ph.D.*

- Adolescent population in residential treatment setting
- Eating disorders, GAD, OCD, depression, self-harm, problematic substance use
- Group therapy (ACT, DBT, process-oriented), individual therapy (mindfulness skills training, exposures), family co-therapy
- Total hours = 479.5; direct contact hours = 235.5

2017-2018	***Student Therapist*** **Anxiety and Related Disorders Clinic**, Logan, UT *Supervisor: Michael P. Twohig, Ph.D.*

- Child, adolescent, and adult community population
- GAD, OCD, depression, and emotion dysregulation

- Semi-structured clinical interviews, cognitive and personality testing, individual therapy
- ACT, ERP
- <u>Total hours</u> = 431; <u>direct contact hours</u> = 236

2017-2018   ***Graduate Student Researcher***
ACT Research Group, Utah State University, Logan, UT
Supervisor: Michael P. Twohig, Ph.D.
Project title: Understanding treatments for obsessions
- Adults with intrusive thoughts
- Established individualized exposure hierarchies
- Administered behavioral avoidance tasks
- Administered brief exposures from acceptance and cognitive reappraisal frameworks respectively

2016-2018   ***Research Therapist & Assessor***
ACT Research Group, Utah State University, Logan, UT
Supervisor: Michael P. Twohig, Ph.D.
Project title: A randomized controlled trial of ACT for perfectionism
- Adults with clinical perfectionism (diagnoses included OCD, GAD, social anxiety disorder, and OCPD)
- Diagnostic assessments based on the Structured Clinical Interview for DSM-5 (SCID-5)
- Individual ACT
- <u>Total hours</u> = 344; <u>direct contact hours</u> = 232.5

2016-2018   ***Research Therapist***
ACT Research Group, Utah State University, Logan, UT
Supervisor: Michael P. Twohig, Ph.D.
Project title: Effect of an acceptance-based intervention on discarding
- University students with significant difficulty discarding
- 90-minute individual acceptance and mindfulness training
- <u>Total hours</u> = 36; <u>direct contact hours</u> = 36

2016-2017   ***Student Therapist***
Psychology Community Clinic, Logan, UT
Supervisors: Susan L. Crowley, Ph.D., & Sara Boghosian, Ph.D.
- Child, adolescent, and adult community population
- Depression, anxiety, relationship difficulties, and self-harm
- Semi-structured intake and diagnostic assessment, cognitive testing and interpretation
- CBT, ACT, behavioral activation, motivational interviewing
- <u>Total hours</u> = 243; <u>direct contact hours</u> = 172

2016   ***Research Therapist***
              ACT Research Group, Utah State University, Logan, UT
              Supervisor: Michael P. Twohig, Ph.D.
              Project title: Effect of ACT on impulsive decision making
              - Adult community population with impulsive decision making (presenting concerns included pornography viewing, overeating, and procrastination)
              - Individual ACT
              - <u>Total hours</u> = 101.5; <u>direct contact hours</u> = 46

BOOK

1. Twohig, M. P., Levin, M. E., & **Ong, C. W.** (in press). *ACT in steps: A session-by-session guide to implementing acceptance and commitment therapy.* New York, NY: Oxford Press.

PEER-REVIEWED PUBLICATIONS

39. Krafft, J., **Ong, C. W.**, Cruz, R. A., Twohig, M. P., & Levin, M. E. (in press). An ecological momentary assessment study investigating the function of hoarding. *Behavior Therapy.*

38. Muñoz, K., **Ong, C. W.**, & Twohig, M. P. (in press). Engaging parents of children with mild bilateral or unilateral hearing loss: Counseling considerations. *Journal of Early Hearing Detection and Intervention.*

37. Muñoz, K., **Ong, C. W.**, Whicker, J. J., & Twohig, M. P. (in press). Promoting counseling skills in audiology clinical supervisors: Considerations for professional development. *The American Journal of Audiology.*

