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Transdiagnostic Treatment Personalization: The Feasibility of Ordering Unified Protocol Modules According to Patient Strengths and Weaknesses

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Abstract

Most patients in community practice attend significantly fewer sessions than are recommended by treatment protocols that have demonstrated efficacy in addressing emotional disorders. Personalized interventions that target the core processes thought to maintain a wide range of disorders may serve to increase treatment efficiency, addressing this gap. This study sought to evaluate the feasibility and acceptability of the personalized delivery of a mechanistically transdiagnostic intervention, the Unified Protocol (UP) for Transdiagnostic Treatment of Emotional Disorders. Using an AB phase change design in accordance with the single-case reporting guideline for behavioral interventions (SCRIBE), 18 individuals with heterogeneous emotional disorders were randomly assigned to receive UP treatment

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modules ordered according to either their pretreatment strengths or weaknesses. Results support the feasibility of reordering the treatment modules as the majority of patients presented with marked differences in skill levels, as well as the acceptability of this approach as patients in both conditions reported satisfaction with their assigned treatment order. Furthermore, the majority of patients demonstrated symptom improvement consistent with previously reported effects of the standard-order UP. Finally, there is preliminary evidence to suggest that those in the strengths condition displayed improvements in outcomes earlier in treatment than those in the weaknesses condition. Taken together, these findings offer preliminary support for improving treatment efficiency through the utilization of a personalized, strengths-based, transdiagnostic approach.

Keywords
treatment personalization, transdiagnostic, modular treatment, unified protocol

Anxiety and depressive disorders are prevalent, costly, and represent a significant public health burden (Bruce et al., 2005; Kessler et al., 2005). Fortunately, there is strong support for the use of behavioral interventions (e.g., cognitive-behavioral therapy) to address these common mental health conditions (Lambert & Bergin, 1994; Rachman, 2009). Despite being relatively time-limited, most evidence-based treatments for anxiety and depressive disorders recommend at least 12 to 16 sessions (e.g., Craske & Barlow, 2006) and a systematic review of the clinical trials literature suggests that approximately 13 treatment sessions are needed to observe improvement in two thirds of patients (Garfield, 1994; Hansen, Lambert, & Forman, 2002). However, the average number of sessions attended by patients in community practice is less than five (Harnett, O'Donovan, & Lambert, 2010). Accordingly, it is critical to increase the efficiency of our treatment protocols such that the skills that drive therapeutic change are presented as early as possible. Improved treatment efficiency (i.e., shorter effective treatments) may also address health care system capacity limitations, as recent estimates suggest that over 20 million U.S. adults with a mental illness do not receive treatment in a given year (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015).

One reason for lengthier courses of treatment may be that high rates of comorbidity among anxiety and depressive disorders tend to complicate care

(Kessler et al., 1996, 1998). Data suggest that 55% of individuals with a principal anxiety disorder will meet criteria for an additional anxiety, depressive, or related disorder, and these estimates rise to 75% when lifetime co-occurrence is considered (Brown, Campbell, Lehman, Grisham, & Mancill, 2001). Moreover, there is evidence to suggest that the time and effort therapists spend to address symptoms of co-occurring conditions impedes treatment of the primary disorder (Craske et al., 2007; Gibbons & DeRubeis, 2008). Thus, treating one set of symptoms at a time may significantly lengthen treatment.

A mechanistically transdiagnostic approach to treatment, informed by core processes implicated in the development and maintenance of a range of conditions, may represent a more efficient way to target comorbid conditions. For example, instead of addressing co-occurring conditions sequentially and, as a result, extending the length of treatment, these transdiagnostic interventions simultaneously address symptoms of multiple disorders by directly targeting shared underlying processes (Sauer-Zavala, Gutner et al., 2017). One such underlying process that has been hypothesized to explain the pervasive pattern of comorbidity among anxiety and depressive disorders is the existence of what has been called a "general neurotic syndrome" (Andrews, 1990, 1996; Brown & Barlow, 2009; Brown, Chorpita, & Barlow, 1998; Tyrer, 1989). Under this conceptualization, heterogeneity in the expression of discrete disorder symptoms (e.g., panic attacks, social withdrawal) is better explained as a manifestation of this broader syndrome.

Anxiety and depressive disorders have been referred to as "emotional disorders" as a way to highlight the common role of emotion dysregulation in their development and maintenance (Barlow, 1991). Specifically, emotional disorders are characterized by the experience of frequent and intense negative emotions, aversive reactions to these emotions when they occur, and subsequent efforts to escape or avoid them, which may reduce the emotion in the short term but maintain the disorder's symptoms in the long term (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Sauer-Zavala & Barlow, 2014). Transdiagnostic interventions provide patients with a set of skills geared specifically toward these common deficits, which in turn lead to symptom change across a range of disorders. For emotional disorders, aversive and avoidant reactions to emotional experiences have been suggested as the primary target (Barlow et al., 2014).

Another potential method for increasing treatment efficiency is to personalize the intervention delivered such that patients receive only the treatment components that best fit with their presentations—referred to as a modular approach (Chorpita, Daleiden, & Weisz, 2005). This approach circumvents the need to work through an entire treatment protocol that may not apply to a given patient in its entirety; only relevant skills, which may cut across diagnostic boundaries,

are selected. Modular treatments have demonstrated steeper trajectories of improvement compared with traditional manualized care, suggesting that this approach may indeed be more efficient (Weisz et al., 2012).

The greatest gain in treatment efficiency may result from the integration of a personalized, modular approach with a mechanistically transdiagnostic intervention. Given that transdiagnostic interventions often consist of multiple components designed to target the same core vulnerability, it is possible that some skills may be more or less robust at engaging the core process driving symptoms for a particular patient. Despite the fact that research in this area is relatively sparse, several potential strategies for personalizing the delivery of treatment skills have been articulated. For example, evaluation of relative strengths and deficits in targeted skills at baseline could be used to individualize the sequence of those skills (Cheavens, Strunk, Lazarus, & Goldstein, 2012). A capitalization model prioritizes skills according to a patient's relative strengths, whereas a compensation model prioritizes areas of greatest weakness. Most of the evidence cited to support these personalization strategies has come from post hoc examinations of pretreatment characteristics that predict differential response to interventions in randomized trials and the literature is mixed with regard to the most advantageous approach (Simon & Perlis, 2010). Recently, though, Cheavens et al. (2012) randomly assigned depressed individuals to receive treatment strategies based on prioritizing strengths or weaknesses and observed steeper trajectories of change on depressive symptoms for patients in the capitalization condition.

