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A probabilistic and individualized approach for predicting treatment gains: An extension and application to anxiety disordered youth

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Abstract

The objective of this study was to extend the probability of treatment benefit method by adding treatment condition as a stratifying variable, and illustrate this extension of the methodology using the Child and Adolescent Anxiety Multimodal Study data. The probability of treatment benefit method produces a simple and practical way to predict individualized treatment benefit based on pretreatment patient characteristics. Two pretreatment patient characteristics were selected in the production of the probability of treatment benefit charts: baseline anxiety severity, measured by the Pediatric Anxiety Rating Scale, and treatment condition (cognitive-behavioral therapy, sertraline, their combination, and placebo). We produced two charts as exemplars which provide individualized and probabilistic information for treatment response and outcome to treatments for child anxiety. We discuss the implications of the use of the probability of treatment benefit method, particularly with regard to patient-centered outcomes and individualized decision-making in psychology and psychiatry.

Keywords

Child/adolescent anxiety; evidence-based treatment; individualized treatment benefit; patient-centered decision making; treatment response and outcome

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Effect sizes are used as indicators of magnitude of treatment response and outcome in randomized controlled trials (Cohen, 1977). Although Cohen's *d* and other effect size indicators are useful in representing information about the *average* effects of treatments across youth, they do not illustrate the likelihood that a *particular* youth will benefit from a given treatment. (Westen, Novotny, & Thompson-Brenner, 2004). Moreover, individuals vary in the likelihood that they will respond to a given treatment (Lindhiem, Kolko, & Cheng, 2012; Westen et al., 2004). Various recommendations have been made when considering how to assess clinical impact of treatment on patients (Kraemer, Frank, & Kupfer, 2011; Lindhiem et al., 2012). The probability of treatment benefit (PTB) method is a new methodology that can provide further information on clinical impact of treatment in an individualized and patient-centered manner.[1]

The PTB method (Lindhiem et al., 2012) was introduced as a strategy that supplements effect size indices by providing *individualized* information about the likelihood that a treatment will benefit a particular child thus allowing patients and caregivers to make an informed decision based on their individual characteristics (PCORI, 2012). The PTB method summarizes the probability, in percentages, that an individual youth will have a favorable treatment benefit based on a set of baseline characteristics. One of the compelling reasons to use the PTB method to assess clinical impact of treatment on patients is that it is easy to understand and provides individualized information. There are two critical features of the PTB method. First, the PTB method is based on the premise that prediction must be probabilistic: for two variables that are not perfectly correlated, the value of one variable cannot predict the value of the second variable with certainty. Second, the PTB method underscores the differences between treatment response and treatment outcome, two terms often used interchangeably (Lindhiem et al., 2012). In the PTB method, "*response* is the magnitude of change from pre- to postassessment, and *outcome* is post-treatment status" (Lindhiem et al., 2012, p. 382). This distinction is important because a particular youth can have differing response and outcome with regard to a treatment modality. For example, a youth with severe psychopathology may have a high probability of treatment response (i.e., magnitude of change from pre- to posttreatment is large) but a low probability of treatment outcome (i.e., nonclinical status at posttreatment). The PTB methodology is distinct from other statistical methods, such as tests of moderation or effect sizes, given its focus on individual prediction in probabilistic terms, resulting in ease of interpretation and clinical utility.

Ultimately, the value of the PTB method lies in its potential clinical utility. Specifically, the PTB method has the potential to be used a decision-support tool to help patients and their families make evidence-based decisions around treatment selection. For example, the PTB method can help an anxious youth and their family decide between three effective treatments (i.e., cognitive-behavioral therapy, sertraline, or their combination) based on the youths individual characteristics. The PTB methodology (Lindhiem et al., 2012) was first applied to an effectiveness trial of a modular treatment for child and adolescent disruptive behavior disorders (Kolko et al., 2009). This initial demonstration of the PTB method explained the rationale behind the methodology and demonstrated proof-of-concept with regard to an evidence-based treatment for disruptive behavior disorders. One stratification variable, baseline severity of symptoms, was used in this initial paper (Lindhiem et al., 2012). The objective of the current study was to extend the PTB method by including two stratification variables and illustrate it using the Child and Adolescent Anxiety Multimodal Study (CAMS; Walkup et al., 2008) data.