36. Morrison, K. L., Smith, B. M., **Ong, C. W.**, Lee, E. B., Friedel, J. E., Odum, A., Madden, G. J., Ledermann, T., Rung, J., & Twohig, M. P. (in press). Effects of acceptance and commitment therapy on impulsive decision making. *Behavior Modification.* https://doi.org/10.1177/0145445519833041

35. Lee, E. B., Homan, K., Morrison, K. L., **Ong, C. W.**, Levin, M. E., & Twohig, M. P. (in press). Acceptance and commitment therapy for trichotillomania: A randomized controlled trial of adults and adolescents. *Behavior Modification.* https://doi.org/10.1177/0145445518794366

34. Smith, B. M., **Ong, C. W.**, Barrett, T. S., Bluett, E. J., Slocum, T. A., & Twohig, M. P. (2019). Longitudinal effects of a 2-year meditation and Buddhism program on well-being, quality of life, and valued living. *Mindfulness, 10*, 2095-2109. http://doi.org/10.1007/s12671-019-01165-z

33. Whicker, J. J., **Ong, C. W.**, Twohig, M. P., & Muñoz, K. (2019). Considerations from psychology on implementing motivational interviewing in audiology: Response to Solheim et al. (2018) "An Evaluation of Motivational Interviewing

for Increasing Hearing Aid Use: A Pilot Study." *Journal of the American Academy of Audiology, 30*, 444-445. https://doi.org/10.3766/jaaa.18088

32.   Twohig, M. P., **Ong, C. W.**, Krafft, J., Barney, J. L., & Levin, M. E. (2019). Starting off on the right foot in acceptance and commitment therapy. *Psychotherapy, 56*, 16-20. http://doi.org/10.1037/pst0000209

31.   **Ong, C. W.**, Whicker, J. J., Muñoz, K., & Twohig, M. P. (2019). Measuring psychological inflexibility in adult and child hearing loss. *International Journal of Audiology.* https://doi.org/10.1080/14992027.2019.1630759

30.   Smith, B. M., Villatte, J. L., **Ong, C. W.**, Butcher, G. M., Twohig, M. P., Levin, M. E., Hayes, S. C. (2019). The influence of a personal values intervention on cold pressor-induced distress tolerance. *Behavior Modification, 43*, 688-710. https://doi.org/10.1177/0145445518782402

29.   **Ong, C. W.**, Barney, J. L., Barrett, T. S., Lee, E. B., Levin, M. E., & Twohig, M. P. (2019). The role of psychological inflexibility and self-compassion in acceptance and commitment therapy for clinical perfectionism. *Journal of Contextual Behavioral Science, 13*, 7-16. https://doi.org/10.1016/j.jcbs.2019.06.005

28.   **Ong, C. W.**, Lee, E. B., Krafft, J., Terry, C. L., Barrett, T. S., Levin, M. E., & Twohig, M. P. (2019). A randomized controlled trial of acceptance and commitment therapy for clinical perfectionism. *Journal of Obsessive-Compulsive and Related Disorders, 22*, 100444. https://doi.org/10.1016/j.jocrd.2019.100444

27.   **Ong, C. W.***, Lee, E. B.*, Levin, M. E., & Twohig, M. P. (2019). A review of AAQ variants and other context-specific measures of psychological flexibility. *Journal of Contextual Behavioral Science, 12*, 329-346. https://doi.org/10.1016/j.jcbs.2019.02.007 [*Co-first authors.]

26.   Krafft, J., **Ong, C. W.**, Twohig, M. P., & Levin, M. E. (2019). Assessing psychological inflexibility in hoarding: The Acceptance and Action Questionnaire for Hoarding (AAQH). *Journal of Contextual Behavioral Science, 12*, 234-242. https://doi.org/10.1016/j.jcbs.2018.08.003

25.   **Ong, C. W.**, Graves, K., Berry, M. S., Odum, A. L., & Twohig, M. P. (2019). Obsessive-compulsive symptoms are associated with increased delay discounting in a novel hand-washing task. *Behavior Analysis: Research and Practice, 19*, 136-149. http://doi.org/10.1037/bar0000096

24.   **Ong, C. W.***, Pierce, B. G.*, Woods, D. W., Twohig, M. P., & Levin, M. E. (2018). The Acceptance and Action Questionnaire – II: An item response theory analysis. *Journal of Psychopathology and Behavioral Assessment, 41*, 123-134. https://doi.org/10.1007/s10862-018-9694-2 [*Co-first authors]

23. Sagayadevan, V., Lee, S. P., **Ong, C.**, Abdin, E., Chong, S. A., & Subramaniam, M. (2018). Quality of life across mental disorders in psychiatric outpatients. *Annals Academy of Medicine, Singapore, 47*, 243-252.