Present Study

The Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al., 2011) may represent an ideal intervention to explore the integration of a personalized, modular delivery within a transdiagnostic intervention. The UP was developed to directly target the aversive, avoidant reactions to frequently occurring emotional experiences that maintain symptoms across the range of emotional disorders. There is promising empirical support for the UP across the range of anxiety disorders (Barlow et al., 2017; Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010; Farchione et al., 2012), depression (Boswell, Anderson, & Barlow, 2014), bipolar disorder (Ellard, Deckersbach, Sylvia, Nierenberg, & Barlow, 2012), and borderline personality disorder (Sauer-Zavala, Bentley, & Wilner, 2016). In addition, several studies have demonstrated that the UP is also associated with reductions in its putative target—aversive reactions to emotional experiences (Boswell et al., 2013; Sauer-Zavala et al., 2012). Moreover, data also indicate that each UP module (e.g., mindful emotion awareness, cognitive flexibility) independently engages

its associated skill when presented in isolation (Brake et al., 2016; Sauer-Zavala, Cassiello-Robbins, et al., 2017), suggesting that UP skills need not be presented in their standard order to enact change on this target. In fact, to our knowledge, the UP is the only mechanistically transdiagnostic intervention that also has clear modules independently demonstrated to engage their putative target.

The primary goal of the present study is to explore whether personalizing the sequence of a modular, transdiagnostic intervention is feasibly accomplished and acceptable to patients. Individuals with heterogeneous emotional disorders were randomly assigned to receive UP treatment modules ordered according to their pretreatment strengths or weaknesses using validated measures previously demonstrated to correspond with UP skills (Sauer-Zavala, Cassiello-Robbins, et al., 2017). With regard to feasibility, we hypothesized that patients would possess clinically significant strengths and weaknesses at baseline that would make ordering modules according to skill-level meaningful. In addition, we hypothesized that by the end of treatment (after patients had received all UP modules), patients would demonstrate large improvements in symptoms, suggesting that personalized sequencing of the UP modules does not negatively affeact outcomes. Finally, we predicted that patients would be satisfied with their personalized sequence of UP skills. An exploratory goal of this pilot study was to compare whether ordering transdiagnostic treatment components according to patients' strengths versus weaknesses leads to earlier change on core processes, as well as symptom outcomes.

Method

Recruitment took place at the Center for Anxiety and Related Disorders (CARD) at Boston University (BU) from a pool of treatment-seeking individuals. The BU Institutional Review Board approved all study procedures and patients provided their informed consent prior to participating. To maximize generalizability, inclusion criteria followed the larger clinic's adult outpatient treatment eligibility requirements and consisted of meeting criteria for a *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association [APA], 2013) emotional disorder diagnosis (i.e., anxiety, depressive, obsessive-compulsive and related, or trauma-related disorders), without a comorbid condition necessitating clinical prioritization (e.g., acute suicide risk, mania, psychotic features, substance use disorder). CARD staff conducted diagnostic assessments with the Anxiety and Depression Interview Schedule, Fifth Edition (ADIS-5; Brown & Barlow, 2014). Assessment staff consisted of graduate students and postdoctoral clinicians trained to rigorous reliability standards on the ADIS (for a detailed description of this process, see Brown, Di Nardo, Lehman, &

Campbell, 2001). Additional inclusion criteria required that patients were at least 18 years of age, fluent in English, and willing to remain on a stable dosage of medication (if currently taking medication) as well as refrain from any concurrent psychotherapy for the duration of the study.

In total, 18 patients consented to participate in the study. Demographic information for all patients is presented in Table 1. Six patients did not complete study procedures and were withdrawn, as our study design (described below) requires complete data. Reasons for withdrawal included lost contact following the consent visit ($n = 2$), unable to complete study questionnaires on a weekly basis ($n = 1$, withdrawn during baseline phase), therapist error in which skills were administered in the wrong order ($n = 1$), and difficulty scheduling weekly therapy sessions ($n = 2$, patients dropped after Session 1 and Session 5). Of the two patients who initiated treatment, one was assigned to the strengths condition and one to the weaknesses condition. Thus, complete posttreatment data were available for 12 patients. Demographic data for treatment completers as a function of condition is presented in our "Preliminary analyses" section.

Study Design

Single-case experimental design (SCED) was utilized to conduct this study; methods and results are reported in accordance with single-case reporting guideline in behavioral interventions (SCRIBE; Tate et al., 2016). This type of design is particularly helpful for preliminary studies with small sample sizes, as a means to gather evidence in support of novel treatment strategies (Kazdin, 2001). SCEDs use each patient as their own control by presenting them with each study phase (in this case baseline and treatment). Specifically, this study employed a phase change (AB) design (Barlow, Nock, & Hersen, 2009). Prior to receiving the intervention, patients first entered a 2-week baseline phase that functions similar to a control condition where no intervention is delivered. Phase changes allow for an evaluation of whether change in the measure of interest occurs when and only when the intervention is introduced.

At the time of study enrollment, patients were randomly assigned to one of two sequencing conditions that informed UP module order in the treatment phase. Half of the patients were assigned to receive the modules ordered from area of greatest strength to weakness, whereas the other half of patients received the modules ordered from area of greatest weakness to strength.

Treatment

Patients received the following UP modules in a personalized order based on their randomization condition: Understanding Emotions (Module 2), Mindful

Table 1. Patient Demographic and Module Order Information.