[1]PTB = Probability of treatment benefit, CAMS = Child and Adolescent Anxiety Multimodal Study

To use the PTB method, it is necessary to identify baseline predictors of treatment benefit. A review of the literature suggests that few variables have consistently emerged as robust baseline predictors of treatment response and outcome across randomized controlled trials of child anxiety treatment. For example, age (e.g., Alfano et al., 2009), IQ (e.g., Southam-Gerow, Kendall, & Weersing, 2001), sex (e.g., Birmaher et al., 2003), comorbidity of internalizing and/or externalizing diagnoses (e.g., Birmaher et al., 2003; Ginsburg et al., 2011), and baseline symptom severity (e.g., Southam-Gerow et al., 2001) have all been posited as potential predictors of treatment benefit. Age is an inconsistent predictor, with some studies identifying age as a predictor of treatment benefit (Ginsburg et al., 2011; Southam-Gerow et al., 2001), whereas others finding no significant relationship (Alfano et al., 2009; Birmaher et al., 2003). Most studies have not identified a significant relationship between sex and treatment benefit (e.g., Ginsburg et al., 2011; Hirshfeld-Becker et al., 2010) or comorbidity of diagnoses and treatment benefit (Ollendick, Jarrett, Grills-Taquechel, Hovey, & Wolff, 2008). Baseline symptom severity has emerged as one of the most robust predictors of treatment benefit in a number of child anxiety treatment trials, including the CAMS trial (Birmaher et al., 2003; Compton et al., in review; Ginsburg et al., 2011; Kley, Heinrichs, Bender, & Tuschen-Caffier, 2012; Liber et al., 2010; Southam-Gerow et al., 2001; The Research Units on Pediatric Psychopharmacology Anxiety Study Group, 2002). Another predictor of treatment benefit is treatment condition. Treatment condition was a robust predictor of outcome in the CAMS trial (Walkup et al., 2008). Further, it is one of the few (if not only) stratification variables that patients have a choice about. Therefore, we elected to include baseline symptom severity and treatment condition as the two stratification variables in this study.

Given the potential demonstrated by the PTB method, we were interested in applying it to an efficacy trial for child and adolescent anxiety (CAMS; Walkup et al., 2008) to extend the methodology. The initial application of the PTB method only used one stratification variable (i.e., severity), whereas in this study, we use two stratification variables (i.e., baseline symptom severity and treatment condition) to extend the methodology. In this study, we use the CAMS data to illustrate this new extension of the PTB method, but we do not present any novel data from the CAMS trial.

Method

CAMS Method

Participants—Participants were those in the CAMS trial (NCT00052078; Walkup et al., 2008). Recruitment occurred from December 2002 through May 2007 at Duke University Medical Center; New York State Psychiatric Institute—Columbia University Medical Center—New York University; Johns Hopkins Medical Institutions; Temple University; University of California, Los Angeles; and Western Psychiatric Institute and Clinic—University of Pittsburgh Medical Center. Additional information about recruitment and enrollment, including a Consolidated Standards of Reporting Trials (CONSORT) flowchart, is provided in other reports (Compton et al., 2010; Walkup et al., 2008). Individuals were eligible if they were between the ages of 7 and 17 years and met criteria for a primary diagnosis of Social Anxiety Disorder (SAD), Generalized Anxiety Disorder (GAD), or Social Phobia (SP) according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR; American Psychiatric Association, 2000).

To summarize, a total of 488 participants (M_{age} = 10.7 years, *SD* = 2.8 years) underwent randomization. Males (50.4%) and females (49.6%) in the sample were primarily non-Hispanic White (78.9%), with 12.1% Hispanic, 9.0% African American or Black, 2.5% Asian, 1.2% American Indian, and 8.4% other. Twenty-five percent were of low

socioeconomic status, defined as a score of 3 or less on the Hollingshead Two-Factor Scale (Hollingshead, 1957). The majority (78.6%) of participants had comorbid diagnoses.