22. Lee, E. B., Haeger, J. A., Levin, M. E., **Ong, C. W.**, Twohig, M. P. (2018). Telepsychotherapy for trichotillomania: A randomized controlled trial of ACT-enhanced behavior therapy. *Journal of Obsessive-Compulsive and Related Disorders, 18*, 106-115. https://doi.org/10.1016/j.jocrd.2018.04.003

21. Levin, M. E., Haeger, J., **Ong, C. W.**, & Twohig, M. P. (2018). An examination of the transdiagnostic role of delay discounting in psychological inflexibility and mental health problems. *The Psychological Record, 68*, 201-210. https://doi.org/10.1007/s40732-018-0281-4

20. **Ong, C. W.**, Lee, E. B., & Twohig, M. P. (2018). A meta-analysis of dropout rates in acceptance and commitment therapy. *Behaviour Research and Therapy, 104*, 14-33. https://doi.org/10.1016/j.brat.2018.02.004

19. **Ong, C. W.**, Krafft, J., Levin, M. E., & Twohig, M. P. (2018). An examination of the role of psychological flexibility in hoarding using multiple mediator models. *Journal of Cognitive Psychotherapy, 32*, 97-111. https://dx.doi.org/10.1891/0889-8391.32.2.97

18. Coleman, C., Muñoz, K., **Ong, C. W.,** Butcher, G. M., Nelson, L., & Twohig, M. P. (2018). Opportunities for audiologists to use patient-centered communication during hearing device monitoring encounters. *Seminars in Hearing, 39*, 32-43. https://doi.org/10.1055/s-0037-1613703

17. Finai, J., Muñoz, K., **Ong, C. W.,** Butcher, G. M., Nelson, L., & Twohig, M. P. (2018). Performance feedback to increase use of counseling skills. *Seminars in Hearing, 39*, 44-51. https://doi.org/10.1055/s-0037-1613704

16. Rudaz, M., Twohig, M. P., **Ong, C. W.**, & Levin, M. E. (2017). Mindfulness and acceptance-based trainings for fostering self-care and reducing stress in mental health professionals: A systematic review. *Journal of Contextual Behavioral Science, 6*, 380-390. https://doi.org/10.1016/j.jcbs.2017.10.001

15. Lee, E. B., **Ong, C. W.**, Twohig, M. P., Lensegrav-Benson, T., & Quakenbush-Roberts, B. (2017). Increasing body image flexibility in a residential eating disorder facility: Correlates with symptom improvement. *Eating Disorders, 26*, 185-199. http://dx.doi.org/10.1080/10640266.2017.1366229

14. **Ong, C. W.***, Bean, R. C.*, Lee, J., & Twohig, M. P. (2017). Acceptance and commitment therapy for PTSD and trauma: An empirical review. *The Behavior Therapist, 40*, 145-150. [*Co-first authors]

13. Muñoz, K., **Ong, C. W.**, Borrie, S. A., Nelson, L., & Twohig, M. (2017). Audiologists' communication behaviour during hearing device management appointments. *International Journal of Audiology, 5*, 328-336. http://dx.doi.org/10.1080/14992027.2017.1282632

12. Sagayadevan, V., Lau, Y. W., **Ong, C.**, Lee, S. P., Chong, S. A., & Subramaniam, M. (2016). Validation of the Clutter Image Rating (CIR) scale among psychiatric outpatients in Singapore. *BMC Psychiatry, 16*: 407. http://dx.doi.org/10.1186/s12888-016-1125-x