ID	Con	Age	Gender	Race	Ethnicity	PD	CD	Meds	Spread	Module order
201[c]	S	29	M	C	H/L	MDD	1	N	1.92	CF, M, I, U, E
202	S	32	F	B	NH/L	SPEC	1	N	2.70	I, U, M, E, CF
203[c]	S	38	F	C	NH/L	SOC	2	Y	3.89	U, I, M, CF, E
204	W	27	F	A	NH/L	MDD	1	N	2.94	CF, E, M, I, U
205[c]	W	45	F	C	NH/L	GAD	0	Y	2.95	CF, M, E, I, U
206[c]	S	21	M	C	NH/L	GAD	0	N	2.11	I, U, E, M, CF
207[c]	S	27	F	C	NH/L	GAD	3	N	4.71	U, I, CF, E, M
208[c]	W	30	M	C	H/L	GAD	1	Y	1.80	E, I, M, CF, U
209[c]	W	33	F	C	NH/L	OCD	2	N	4.29	M, E, CF, I, U
210[c]	W	27	M	C	NH/L	GAD	0	N	4.13	M, U, E, I, CF
211[c]	S	28	M	C	NH/L	GAD	1	Y	3.17	U, CF, I, M, E
212	S	18	M	C	H/L	GAD	2	N	3.37	I, U, M, E, CF
213	W	26	M	C	NH/L	OSA	0	Y	3.02	E, CF, M, I, U
214[c]	S	35	M	C	NH/L	OCD	3	Y	1.57	I, U, M, CF, E
215[c]	W	24	F	C	NH/L	SOC	4	N	5.99	M, CF, E, I, U
216	N/A	74	F	C	NH/L	GAD	1	Y	N/A	N/A
217	S	51	F	B	H/L	PDD	1	N	1.79	U, CF, I, M, E
218[c]	W	21	F	C	NH/L	OST	0	N	3.93	E, M, I, U, CF

Note. Patient 216 was not randomized to a condition. Con = condition; PD = primary diagnosis; CD = number of comorbid diagnoses; Meds = medications (yes/no); Spread = the absolute value of the difference between z scores; "c" = study completer; S = strengths; M = male; C = Caucasian; H/L = Hispanic/Latino; MDD = major depressive disorder; N = no; CF = cognitive flexibility; M = mindful emotion awareness; I = interoceptive exposures; U = understanding emotions; E = countering emotion behaviors; F = female; B = Black or African American; NH/L = not Hispanic/Latino; SPEC = specific phobia; SOC = social anxiety disorder; Y = yes; W = weaknesses; A = Asian; GAD = generalized anxiety disorder; OCD = obsessive-compulsive disorder; OSA = other specified anxiety disorder; PDD = persistent depressive disorder; OST = other specified trauma-related disorder.

Emotion Awareness (Module 3), Cognitive Flexibility (Module 4), Countering Emotional Behaviors (Module 5), and Interoceptive Exposures (Module 6). While they are described in detail elsewhere (Payne, Ellard, Farchione, Fairholme, & Barlow, 2014), a brief summary of the modules included in this study is outlined here: (a) Understanding Emotions provides psychoeducation about the adaptive nature of emotions and the three-component model of emotions (i.e., emotions consist of thoughts, physical sensations, and behaviors) and aims to demonstrate to patients that avoidant ways of coping with strong emotions may be exacerbating their symptoms. (b) Mindful Emotion Awareness promotes emotional tolerance, in lieu of avoiding or changing

one's emotional experience, by guiding patients toward the adoption of a nonjudgmental, present-focused stance toward emotions. (c) The goal of Cognitive Flexibility is to increase patients' ability to generate and consider alternative appraisals of emotional situations while continuing to promote tolerance of emotional stimuli, including the automatic appraisals, themselves. (d) The Countering Emotional Behaviors seeks to decrease the frequency of emotionally avoidant behaviors by identifying and preventing engagement in emotion avoidance strategies as a way to facilitate extinction of distress in response to strong emotions. (e) Finally, Interoceptive Exposures aims to increase patients' awareness of the role physical sensations play in their experience of emotion and increase their tolerance of those physical sensations through a series of physical sensation induction exercises.

Sessions occurred once per week and were 50 to 60 min long. Study therapists (SSZ, CCR, and AAA) were certified in the provision of the UP. Treatment sessions were audio recorded and 20% (n = 22) were selected by random and rated for therapist competence (i.e., adherence to the protocol, rapport, and time management) and inclusion of disallowed interventions (e.g., other intervention content). Overall, average adherence ratings were high (4.45 on a 5-point scale) though there was a single instance in which a non-UP intervention strategy was mentioned.

Assessment

Patients completed all study measures via a secure, online survey platform. For the baseline visit, patients completed the measures in-person at the center. For the remainder of the baseline phase, patients completed the measures remotely. During the treatment phase, patients had the option to complete the measures remotely or at the clinic prior to their treatment session. One week posttreatment, patients were asked to complete the measures remotely a final time.

Anxiety. The Overall Anxiety Severity and Impairment Scale (OASIS; Norman, Cissell, Means-Christensen, & Stein, 2006) is a brief, five-item self-report questionnaire that assesses severity and impairment of anxiety symptoms in the past week. The measure produces a total score range of 0 to 20, with a clinical cutoff score of 8. Psychometric evaluation of the OASIS indicates good internal consistency, test–retest reliability, and convergent and divergent validity (Norman et al., 2006).

Depression. The Overall Depression Severity and Impairment Scale (ODSIS; Bentley, Gallagher, Carl, & Barlow, 2014) was adapted from the aforementioned OASIS measure as a brief assessment of severity and impairment of

depression. As with the OASIS, the ODSIS asks about depressive symptoms in the past week, and scores range from 0 to 20 with a clinical cutoff of 8. The ODSIS has established good internal consistency, as well as convergent and discriminant validity (Bentley et al., 2014).

Experiential avoidance. The Multidimensional Experiential Avoidance Questionnaire (MEAQ; Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011) is a 62-item self-report measure assessing the tendency to avoid or escape a wide range of internal experiences. Questions (e.g., "I usually try to distract myself when I feel something painful," "I work hard to keep out upsetting feelings") are rated on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*). The MEAQ total score was used in this study. It has demonstrated good internal consistency, strong convergent validity, and discriminant validity with associated higher order temperament factors (e.g., neuroticism; Gámez et al., 2011).