Procedures

All procedures were approved and monitored by institutional review boards, and by the data and safety monitoring board of the National Institute of Mental Health. Parental consent and child assent was obtained by all study participants. Participants were recruited through a variety of means (e.g., flyers, TV, radio ads, websites) and study enrollment occurred at multiple sites representing a range of demographic and geographic locations. Participants completed a three stage screening process; if participants were deemed eligible, a baseline assessment determined participants' pretreatment parent and child ratings regarding anxiety, relevant comorbidity, and child and family functioning before being randomized to treatment. Participants were required to meet criteria for a principal diagnosis of GAD, SAD, and/or SP. Youth who met diagnostic criteria for another DSM-IV-TR disorder, with the exception of major depressive disorder, bipolar disorder, pervasive developmental disorder, or schizophrenia, were also allowed to participate as long as the disorder was not principal or co-principal. Children who failed an adequate trial of a psychotropic medication or cognitive-behavioral therapy (CBT) were excluded from participation.

Following the baseline assessment, participants were randomly assigned to one of four conditions: CBT (Coping Cat; Kendall & Hedtke, 2006a, 2006b) medication (sertraline), CBT + sertraline (combination), or pill placebo. The Coping Cat program (Kendall & Hedtke, 2006a, 2006b) was adapted for the patients' age and study duration (Kendall, Gosch, Furr, & Sood, 2008) and involved 14 60-minute sessions over 12 weeks. The sertraline, combination, and placebo conditions involved 14 sessions, either in person or over the phone, of 30 to 60 minutes over the course of 12 weeks. Sertraline was administered on a fixed-flexible schedule beginning with 25 mg per day and adjusted up to 200 mg per day by week 8. Through week 8, patients who were considered to be mildly ill or worse and who had minimal side effects were eligible for dose increases. Independent evaluators were blind to treatment condition at the time of the assessment. Readers are referred to (Compton et al., 2010; Walkup et al., 2008) for a full description of study procedures.

Missing data analyses—At post-treatment, 10.2% of PARS data were missing due to attrition, and no variables were found to be predictive of attrition. Missing values were imputed, assuming missingness at random, using the Markov chain Monte Carlo (MCMC) procedure (Gilks, Richardson, & Spiegelhalter, 1996). For this imputation, MCMC was used to create twenty independent draws of missing data from a predictive distribution, and pooled inferential statistics were calculated from these imputed datasets using the Statistical Package for the Social Sciences (SPSS) 17.0 statistical package with Missing Values add-on.

Measures

The primary measure of treatment benefit was the Pediatric Anxiety Rating Scale (PARS; The Research Units on Pediatric Psychopharmacology Anxiety Study Group, 2002). The PARS is a 50-item dimensional measure of anxiety severity, administered by an independent evaluator (IE), that takes into account both child- and parent-report. Total scores are computed by the IE (anxiety severity, frequency, distress, avoidance, and interference during the previous week). PARS 6-item total scores range from 0 to 30. The PARS has demonstrated excellent interrater reliability (ICC of 0.97), adequate retest reliability (0.55), and fair internal consistency (The Research Units on Pediatric Psychopharmacology Anxiety Study Group, 2002). Additionally, the PARS is sensitive to treatment response (The

Research Units on Pediatric Psychopharmacology Anxiety Study Group, 2002). Psychometric studies of the PARS have included participants from clinical (e.g., The Research Units on Pediatric Psychopharmacology Anxiety Study Group, 2002) and community samples (Ginsburg, Keeton, Drazdowski, & Riddle, 2010). In this study, we use PARS total score collected at baseline and 12 weeks (following active treatment). Inter-rater reliability on administration of the PARS in the CAMS trial was determined based on a review of 10% of videotaped assessments conducted at pre- and posttreatment (Pearson's r = .85; Walkup et al., 2008).

PTB Method

The major PTB steps include (1) baseline stratification of the data set, (2) selection of dichotomous variables to quantify both response and outcome, (3) estimation of probability values and confidence intervals, and (4) cross-validation.

Baseline stratification—The dataset was stratified by baseline severity (three levels) and treatment (four conditions) for a total of 12 groups (baseline severity by treatment condition). Baseline severity conditions were "Mild" (< 16 on the PARS; n = 129), "Moderate" (17–22 on the PARS; n = 252), and "Severe" (> 23 on the PARS; n = 106)[2]. The treatment conditions were combination (CBT + sertraline), sertraline, CBT, and Placebo.