11. **Ong, C.***, Sagayadevan, V.*, Abdin, E., Shafie, S., Jeyagurunathan, A., Eng, G. K., … Subramaniam, M. (2016). Screening for drinking problems in the elderly in Singapore using the CAGE questionnaire. *Annals Academy of Medicine, Singapore, 45*, 456-465. [*Co-first authors]

10. Lee, S. P., **Ong, C.**, Vaingankar, J., Subramaniam, M., & Chong, S. A. (2016). Validity of the associated symptom criteria for generalized anxiety disorder: Observations from the Singapore Mental Health Study. *The Journal of Nervous and Mental Disease, 205*, 390-396. http://dx.doi.org/10.1097/NMD.0000000000000608

9. Lee, S. P., **Ong, C.**, Sagayadevan, V., Ong, R., Abdin, E., Lim, S., … Subramaniam, M. (2016). Hoarding symptoms among psychiatric outpatients: Confirmatory factor analysis and psychometric properties of the Saving Inventory – Revised (SI-R). *BMC Psychiatry, 16*: 364. http://dx.doi.org/10.1186/s12888-016-1043-y

8. Frost, R. O., **Ong, C.**, Steketee, G., & Tolin, D. (2016). Behavioral and emotional consequences of thought listing versus cognitive restructuring during discarding decisions in hoarding disorder. *Behaviour Research and Therapy, 85*, 13-22. http://dx.doi.org/10.1016/j.brat.2016.08.003

7. Seow, L. S. E., **Ong, C.**, Mahesh, M. V., Sagayadevan, V., Shafie, S., Chong, S. A., & Subramaniam, M. (2016). A systematic review on comorbid post-traumatic stress disorder in schizophrenia. *Schizophrenia Research, 176*, 441–451. http://dx.doi.org/10.1016/j.schres.2016.05.004

6. **Ong, C. W.**, Clyde, J. W., Bluett, E. J., Levin, M. E., & Twohig, M. P. (2016). Dropout rates in exposure with response prevention for obsessive-compulsive disorder: What do the data really say? *Journal of Anxiety Disorders, 40*, 8-17. http://dx.doi.org/10.1016/j.janxdis.2016.03.006

5. **Ong, C.***, Abdin, E.*, Chong, S. A., Vaingankar, J. A., & Subramaniam, M. (2016). Days out of role due to mental and physical conditions: Results from the Singapore Mental Health Study. *PLoS ONE, 11*, e0148248. http://dx.doi.org/10.1371/journal.pone.0148248 [*Co-first authors]

4.   **Ong, C.**, Sagayadevan, V., Lee, S. P., Ong, R., Chong, S. A., Frost, R. O., & Subramaniam, M. (2016). Hoarding among outpatients seeking treatment at a psychiatric hospital in Singapore. *Journal of Obsessive-Compulsive and Related Disorders, 8*, 56-63. http://dx.doi.org/10.1016/j.jocrd.2015.12.002

3.   Magiati, I., **Ong, C.**, Lim, X. Y., Tan, J. W., Ong, A. Y. L., Patrycia, F., … Howlin, P. (2016). Anxiety symptoms in young people with autism spectrum disorder attending special schools: Associations with gender, adaptive functioning and autism symptomatology. *Autism: International Journal of Research and Practice, 20*, 306-320. http://dx.doi.org/10.1177/1362361315577519

2.   **Ong, C.**, Pang, S., Sagayadevan, V., Chong, S. A., & Subramaniam, M. (2015). Functioning and quality of life in hoarding: A systematic review. *Journal of Anxiety Disorders, 32*, 17-30. http://dx.doi.org/10.1016/j.janxdis.2014.12.003

1.   Subramaniam, M., Soh, P., **Ong, C.**, Seow, L. S. E., Picco, L., Vaingankar, J. A., & Chong, S. A. (2014). Patient-reported outcomes in obsessive-compulsive disorder. *Dialogues in Clinical Neuroscience, 16*, 239-254.