Knowledge quizzes. After each treatment module, patients completed a five/six-item "quiz" to assess their understanding of important content from the most recent module. The quizzes consisted of multiple-choice questions, some with more than one correct answer, and patients were instructed to select all answers that apply, for a score of up to 8 to 11 possible points depending on the quiz. The scores were then converted to a percentage for consistency. Examples include "Which of the following are unhelpful reactions to emotional experiences?" "True or false: How you interpret your physical sensations influences how you react to them," and "What is an emotion-driven behavior?"

Acceptability/feasibility. Following treatment, patients were administered a form with an opportunity to provide feedback on the treatment. The form included two types of questions: (a) Likert-type-scale questions (e.g., "Did you think that the treatment approach and activities made sense and were reasonable to you?" "Overall, how satisfied were you with the treatment?"), with patients being asked to choose from 1 (*not at all acceptable*/*satisfied*) to 5 (*extremely acceptable*/*satisfied*), as well as (b) open-ended questions (e.g., "Are there any changes you would recommend?" "What did you think about the order in which the treatment skills were presented?").

Module ordering. Patients' pretreatment strengths and weaknesses were assessed at baseline via measures that correspond to each UP skill module. Sauer-Zavala, Cassiello-Robbins and colleagues (2017) recently demonstrated that these validated measures correspond to each UP module and are sensitive to picking up changes in skill level when their associated module is

applied. These measures include Beliefs about Emotions Scale (BES; Rimes & Chalder, 2010) for Understanding Emotions, the Southampton Mindfulness Questionnaire (SMQ; Chadwick et al., 2008) for Mindful Emotion Awareness, the UP Cognitive Skills Questionnaire (UP-CSQ; Conklin, Woods, Cassiello-Robbins, & Sauer-Zavala, in preparation) for Cognitive Flexibility, the UP Behavioral Avoidance Questionnaire (UP-BAQ; Conklin et al., in preparation)[1] for Countering Emotional Behaviors, and the anxiety sensitivity index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) for Interoceptive Exposures.

To determine each patient's relative strengths and weaknesses, it was necessary to place the measures on the same scale to compare their scores; as such, each score was converted to a *z* score and the modules were ordered accordingly. A data set containing survey responses from a large undergraduate sample ($N = 457$ [BES], 466 [SMQ], 514 [UP-CSQ], 522 [UP-BAQ], 487 [ASI]) on these measures was used to generate the normative data used in the *z* scores calculations. These data were used so that all *z* score calculations would be based on the same sample, reducing concerns associated with using different validation samples to calculate the various scores. Table 1 demonstrates the spread of the absolute value of the *z* scores and module order for each patient.

Results

Preliminary Analyses

First, we sought to explore whether the patients in our treatment conditions (i.e., assignment to receive UP modules in order of strengths vs. weaknesses) were equivalent at baseline. There were six female and six male treatment completers, with two females and four males in the strengths condition, and four females and two males in the weaknesses condition. A Fisher exact test indicated that these differences were nonsignificant ($p = .57$). All 12 patients reported their race as Caucasian, with two patients additionally reporting a Hispanic or Latino ethnicity (one patient in each condition). Patients ranged from 21 to 45 years old ($M = 29.83$, $SD = 7.03$). In regard to age, patients in the strengths condition ($M = 29.67$, $SD = 6.05$) did not significantly differ compared with patients in the weaknesses condition, $M = 30.00$, $SD = 8.48$; $t(10) = -0.078$, $p = .94$. Nonsignificant Shapiro–Wilk statistics indicated that the MEAQ, OASIS, and ODSIS data were normally distributed at baseline ($p = .417$; .413; and .551, respectively); thus, parametric statistics (i.e., independent samples *t* tests) were conducted to examine differences between patients in the strengths versus weaknesses conditions for baseline scores on these measures. There were no significant differences between conditions, indicating that patients in strengths and weaknesses had a similar starting point based on these three measures (see Table 2).

Table 2. Independent Samples *t* Tests on Baseline OASIS, ODSIS, and MEAQ Scores Based on Condition.

Measure	Condition	*M*	*SD*	*t*-value	*df*	*p* (two-tailed)
OASIS	Strength	10.66	2.87	0.00	10	1.00
	Weakness	10.66	3.88			
ODSIS	Strength	8.16	5.67	0.33	10	.75
	Weakness	7.33	2.50			
MEAQ	Strength	229.66	13.92	2.14	10	.06
	Weakness	205.83	23.47			

Note. OASIS = Overall Anxiety Severity and Impairment Scale; ODSIS = Overall Depression Severity and Impairment Scale; MEAQ = Multidimensional Experiential Avoidance Questionnaire.

Additional demographic data as a function of condition are available in Table 1. Specifically, five patients (41.67%) were currently prescribed psychotropic medication at baseline and, per inclusion criteria, they agreed to continue taking the same type and current amount of the dose for the duration of the study. Patients had principal diagnoses of generalized anxiety disorder (GAD; $n = 6$), social anxiety disorder (SOC; $n = 2$), obsessive-compulsive disorder ($n = 2$), major depressive disorder (MDD; $n = 1$), and other specified trauma-related disorder ($n = 1$). On average, patients had 1.42 comorbid disorders ($SD = 1.38$). The most common comorbid disorders were GAD ($n = 4$), SOC ($n = 3$), specific phobia ($n = 4$), and MDD ($n = 2$).

Feasibility of Reordering Modules

Our primary aim, determining the feasibility and acceptability of reordering the UP modules according to patients' strengths and weakness, was accomplished through several steps.

Variability in skill level within individuals. First, we explored the degree of spread between each patient's area of greatest strength and area of greatest weakness to determine whether clinically meaningful differences in skill level (on which to base module ordering) indeed exist. We defined a significant spread in skill use as at least 1.96 standard deviations between standard scores, reflecting their area of greatest strength and their area of greatest weakness. Seventy-five percent of individuals ($n = 9$) demonstrated a clear spread in skill use, suggesting that it is feasible to organize treatment delivery based on patients' relative strengths and weaknesses.