Dichotomous outcome and response variables—In order to make individualized predictions in probabilistic terms, outcomes must be categorical. To achieve this, we created dichotomous variables to quantify (a) treatment response and (b) treatment outcome. Treatment response ("Response") was defined as whether or not a patient made reliable gains from pre- to posttreatment based on the Reliable Change Index (RCI; Jacobson & Truax, 1991). The RCI was estimated as 8 for the PARS, using the RCI equation (Jacobson & Truax, 1991). Because rates of deterioration (reliable worsening of symptoms based on the RCI) were so low in the sample (n = 1; 0.2% for the PARS), "Deterioration" was not predicted as an outcome. We chose treatment outcome variables to reflect concepts of clinical significance (Jacobson, Follette, & Revenstorf, 1984; Jacobson & Truax, 1991; Kendall, Marrs-Garcia, Nath, & Sheldrick, 1999). The first variable, "Normal Range" (Yes = 1; No = 0), indicates whether or not a patient is within the normal range at posttreatment (0–10 on the PARS). The second variable, "Clinical Range" (Yes = 1; No = 0), indicates whether or not a patient is within the clinical range at posttreatment (11–30 on the PARS). Receiver operating characteristic methods derived from signal detection theory (Swets & Pickett, 1982) assessed the performance of various PARS posttreatment scores at predicting loss of all targeted diagnoses on the Anxiety Disorders Interview Schedule-IV-Child and Parent (ADIS-IV-C/P; Silverman & Albano, 2006). For each PARS posttreatment score, *efficiency* (probability that the test and the gold standard agree) values guided the decision-making for the cutoff between "clinical" and "normal" ranges (see Caporino et al., 2013).

Probability estimates—Logistic regression models were used to estimate the probabilities of ending treatment in the normal range, ending treatment in the clinical range, and making reliable gains during treatment. The probabilities were estimated from the logistic models by inverting the intercept and logit coefficients back to the probability scales. Specifically, the formula $p_0=\frac{\exp(\alpha)}{1+\exp(\alpha)}$, where α is the intercept of a logistic model, was used to estimate the probability of having an outcome or response of interest for a patient with reference level of severity in the reference treatment condition. The formula $p_1=\frac{\exp(\alpha+\beta)}{1+\exp(\alpha+\beta)}$, where β is the estimated log odds ratio for that level, was used to

estimate the probability of having the same outcome or response for a patient with severity other than the reference level in a treatment condition other than the reference condition. Confidence intervals were individually calculated using the standard errors. The expected (median) treatment response and outcome at baseline were also estimated for each of the twelve groups.

Cross-validation—Split-half cross-validation was conducted by randomly selecting half of the sample for each subgroup and estimating the probability values, as described above, for each of the randomly selected subgroups separately.

Results

Interpreting the PTB Method

Treatment outcome—The PTB chart is displayed in Table 1 whereas confidence intervals are displayed in Table 2. Probability values are significantly different from one another when they have non-overlapping 95% confidence intervals. Overall, study participants had a 58% probability (95% CI = 53–62%) of ending the treatment phase of the study in the normal range on the PARS (i.e., 0–10). The median PARS score at posttreatment was 9. However, there was variability in the probability values depending on baseline severity and treatment condition. For example, the probability of ending the treatment phase of the study in the normal range on the PARS ranged from 22% (severe patients in the placebo condition) to 78–80% (mild patients in any of the three active treatment conditions). In general, patients receiving the combination treatment had the highest probability of ending treatment in the normal range (62–78% depending on baseline severity) whereas patients in the placebo condition had the lowest probability (22–52% depending on baseline severity). Interpretation of PTB Tables 1 and 2 suggests that combination treatment was superior to either monotherapy, but only for moderate and severe cases of anxiety. For mild cases of anxiety, all three active treatment conditions had comparable probabilities of ending treatment in the normal range (78–80%).