BOOK CHAPTERS

5.   Twohig, M. P., **Ong, C. W.**, Petersen, J. M., Barney, J. L., & Fruge, J. E. (in press). Acceptance and commitment therapy and exposure exercises. In M. E. Levin, M. P. Twohig, & J. E. Krafft (Eds.). *Innovations in Acceptance and Commitment Therapy: Clinical Advancements and Applications in ACT.* Oakland, CA: New Harbinger.

4.   **Ong, C. W.**, Smith, B. M., Levin, M. E., Twohig, M. P. (in press). Mechanisms of change: Mindfulness and acceptance. In J. S. Abramowitz and S. M. Blakey (Eds). *Clinical Handbook of Fear and Anxiety: Psychological Processes and Treatment Mechanisms*. Washington, D.C.: American Psychological Association Press.

3.   Lee, E. B., **Ong, C. W.**, & Twohig, M. P. (in press). Acceptance and Commitment Therapy (ACT) for anxiety. In P. Lucena-Santos, S. A. Carvalho, J. Pinto-Gouveia, M. S. Oliveira, & J. Pistorello (Eds.). *Manual Internacional de Fundamentos Teóricos e Práticos da Terapia de Aceitação e Compromisso* [International Handbook of Theoretical and Practical Foundations of Acceptance and Commitment Therapy]. Novo Hamburgo, RS: Sinopsys Editora.

2.   **Ong, C. W.**, Lee, E. B., & Twohig, M. P. (in press). Hoarding disorder. In A. Maragakis and W. T. O'Donohue (Eds.), *Principle-based stepped care and brief psychotherapy for integrated care settings*. New York, NY: Springer Publishing.

1.   Lee, E. B., **Ong, C. W.**, & Twohig, M. P. (in press). Trichotillomania and excoriation disorder. In A. Maragakis and W. T. O'Donohue (Eds.), *Principle-*

based stepped care and brief psychotherapy for integrated care settings. New York, NY: Springer Publishing.

SUBMITTED MANUSCRIPTS

7. Meibos, A., Muñoz, K., **Ong, C. W.**, & Twohig, M. P. (2019). *The relationship between hearing loss and psychosocial wellbeing in adults.* Manuscript submitted for publication.

6. **Ong, C. W.**, Hancock, A. S., Barrett, T. S., Lee, E. B., Wan, N., Gillam, R., … Twohig, M. P. (2019). *Effect of acceptance and commitment therapy on neurological functioning in clinical perfectionism.* Manuscript submitted for publication.

5. **Ong, C. W.**, Levin, M. E., & Twohig, M. P. (2019). *Beyond acceptance and commitment therapy: Process-based therapy.* Manuscript submitted for publication.

4. Zemestani, M., Salavati, M., Seyedolshohadayi, A., Petersen, J. M., **Ong, C. W.**, Twohig, M. P., & Ghaderi, E. (2019). *Acceptance and commitment therapy (ACT) versus exposure and response prevention (ERP) for patients with obsessive-compulsive disorder on an optimal dose of SSRIs: A randomized controlled trial in Iran*. Manuscript submitted for publication.

3. Kasin, C., Muñoz, K., **Ong, C. W.**, Whicker, J. J., Twohig, M. P. (2019). *The relationship between pediatric hearing loss and psychosocial well-being among parents.* Manuscript submitted for publication.

2. **Ong, C. W.**, Blakey, S. M., Smith, B. M., Morrison, K. L., Bluett, E. J., Abramowitz, J. S., & Twohig, M. P. (2018). *Moderators and processes of change in traditional exposure and response prevention (ERP) versus acceptance and commitment therapy-informed ERP for obsessive-compulsive disorder*. Manuscript submitted for publication.

1. Levin, M. E., Krafft, J., An, W., **Ong, C. W.**, & Twohig, M. P. (2018). *Examining the daily effects of cognitive defusion and restructuring delivered through mobile apps for self-criticism.* Manuscript submitted for publication.