Satisfaction and acceptability. In addition to determining whether reordering UP modules based on variability in skill level was possible, we were also interested in exploring whether organizing treatment in this manner resulted in an intervention that patients found acceptable. Overall, patients rated the treatment they received as "very acceptable" ($M = 4.83$, $SD = 0.39$, where five is the highest possible score). Patients were also quite satisfied with treatment ($M = 4.67$, $SD = 0.65$, where 5 is the highest possible score). An independent samples t test indicated that patients in the strengths ($M = 4.67$, $SD = 0.82$) versus weaknesses ($M = 4.67$, $SD = 0.51$) conditions did not significantly differ in treatment satisfaction ratings, $t(10) = 0.00$, $p = 1.00$. The difference in acceptability between patients in the strengths ($M = 5.00$, $SD = 0.00$) and weaknesses ($M = 4.66$, $SD = 0.51$) conditions was also not significant, $t(5) = 1.58$, $p = .175$. The results of these tests indicate that receiving UP treatment modules in a personalized order is acceptable to patients.

While patients indicated that the reordering was acceptable overall, it is worth noting that four out of 12 patients provided qualitative feedback stating that the Understanding Emotions module would be most helpful if it were provided first. One patient stated, "I thought the order was fine, except the last two sessions (Understanding Emotions) should have been first." In addition, the three patients who received the psychoeducation module first provided comments indicating that the order of the modules felt "like a natural progression."

Skill uptake. Given that the UP is generally presented in a standard order such that subsequent skills build off previously presented modules, it was important to determine whether patients were able to glean important concepts from treatment regardless of what order the skills were received. Patients scored, on average, an 86.69% on the UP knowledge acquisition quizzes that were administered following the presentation of each module. The average scores on each individual quiz were 82.92% on Understanding Emotions, 92.73% on Mindful Emotion Awareness, 84.09% on Cognitive Flexibility, 82.05% on Countering Emotional Behaviors, and 91.67% on Interoceptive Exposures. Shaprio–Wilk statistics indicated that data for three out of the five quizzes (Mindful Emotion Awareness, Cognitive Flexibility, and Interoceptive Exposures) were not normally distributed ($p = .012$, .008, and .000, respectively). Therefore, nonparametric statistics were used to examine between-condition differences on these measures. The Mann–Whitney U test indicated that there were no significant differences between conditions on scores for the Countering Emotional Behaviors, Understanding Emotions, Interoceptive Exposures, and Mindful Emotion Awareness quizzes (see Table 3). There was a difference in Cognitive Flexibility scores between conditions that approached significance such that patients in the weaknesses condition scored higher than those

Table 3. Mann–Whitney U Tests of Knowledge Quizzes Based on Condition.

Quiz	Condition	*M*	*SD*	*Mann–Whitney U Test Statistic*	*p* (exact)
Understanding Emotions	Strength	81.67	11.69	15.00	.699
	Weakness	84.17	14.97		
Mindful Emotion Awareness	Strength	90.00	6.32	7.50	.177
	Weakness	96.00	5.48		
Cognitive Flexibility	Strength	74.17	19.85	4.50	.052
	Weakness	96.00	5.48		
Countering Emotional Behaviors	Strength	84.58	18.90	13.00	.485
	Weakness	79.52	14.82		
Interoceptive Exposures	Strength	85.42	22.94	14.00	.589
	Weakness	97.92	5.10		

in strengths (Table 3). Overall, these results support the feasibility of delivering the UP in a personalized order, suggesting that patients can demonstrate strong grasp of treatment concepts regardless of the order in which they are presented.

Treatment outcomes. The final assessment of feasibility was to examine whether a personalized order of treatment skills produced treatment outcomes (i.e., reductions in anxiety, depression, and experiential avoidance) similar to standard care. Visual inspection is the most commonly used analytic tool in SCEDs (Barlow et al., 2009). To conduct visual inspection analyses, baseline and treatment data are plotted graphically to examine differences in the slope and level across phases. In the present study, visual inspection allowed us to ensure that the introduction of personalized UP treatment indeed leads to changes on our outcome variables, following a stable baseline period. All measures are scored such that a decrease in score indicates improvement.

Visual inspection based on change in level indicated that, by the end of treatment, 10 out of 12 patients displayed change on our outcomes measures after the introduction of the personalized UP (see Figures 1 and 2). Specifically, five patients (201, 203, 206, 207, and 214) in the strengths condition and five (205, 208, 209, 215, and 218) in the weaknesses condition showed a significant decrease in level on the OASIS and ODSIS. All patients showed a decrease in level on the MEAQ although for some patients (e.g., 210, 201, 214, 211, and 218) this reduction was small in magnitude. Thus, as predicted, there is preliminary evidence that personalized UP treatment leads to change in symptoms following a baseline period.

Effect sizes. To provide an additional examination of treatment outcomes, effect sizes were calculated. Effect sizes are considered significant if their 95% confidence intervals (CIs) do not include zero; significant effects were interpreted conservatively with 0.2, 0.5, and 0.8 representing small, medium, and large effects, respectively (Cohen, 1988). First, standardized mean gain (ESsg) was calculated to examine the magnitude of change from pre- to posttreatment in the full sample. These effect sizes indicated a significant reduction in anxiety on the OASIS that was large in magnitude (ESsg = −1.25, *SEsg* = 0.42, 95% CI = [−2.07, −0.42]). Similar significant, large effects were seen for depression on the ODSIS (ESsg = −0.82, *SEsg* = 0.27, 95% CI = [−1.35, −0.30]) and experiential avoidance on the MEAQ (ESsg = −1.38, *SEsg* = 0.39, 95% CI = [−2.14, −0.62]). These large overall effect sizes suggest that delivering the modules in a nonstandard order leads to promising symptom improvement.