Treatment response—Study participants had a 61% chance (95% CI = 57–66%) of making reliable gains on the PARS as defined by the RCI. The median improvement was 10 points. Again, there was variability depending on baseline severity and treatment condition. For example, the probability of making reliable gains on the PARS ranged from 27% (mild patients in the placebo condition) to 94% (severe patients receiving combination treatment). Patients receiving the combination treatment had the highest probability of making reliable gains (59–94% depending on baseline severity) whereas patients in the placebo condition had the lowest probability (27–68% depending on baseline severity). From Tables 1 and 2, we see that combination treatment was generally superior to either monotherapy in terms of response, but only for moderate and severe cases of anxiety. For mild cases of anxiety, all three active treatment conditions had comparable probabilities of making reliable gains (43–59%).

Cross validation—Results from the cross-validation yielded probability values that were all within five percentage points (M = 1.77%, SD = 1.57%) of those reported in PTB Table 2. Also, the same decreasing or increasing trends across severity groups were observed for both sets of probabilities generated from the split-halves. The split-half cross validation therefore indicated that the proposed method would likely provide reliable predictions with a new sample taken from the same population.

Discussion

The PTB method is a patient-centered complement to effect sizes when interpreting the results of randomized controlled trials and addresses questions related to individual benefit from treatment. In CAMS, the overall effect sizes suggest that the average anxious child will end treatment .86 standard deviations below his or her pre-treatment level if s/he receives combination treatment, .31 standard deviations if s/he receives CBT, and .45 if s/he receives sertraline. This would suggest that clinicians could recommend combination treatment to all anxious youth. However, effect sizes do not provide information on the probability that a particular anxious youth will actually experience a .86 reduction in symptoms at posttreatment, given that there is variability in response and outcome not represented in the effect size.

The PTB method provides a more nuanced understanding of treatment options based on pretreatment characteristics and treatment gains as measured by the PARS. Specifically, the PTB method allows for a more simplified and individualistic presentation of treatment benefit for a particular youth. For youth in the mild range at pretreatment, all three therapies are comparable (combination, sertraline, and CBT) with regard to both response and outcome. Generally, for youth in the moderate and severe range, combination treatment emerges as the best option with regard to both response and outcome. Information provided in an individualized, probabilistic, and understandable format allows families to make an informed decision regarding the best treatment for their child, creates transparent communication to patients and their families and calibrates patient expectations. For example, it is important for patients and families to know that they will likely to continue to experience symptoms after treatment if they present to treatment with severe symptoms.

Consider an anxious youth who is in the mild range on the PARS during the acute treatment phase. The present findings indicate that this youth has efficacious options. Treatment using combination (CBT + sertraline) or CBT would result in a 78% chance of being in the normal range after treatment. The option of treatment with sertraline suggests an 80% chance of being in the normal range after treatment. In this case, the clinician can help the youth and family explore the options with regard to their preferences, given that all three options produce comparable benefits. Potential questions include: How do the youth and family feel about medication? Do the youth and family have interest and time to commit to weekly sessions? In the case of a severely anxious youth, if the patient chooses combination, s/he has a 62% chance of being in the normal range after treatment, 27% if s/he chooses sertraline, and 49% if s/he chooses CBT alone. The decision point might be between combination and CBT alone. If the family has reservations about medication, they could decide to start with CBT and then add sertraline if the child does not respond to CBT as expected. Or, if the family is comfortable with medication, combination therapy may be initiated immediately. Of course, it is important to remember that this data provides information for families based on the acute treatment phase, and not long-term follow-up. It is possible that youth who receive combination treatment are less likely to relapse long-term, which would then provide more support for initiating combination treatment. Through these examples, the PTB method provides individualized information for patients and families, which makes decision-making about treatment choice more transparent and streamlined.

A benefit of the PTB method is its simplicity in providing information in an easy-to-digest format, rather than statistical terminology with which many patients and families are not familiar. The PTB method represents a step towards providing clear communication to clinicians, patients, and their families. This consideration is particularly important given research suggesting that clinicians report misgivings about applying the results of randomized trials to their patients (Stewart, Stirman, & Chambless, 2012) and a preference

for more individualized decision-making rather than average effect sizes (Stewart & Chambless, 2007). The PTB method has utility for researchers designing efficacy and effectiveness trials and can be constructed to include confidence intervals (see Table 2).