OTHER WORK

2. **Ong, C. W.**, Papa, L. A., Reveles, A. K., Smith, B. M., & Domenech Rodríguez, M. M. (2018). *Safe Passages for U: Training Manual*. Logan, UT: Utah State University. http://dx.doi.org/10.17605/osf.io/45KB6

1. **Ong, C. W.**, Papa, L. A., Reveles, A. K., Smith, B. M., & Domenech Rodríguez, M. M. (2018). *Safe Passages for U: Participant's Manual*. Logan, UT: Utah State University. http://doi.org/10.17605/OSF.IO/D5BZ7

WORKSHOP EXPERIENCE

4. Twohig, M. P., & **Ong, C. W.** (2019, September). Introduction to acceptance and commitment therapy and experiential workshop. Introductory training on acceptance and commitment therapy for professionals and students at Utah State University, Logan, UT.

3. **Ong, C. W.** (2018, October). *ACT workshop for Women's Leadership Initiative.* Invited workshop on acceptance and commitment training for Women's Leadership Initiative at Utah State University, Logan, UT.

2. Reveles, A. K., **Ong, C. W.**, & Litson, K. (2018, January). *Safe Passages for U.* Cultural competence training developed as part of a grant funded by the Diversity Council at Utah State University, Logan, UT.

1. **Ong, C. W.** (2016, March). *Mind your anxiety*. Invited workshop on anxiety and mindfulness as part of annual *Mental Health Is No Joke* week at Utah State University, Logan, UT.

CONFERENCE PRESENTATIONS

6. Meibos, A., Muñoz, K., **Ong, C. W.**, & Whicker, J. J. (2019, November). Hearing loss and well-being in adults: Results from a cross-sectional online survey. In *Hearing, vestibular, tinnitus—assessment and intervention: Adult*. Technical session conducted at the American Speech-Language-Hearing Association annual convention, Orlando, FL.

5. **Ong, C. W.,** Terry, C. L., & Twohig, M. P. (2019, November). The effect of defusion versus distraction on letting go of personal possessions. In H. Levy (Chair), *Improving treatments for hoarding disorder: From the laboratory to the clinic*. Symposium conducted at the 53rd annual convention of the Association for Behavioral and Cognitive Therapies, Atlanta, GA.

4. **Ong, C. W.**, Lee, E. B., Krafft, J., Terry, C. L., Barrett, T. S., Levin, M. E., & Twohig, M. P. (2019, November). A randomized controlled trial of acceptance and commitment therapy for clinical perfectionism. In **C. W. Ong** (Chair), *Using acceptance and commitment therapy for different clinical presentations: Evidence-based adaptations*. Symposium conducted at the 53rd annual convention of the Association for Behavioral and Cognitive Therapies, Atlanta, GA.

3. Krafft, J., **Ong, C. W.**, Cruz, R. A., Twohig, M. P., & Levin, M. E. (2019, July). *The function of hoarding in the moment and its relationship to psychological flexibility*. Paper presented at the 26th annual conference of the International OCD Foundation, Austin, TX.

2. **Ong, C. W.**, Hancock, A. S., Lee, E. B., Gillam, R. B., & Twohig, M. P. (2018, November). The effect of acceptance and commitment therapy on neurological activity in clinical perfectionism. In R. J. Jacoby (Chair), *Acceptance and*

anxiety: Recent advances in the assessment and treatment of anxiety disorders using an ACT framework. Symposium conducted at the 52nd annual convention of the Association for Behavioral and Cognitive Therapies, Washington, DC.

1.   **Ong, C. W.**, Twohig, M. P., Hancock, A. S., Lee, E. B., & Levin, M. E. (2018, July). *Applying acceptance and commitment therapy to perfectionism*. Paper presented at the 25th annual conference of the International OCD Foundation, Washington, DC.

POSTERS

10.   **Ong, C. W.**, Hancock, A. S., Lee, E. B., Gillam, R. B., Levin, M. E., & Twohig, M. P. (2018, July). *Neurological differences between individuals with and without clinical perfectionism.* Poster presented at the 25th annual conference of the International OCD Foundation, Washington, DC.