Second, Hedges *g*, an effect size that includes a correction for small sample sizes, was used to compare the conditions at posttreatment. Results suggest that there are no significant differences between the two conditions at posttreatment: OASIS (Hedges *g* = −.51, *SE* = .59, 95% CI = [−1.67, 0.63]), ODSIS (Hedges *g* = 0, *SE* = .58, 95% CI = [−1.13, 1.13]), and MEAQ (Hedges *g* = 1.05, *SE* = .62, 95% CI = [−0.16, 2.25]). These results indicate that there was relative equivalence among both conditions, which is to be expected as every patient received the same modules and skills by the end of treatment.

Preliminary Investigation of Strengths Versus Weaknesses

A secondary aim of the present study was to explore whether prioritizing strengths versus weaknesses resulted in more efficient reductions in our outcome measures. Of note, patients 201, 208, and 214 did not show significant spread in skill; however, their data did not appear systematically different from the other study patients.

Visual inspection. Given our finding that patients in both conditions demonstrated equivalent symptom reduction by posttreatment, visual inspection to explore treatment efficiency primarily focused on differences in level and slope of scores between the baseline phase and early sessions from the treatment phase (i.e., treatment Sessions 1 and 2; see Figures 1 and 2). Following the first UP module (corresponding to Sessions 1 and 2 on the graphs), four patients in the strengths condition (67%; 201, 203, 206, and 214) had scores on the OASIS, ODSIS, and MEAQ that fell below baseline data points during at least one the first two sessions. In the weaknesses condition, two patients (33%; 209, 210) had an OASIS score below baseline data points, one (16%;

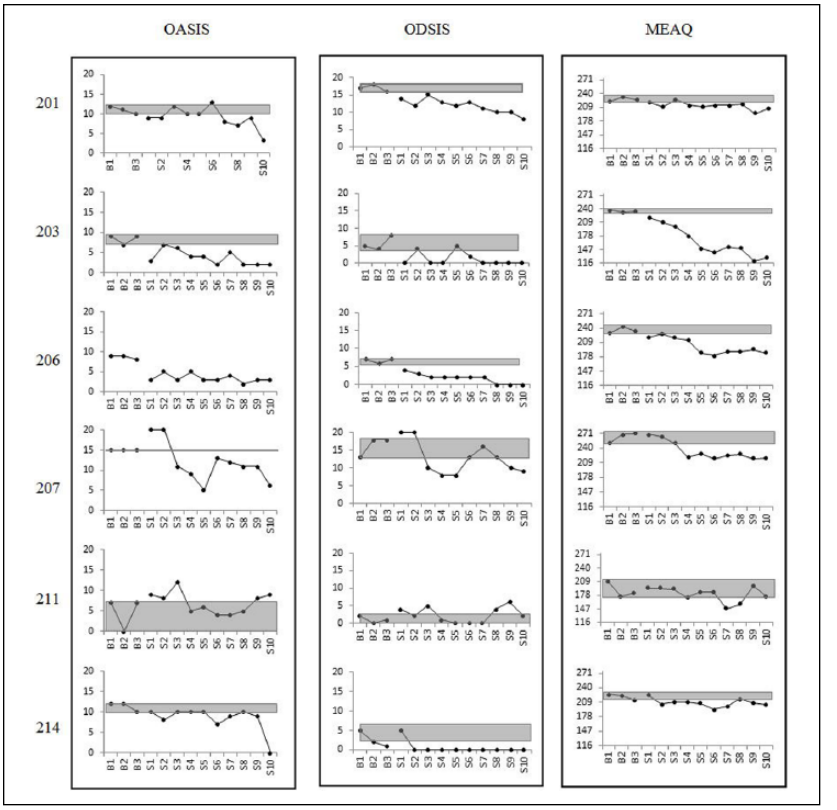

Figure 1. Graphs for OASIS, ODSIS, and MEAQ scores for patients in the strengths condition.
Note. OASIS = Overall Anxiety Severity and Impairment Scale; ODSIS = Overall Depression Severity and Impairment Scale; MEAQ = Multidimensional Experiential Avoidance Questionnaire.

209) had an ODSIS score below baseline data points, and two (33%; 209, 215) had an MEAQ score below baseline data points within the first two sessions. These results provide preliminary evidence that a faster reduction in symptoms was demonstrated for patients in the strengths condition. These analyses are examined quantitatively in the sections below.

Percentage of nonoverlapping data (PND). PND was used to bolster visual inspection analyses evaluating which treatment condition led to more efficient treatment gains. PND is calculated to determine the effectiveness of a

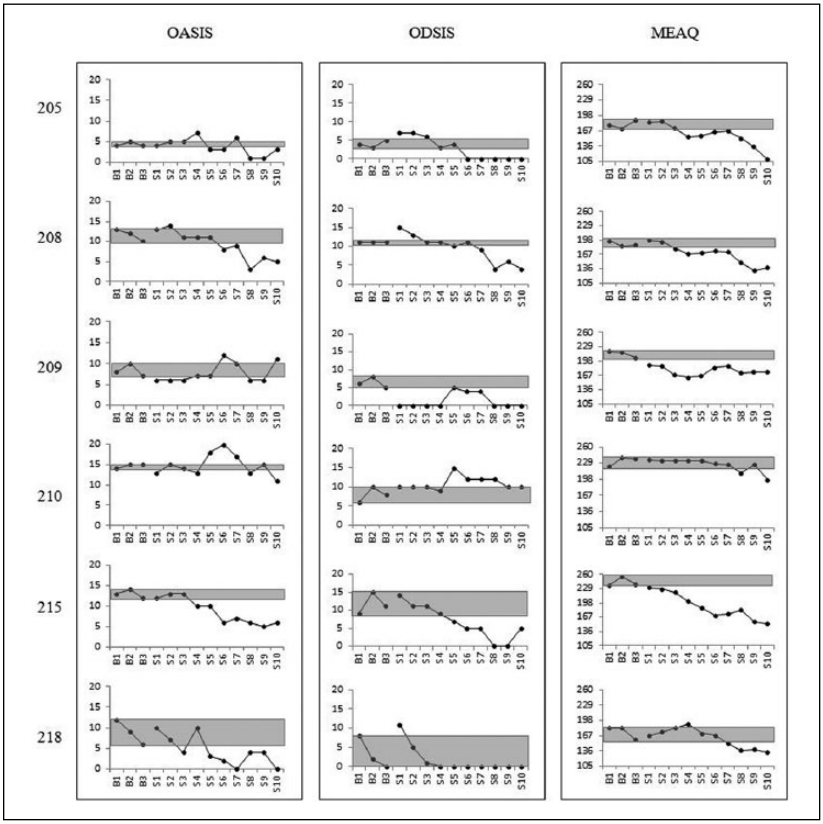

Figure 2. Graphs for OASIS, ODSIS, and MEAQ scores for patients in the weaknesses condition.
Note. OASIS = Overall Anxiety Severity and Impairment Scale; ODSIS = Overall Depression Severity and Impairment Scale; MEAQ = Multidimensional Experiential Avoidance Questionnaire.