In this application of the PTB method, we used the largest available sample of treatment response and outcome in anxious youth, CAMS. Findings replicated previous work estimating response and outcome in disruptive behavior disorders (Lindhiem et al., 2012). This work extends the PTB method by using two stratifying variables, further suggesting its potential use as an evidence-based decision making tool. A limitation of this study, from the perspective of external validity, includes reliance on efficacy rather than effectiveness data. Future work would benefit from the application of PTB to data from community settings. It is likely that the findings presented within this study would not be generalizable to community settings given that patients in the CAMS trial may have different characteristics from patients typically seen in community clinics (e.g. Beidas et al., 2012; Ehrenreich-May et al., 2011; Southam-Gerow, Weisz, &Kendall, 2003). Further, resource constraints (i.e., time, cost, need for extensive training) suggest that a research tool such as the PARS would not be as appropriate for administration in practice settings, and other measures, such as the Child and Behavior Checklist (CBCL; Achenbach 1991) may be more appropriate. One caveat to keep in mind is that the data summarized in a PTB chart are specific to the setting in which it was developed. A PTB chart developed in one clinic or practice should not be used in another clinic or practice. Rather, we encourage those who want to use the PTB method to track outcome data specific to their own practice with which to create PTB charts for their own setting.

A number of other limitations must be mentioned. The first is that we only used two predictors as to stratify at baseline. The current iteration of the PTB method restricts the number of stratification variables, therefore we selected to use two predictors that were empirically validated and reflective of patient preference. Future plans include development of a more sophisticated web application for the PTB method that incorporates machine learning algorithms that will allow us to efficiently and flexibly add additional baseline variables. Second, the baseline stratification is somewhat arbitrary (e.g. how many groups). This limits the degree to which prediction about treatment response and outcome can be individualized, especially for patients who are close to the cut-off between one stratification and the next. A next approach would be to use an automated search algorithm to find participants from the data set who match the new patient on one or more characteristic(s). Given recent advances in technology and machine learning, PTB could be advanced by using automatized algorithms to estimate individualized treatment benefit for a particular patient based on several of their pretreatment characteristics easily accessed using electronic medical records. Finally, the PARS only reflects anxiety in the previous week and may not capture durable improvement or deterioration. Investigations of other measures of child anxiety that include parent and self-report are encouraged, particularly ones that are appropriate for community settings.

Future directions exist for the PTB method. First, we encourage the application to other mental health diagnoses. Second, exploration of other stratification variables, other than baseline severity and treatment condition, is warranted. Other baseline stratification characteristics could include parental anxiety (Kendall, Hudson, Gosch, Flannery-Schroeder, & Suveg, 2008), comorbidity (Lavigne et al., 2008), social support (Dadds & McHugh, 1992), life stress (Lavigne et al., 2008), referral source (Reyno & McGrath, 2006), and moderators found to be important in the CAMS trial (Compton et al., in review). We encourage mixed-methods research to explore the patient-centered response and outcomes that matter to patients and their families (e.g., quality of life (Gladis, Gosch, Dishuk, & Crits-Christoph, 1999); days of absence from school). Third, research is needed to explore

the impact of using the PTB method to guide patients in decision making. Does PTB-based decision making result in higher patient satisfaction and better patient response and outcome? Given that perceived benefit early in mental health treatment is an important predictor of remaining in treatment and preventing premature termination of treatment (Horwitz et al., 2012), understanding if the PTB method increases perceived benefit is critical. Generally, evidence from healthcare suggests that patient-centered care results in better patient response and outcomes as well as satisfaction (Stewart et al., 2000), and exploring this in mental health is imperative.

Implications

Policy

There has been an increasingly prominent emphasis on individualized and patient-centered treatment and outcomes, as evidenced by the National Institute of Mental Health Strategic Plan, Objective 3.2, to “expand and deepen the focus to personalize intervention research” (United States Department of Health and Human Services, National Institutes of Health, 2008). Further, the Patient Protection and Affordable Care Act has created and supports the non-profit organization, Patient Centered Outcomes Research Institute, whose mission is to “provide patients, their caregivers and clinicians with the evidence-based information needed to make better-informed health care decisions” (PCORI, 2012), which funds research to understand how to help patients make informed decisions about healthcare (Clancy & Collins, 2010). Less attention has been paid by mental health when considering individualized patient care and outcomes. The PTB method represents a step in moving the agenda of patient-centered care forward in mental health.