9.   Domenech Rodríguez, M. M., Reveles, A. K., Litson, K., Patterson, C., Smith, B. M., & **Ong, C. W.** (2018, October). *Development of a measure to assess cultural competence in the general population*. Poster presented at the biennial conference of the National Latina/o Psychological Association, La Jolla, CA.

8.   **Ong, C. W.**, Levin, M. E., Krafft, J., & Twohig, M. P. (2017, November). *An examination of the role of psychological flexibility in hoarding using multiple mediator models*. Poster presented at the 51st annual convention of the Association for Behavioral and Cognitive Therapies, San Diego, CA.

7.   Lee, E. B., **Ong, C. W.**, Lensegrav-Benson, T., Quakenbush-Roberts, B., & Twohig, M. P. (2017, November). *Changes in body image flexibility in a residential eating disorder facility: Correlates with symptom improvement*. Poster presented at the 51st annual convention of the Association for Behavioral and Cognitive Therapies, San Diego, CA.

6.   **Ong, C. W.**, Graves, K., Berry, M. S., Odum, A. L., & Twohig, M. P. (2016, October). *Impulsivity and compulsivity: Delay discounting and its relationship to obsessive-compulsive symptoms*. Poster presented at the 50th annual convention of the Association for Behavioral and Cognitive Therapies, New York, NY.

5.   **Ong, C. W.**, Clyde, J. W., Bluett, E. J., Levin, M. E., & Twohig, M. P. (2016, October). *Dropout rates in exposure with response prevention for obsessive-compulsive disorder: A meta-analytic review*. Poster presented at the 50th annual convention of the Association for Behavioral and Cognitive Therapies, New York, NY.

4.   Lee, E. B., Bluett, E., **Ong, C.**, Lockhart, G., Twohig, M., Lensegrav-Benson, T., & Quakenbush-Roberts, B. (2016, June). *Psychological flexibility as a predictor of quality of life and eating disorder risk in a residential treatment setting*. Poster

presented at the Association for Contextual Behavioral Science World
Conference 14, Seattle, WA.

3. **Ong, C.**, Subramaniam, M., Lee, S. P., Picco, L., Pang, S., Vaingankar, J., …
Chong, S. A. (2014, September). *Recommendations for help seeking in
Singapore*. Oral presentation at the Singapore Health & Biomedical Congress,
Singapore.

2. Picco, L., Subramaniam, M., Lee, S. P., Pang, S., **Ong, C.**, Vaingankar, J. A., &
Chong, S. A. (2014, September). *Recognition of mental disorders in Singapore*.
Poster presented at the Singapore Health & Biomedical Congress, Singapore.

1. **Ong, C.**, Frost, R. O., Steketee, G., & Tolin, D. F. (2013, November). *Cognitive
restructuring vs. thought listing in decisions about discarding in hoarding
disorder*. Poster presented at the 47th annual convention of the Association for
Behavioral and Cognitive Therapies, Nashville, TN.

GRANT ACTIVITY

2019-2020	Principal Investigator. Association for Contextual Behavioral Science Research Development Grant. *A Process-Based App Intervention Study for Clinical Perfectionism.* US$4,988. Decision pending.
2019-2020	Principal Investigator. International OCD Foundation Young Investigator Award. *An Examination of Processes of Change in OCD Using Ecological Momentary Assessment.* US$49,813.66. Not funded.
2017-2020	Co-Investigator. Utah State University Diversity Council Long-Term Grant. *Safe Passage.* US$15,000. PI: Kaylee Litson.
2015-2017	Project Director. International OCD Foundation. *Prediction, Understanding and Treatment of Perfectionism.* US$50,000. PI: Michael P. Twohig, Ph.D.
2015-2017	Co-Investigator. Institute of Mental Health Center Grant. *Non-Suicidal Self-Injurious Behaviors in a Psychiatric Outpatient Sample.* US$33,135. PI: Shazana Shahwan, M.S.
2014-2016	Principal Investigator. Institute of Mental Health Center Grant. *Comorbid Hoarding in Outpatients with Anxiety Disorders, Depressive Disorders, Schizophrenia, and Gambling Disorder.* US$20,110.