treatment, particularly for SCED studies (Tarlow & Penland, 2016a). Nonoverlapping data include any scores from the treatment phase that do not coincide with the range of scores in the baseline phase. By using the number of nonoverlapping scores between the two phases and the total number of baseline and treatment time points (3 and 10, respectively), an online calculator was utilized to determine the PND and the corresponding *p* value for each patient in OASIS, ODSIS, and MEAQ (Tarlow & Penland, 2016b). To be considered significant, the PND must be greater than or equal to 70% (Scruggs & Mastropieri, 1998). In the current study, higher PND values indicate more efficient treatment because a faster reduction in scores yields a higher value.

PND scores are reported in Table 4. Overall, patients in the strengths condition had a greater number of significant PND scores than patients in the weaknesses condition on all three measures. Five out of six patients in the strengths condition (201, 203, 206, 207, and 214) had significant PND based on the MEAQ, whereas only three patients in the weaknesses condition (208, 209, and 215) had significant PND. Together, on OASIS and ODSIS, five patients in the strengths condition (201, 203, 206, 207, and 214) had significant PND. Only one patient in the weaknesses condition (209) had significant PND on OASIS or ODSIS.

Average session at which scores fell below baseline for the first and final times. Finally, identifying the average session at which a patient's treatment scores falls below baseline scores is another means by which we can determine if personalizing module order by strengths versus weaknesses is an efficient way to treat patients. Looking at both the first point and final point at which a patient's scores fall below the lowest baseline point allows for the examination of which condition may lead to improvement more quickly and efficiently in the treatment phase. Patients in the strengths condition tended to have an earlier average session in which their treatment scores fell below their baseline for the first time. For the ODSIS, OASIS, and MEAQ, patients in the strengths condition had an average session of 2.16 (SD = 1.60), 3.00 (SD = 3.52), and 2 (SD = 1.26), respectively. The patients in the weakness condition had an average session of 5.16 (SD = 2.92) for ODSIS, 3.33 (SD = 2.06) for OASIS, and 4 (SD = 2.96) for MEAQ. Altogether, this provides a preliminary indication that patients in the strengths condition had greater initial success with treatment than those in the weakness condition.

Similarly, individuals in the strengths condition had an earlier average session in which their scores fell and stayed below baseline scores than those in the weakness condition. For the OASIS and ODSIS, patients in the strengths condition fell and stayed below baseline at an average of 5.5 sessions (SD = 3.67) and 4.83 sessions (SD = 4.07), respectively, whereas individuals in the weaknesses condition had an average of 7.16 sessions (SD = 2.56) and 6.33 sessions (SD = 2.06), respectively. Individuals in the weakness condition had an average session of 4.33 (SD = 3.56) for MEAQ, which is earlier than the average session for strengths, which was 4.66 (SD = 3.93). This may suggest that patients in the strengths condition showed symptom improvement sooner than those in the weaknesses condition.

Discussion

This study sought to evaluate the feasibility and acceptability of personalized delivery of a modular, transdiagnostic treatment. First, as hypothesized, we

Table 4. PND for OASIS, ODSIS, and MEAQ for Each Patient.

Patient	Condition	Measure	PND	Significance
201	Strength	OASIS	60.00	.0987
		ODSIS	100.00	.0022*
		MEAQ	90.00	.0097*
203	Strength	OASIS	90.00	.0097*
		ODSIS	80.00	.0260*
		MEAQ	100.00	.0022*
205	Weakness	OASIS	50.00	.1622
		ODSIS	50.00	.1622
		MEAQ	70.00	.0545
206	Strength	OASIS	100.00	.0022*
		ODSIS	100.00	.0022*
		MEAQ	100.00	.0022*
207	Strength	OASIS	80.00	.0260*
		ODSIS	50.00	.1622
		MEAQ	80.00	.0260*
208	Weakness	OASIS	50.00	.1622
		ODSIS	50.00	.1622
		MEAQ	80.00	.0260*
209	Weakness	OASIS	50.00	.1622
		ODSIS	90.00	.0097*
		MEAQ	100.00	.0022*
210	Weakness	OASIS	40.00	.2484
		ODSIS	0.00	1.0000
		MEAQ	20.00	.5027
211	Strength	OASIS	50.00	.2750
		ODSIS	30.00	.4873
		MEAQ	30.00	.3609
214	Strength	OASIS	50.00	.1622
		ODSIS	90.00	.0097*
		MEAQ	80.00	.0260*
215	Weakness	OASIS	70.00	.0545
		ODSIS	60.00	.0987
		MEAQ	100.00	.0022*
218	Weakness	OASIS	70.00	.0545
		ODSIS	0.00	1.0000
		MEAQ	40.00	.2484