Practice

The PTB method provides a data-driven, simplistic, and clear way for clinicians, patients and their families to make important treatment decisions. Mental health treatments require significant financial and time investments on the part of youth and families. This method allows clinicians to help guide patients and families in making this difficult decision in a personalized way (Stewart & Chambless, 2007). The PTB method has the potential to help bridge the chasm between research and practice. One frequently cited concern from community clinicians with regard to evidence-based practice is that their patients do not resemble the patient population sampled in randomized controlled trials especially with regard to severity (Stewart et al., 2012; Westen et al., 2004). This belief, among other barriers, (e.g., Beidas, Edmunds, Marcus, & Kendall, 2012; Beidas & Kendall, 2010) has stymied the dissemination and implementation of evidence-based practices. PTB data can help clinicians decide *which* evidence-based practice they should implement with *which client* in a more personalized manner.

Conclusion

Psychology and psychiatry can advance in personalized care and the use of patient characteristics to determine which treatment option is best. The PTB method represents an effort to produce a simple and intuitive method to help patients, families, and clinicians make this decision in an evidence-based way.

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Table 1

PTB Method for PARS Stratified by Baseline Symptom Severity and Treatment Condition

PARS	Probability of Treatment Benefit (PARS)			Baseline Score: _____	
	Normal Range	Clinical Range	Improvement (Reliably Better)	Expected Response	Expected Outcome
Mild Combo	78%	22%	59%	10 pts	4
Mild SRT	80%	20%	47%	8 pts	5
Mild CBT	78%	22%	43%	7 pts	6
Mild Placebo	52%	48%	27%	3 pts	11
Moderate Combo	76%	24%	85%	13 pts	6
Moderate SRT	52%	48%	59%	10 pts	9
Moderate CBT	47%	53%	53%	9 pts	12
Moderate Placebo	37%	63%	44%	6 pts	13
Severe Combo	62%	38%	94%	16 pts	8
Severe SRT	27%	73%	62%	9 pts	16
Severe CBT	48%	52%	76%	12 pts	11
Severe Placebo	22%	78%	68%	10 pts	15
TOTAL	58%	42%	61%	10 pts	9

Note. PTB = Probability of Treatment Benefit, PARS = Pediatric Anxiety Rating Scale, Combo = combination (CBT + sertraline), SRT = sertraline, CBT = cognitive-behavioral therapy.

Table 2

PTB Method for PARS with 80% and 95% Confidence Intervals (CIs)

PARS	Probability of Treatment Benefit					
	Normal Range		Clinical Range		Improvement (Reliably Better)	
	80% CI	**95%CI**	**80% CI**	**95%CI**	**80% CI**	**95%CI**
Mild Combo	66 – 87	58 – 90	13 – 34	10 – 42	47 – 71	40 – 76
Mild SRT	69 – 87	62 – 90	13 – 31	10 – 38	37 – 57	32 – 62
Mild CBT	68 – 85	61 – 82	15 – 32	12 – 39	33 – 54	28 – 59
Mild Placebo	37 – 68	29 – 74	32 – 63	26 – 71	15 – 44	11 – 54
Moderate Combo	69 – 82	64 – 85	18 – 31	15 – 36	79 – 80	75 – 92
Moderate SRT	43 – 69	39 – 64	40 – 57	36 – 61	51 – 67	46 – 71
Moderate CBT	40 – 55	36 – 59	45 – 60	41 – 64	45 – 60	41 – 64
Moderate Placebo	26 – 48	22 – 55	52 – 74	45 – 78	33 – 56	28 – 61
Severe Combo	51 – 73	45 – 77	27 – 49	23 – 55	86 – 97	78 – 98
Severe SRT	16 – 42	12 – 51	58 – 84	49 – 88	49 – 74	42 – 79
Severe CBT	35 – 60	29 – 67	40 – 65	33 – 71	63 – 85	56 – 89
Severe Placebo	12 – 37	9 – 47	63 – 88	53 – 91	52 – 80	44 – 85
TOTAL	55 – 61	53 – 62	39 – 45	38 – 47	58 – 64	57 – 66

Note. PTB = Probability of Treatment Benefit, PARS = Pediatric Anxiety Rating Scale, Combo = combination (CBT + sertraline), SRT = sertraline, CBT =cognitive-behavioral therapy