TEACHING EXPERIENCE

2018-2019	***Guest Lecturer*** **Department of Psychology, Utah State University,** Logan, UT PSY 3210: Abnormal Psychology Topic: *Obsessive-Compulsive and Related Disorders*

2017	***Guest Lecturer***
	Department of Psychology, Utah State University, Logan, UT
	PSY 3720: Behavior Assessment and Intervention
	Topic: *The Practice of Acceptance and Commitment Therapy*

2013	***Teaching Assistant***
	Department of Psychology, Smith College, Northampton, MA
	Supervisor: David C. Palmer, Ph.D.

- Created lab exercises for introductory statistics course
- Uploaded quizzes onto Moodle course page
- Graded exams

EDITORIAL ACTIVITY

2019	Invited reviewer for the *Journal of Cognitive Psychotherapy*
2019	Invited reviewer for the *Journal of Obsessive-Compulsive and Related Disorders*
2019	Invited reviewer for the *Journal of Contextual Behavioral Science*
2018	Guest reviewer for *Cognitive and Behavioral Practice*
2018	Guest reviewer for *Behavior Analysis: Research and Practice*
2017	Guest reviewer for the *Journal of Contextual Behavioral Science*
2016	Ad hoc reviewer for Association for Contextual Behavioral Science World Conference 14 symposium submissions
2016	Guest reviewer for *Behavior Therapy*
2016	Invited reviewer for the *Journal of Obsessive-Compulsive and Related Disorders*

PROFESSIONAL DEVELOPMENT TRAININGS

2019	*Grants Training Workshop*
	Hanover Research
	Utah State University, Logan, UT

2019	*Focused Acceptance and Commitment Therapy: The Basics and Beyond*
	Kirk Strosahl, Ph.D.
	Utah State University, Logan, UT

2018	*Advanced ACT: Doing Experiential Work Without Exercises*
	Matthieu Villatte, Ph.D., & Jennifer Villatte, Ph.D.
	Utah State University, Logan, UT

2016	*Acceptance & Commitment Therapy: Focusing on Values Work, Self-Care, and Self-Compassion*
	Kelly G. Wilson, Ph.D.
	ACBS World Conference 14, Seattle, WA

2016	*Better Together: Campus Interfaith Allies Training* Bonnie Glass-Coffin, Ph.D. Utah State University, Logan, UT
2015	*Ownership Gone Awry: Understanding and Treating Hoarding Disorder* Gail Steketee, Ph.D., & Randy O. Frost, Ph.D. Association for Behavioral and Cognitive Therapies 49th Annual Convention, Chicago, IL
2015	*Allies (LGBTQA) on Campus Training* Nicole Vouvalis, J.D., & Tyra P. Sellers, Ph.D. Utah State University, Logan, UT
2015	*Getting Started as a Successful Proposal Writer and Academician* M. S. AtKisson, Ph.D. Utah State University, Logan, UT
2015	*Introduction to Acceptance and Commitment Therapy & ACT Experiential Workshop* Michael P. Twohig, Ph.D., & Kate L. Morrison, M.S. Utah State University, Logan, UT

PROFESSIONAL ORGANIZATION MEMBERSHIP

2015-	Association for Behavioral and Cognitive Therapies
2015-	Association for Contextual Behavioral Science

HONORS AND AWARDS

2019	Utah State University Doctoral Student Researcher of the Year
2019	College of Education and Human Services Doctoral Student Researcher of the Year
2018-2019	Michael Bertoch Scholarship ($1,000)
2017-2018	Walter R. Borg Scholarship and Research Productivity Award ($3,500)
2013	*Summa cum laude* with highest honors in Psychology
2013	William Sentman Taylor Prize in Psychology
2013	Ettie Chin Hong '36 Prize in East Asian Languages and Literatures
2013	Elected to Phi Beta Kappa
2013	Elected to Sigma Xi
2011-2012	First Group Scholar
2010-2013	Dean's List