Note. PND = percentage of nonoverlapping data; OASIS = Overall Anxiety, Severity, and Impairment Scale; ODSIS = Overall Depression Severity and Impairment Scale; MEAQ = Multidimensional Experiential Avoidance Questionnaire.
*denotes significance at the .05 level

found that the majority of our sample (nine of 12 treatment completers) reached our a priori threshold for significant spread in skill levels across modules prior to starting treatment. As most individuals had clear relative strengths and weaknesses, reordering modules based on patients' presenting skill-levels appears feasible. Second, patients in both conditions rated their personalized order of UP modules as highly acceptable and indicated that they were satisfied with the treatment they received, though a third of patients (four of 12) reported that they wished to have received the Understanding Emotions module earlier in the sequence. Given the introductory and foundational nature of this module, it makes intuitive sense that patients would have preferred it earlier in treatment. Third, we found that patients showed a strong understanding of treatment concepts and that reordering modules did not negatively affect learning. Finally, visual inspection and effect size data suggest that the majority of patients demonstrated meaningful reductions in anxiety, depression, and emotional avoidance from pre- to posttreatment; these reductions were similar in magnitude to the reductions in depression and anxiety in previously reported UP trials (e.g., Barlow et al., 2017).[2] There were no differences between conditions at posttreatment, which is not particularly surprising given that, by the end of treatment, all patients had received the same five modules (albeit in a personalized order). Overall, these data provide preliminary support for the feasibility and acceptability of personalizing the sequence of the UP based on patients' pretreatment skill-levels.

An exploratory goal of this pilot study was to compare strategies for reordering modules (prioritizing patients' strengths vs. weaknesses) on the efficiency of improvements for both symptom outcomes and core processes (i.e., emotional avoidance). Though we anticipated that all participants would demonstrate similar results by the end of treatment, it was unclear whether either condition would demonstrate meaningful changes on outcomes earlier in treatment, such as by Session 1 or 2. Preliminary results suggest that individuals in the strengths condition demonstrated earlier change in symptoms of anxiety, depression, and emotion avoidance than individuals in the weaknesses condition, evidenced by visual inspection and PND. This finding is in line with similar research on treatment personalization, which found that capitalizing on strengths leads to steeper trajectories of change for depressive symptoms (Cheavens et al., 2012). Stable early change on treatment targets is imperative for improving treatment efficiency and reducing the burden of mental illness. Patients in community practice attend fewer sessions than the recommended lengths for most evidence-based interventions, making it necessary to explore innovative strategies to enact change more quickly (Garfield, 1994; Hansen et al., 2002; Harnett et al., 2010). In addition, waitlists at

community clinics are typically quite long (CBHSQ, 2015), so more efficient treatments may reduce service capacity limitations.

It is important to note that the conclusions of the current study should be understood in the context of its limitations. The sample size of the study was fairly small, though customary for the use of stringent SCED methodology and data analyses. As described earlier, each individual served as his or her own control in the SCED framework, allowing for the comparison of the baseline (assessment-only phase) and the treatment phase and offsetting this limitation for the feasibility/acceptability aims. However, although results from this study provide preliminary support for capitalizing on patients' existing strengths as a means to promote more efficient symptom reduction, our small sample sizes precluded the use of group-based comparisons assessing outcomes as a function of strengths versus weaknesses. Larger studies that allow for inferential tests are necessary. Furthermore, a larger sample may allow for fine-grained examination of module placement (e.g., How does mindfulness perform when it is the first vs. last module?) to determine whether certain modules' positions are more associated with improvements. In addition, it is possible that the advantage of prioritizing strengths is not as pronounced when compared with a standard treatment order (instead of prioritizing weakness, as was done in the present study). In addition, another next step toward personalization and treatment efficiency would be to provide only a limited number of modules to patients. Identifying the smallest number of modules necessary to produce the most potent improvements is an essential future direction in treatment personalization.

As the present study only collected data during the baseline and the treatment phase, an additional limitation of this investigation is the absence of outcomes on anxiety, depression, and emotional avoidance in the months following treatment completion. Research in this area suggests that patients continue to improve during a follow-up phase (Comer & Kendall, 2013) and it is possible that the two conditions in this study may have shown differential improvements during this period. With regard to procedures for ordering UP modules, a small but significant minority (three of 12 patients) did not reach our a priori threshold for clinical significant differences in skill-level as a function of module; thus, it is possible that reordering treatment for these individuals may not provide an advantage above standard delivery of the UP. More research is needed to determine an empirically established threshold for skill-level spread that informs when it would be clinically useful to sequence modules according to strengths and weaknesses. Finally, the present study collected satisfaction/acceptability data for the overall treatment, rather than following each module, precluding our ability to explore patient responses to each individual module.

Another consideration is the fact that the present study did not include a formal emotion exposure module, though the standard UP includes this component. We elected to exclude this module for several reasons. First, we were interested in understanding the implications of ordering treatment according to skill strengths and weakness and emotion exposures is therapeutic activity, rather than a coping skill. In addition, when considering a measure that could be used to quantify the "skill" of emotion exposure, we found it difficult to differentiate from our measure of behavioral avoidance (used for the Countering Emotion Behaviors module); in fact, encouraging patients to act opposite to emotional avoidance, as is done in this module, can function as an exposure, suggesting that this treatment strategy was provided informally. Although the exclusion of the formal emotion exposures module from the UP may have affected the conclusions that can be drawn regarding personalizing this specific intervention, the present study provides important information about the overall process of ordering skills according to relative strengths.

Conclusion

In sum, findings from this investigation point to the feasibility and acceptability of personalizing treatment based on patients' skills prior to starting treatment. Preliminary findings suggest that a strengths-based approach that capitalizes on patients' existing skills may lead to changes in treatment targets earlier in treatment. In addition, the UP, an already efficient, transdiagnostic treatment, may be further improved by personalizing its delivery based on each patient's individual strengths and weaknesses. This finding has important implications for treatment personalization and efficiency.

Declaration of Conflicting Interests

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Notes

1. A different measure was used to assess gains in the Countering Emotional Behaviors module in the Sauer-Zavala, Cassiello-Robbins, et al. (2017) study; we were not satisfied with its sensitivity to measure change in the Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders (UP) treatment, so

our research group developed the measure cited above. Results from the validation article cited above suggest the UP Behavioral Avoidance Questionnaire (UP-BAQ) adequately captures movement on skills associated with its associated UP module.

2. Using the same outcome measures that were reported in the current study, Barlow et al. (2017) found large reductions in anxiety symptoms (ESsg = 1.41) and medium reductions in depressive symptoms (ESsg = .58).

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