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Behavioral Parent Training for Preschool ADHD: Family-Centered Profiles Predict Changes in Parenting and Child Outcomes

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Abstract

Objective: Behavioral parent training (BPT) is the first line of treatment for preschool-aged children with attention deficit hyperactivity disorder (ADHD); however, clinically significant improvements are not universal. In the current study, we employ a person-centered approach to create subgroups of families based on the intersection of multiple parent, child, and family pre-treatment factors. Further, we explore the utility of pre-treatment family profiles in predicting post-treatment differences in observed parenting behavior (i.e., behavioral control, parental warmth) and clinically significant change in child ADHD and oppositional symptoms.

Method: Longitudinal data were collected using observational and parent-, teacher- and clinician-reported assessments from 130 parent-child dyads ($M_{age=}$ 3.57, range = 3.0 - 4.11, 73.8% male, 69.2% White, 25.6% Hispanic) participating in BPT.

Results: Findings from the current study suggest three distinct family profiles, which consisted of one profile with high family stress (HFS) as evidenced by elevated symptomatology across parent, child, and family-level domains, a second profile with elevated parental anxiety (PA), and a final profile with elevated parental depression (PD). These family-centered profiles were differentially associated with changes in observed parenting practices. Specifically, the PD profile (39%) demonstrated minimal improvements in behavioral control and warmth following treatment. In contrast, the HFS profile (30%) only improved in behavioral control and the PA profile (31%) improved in both parenting domains following treatment. In addition, marginally significant differences in child oppositional and ADHD symptoms were observed across profiles.

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Conclusions: Family-centered approaches may be useful for selecting and implementing interventions.

Keywords

Behavioral parent training; preschool; ADHD; ODD; person-centered

Attention deficit hyperactivity disorder (ADHD) is a childhood-onset neurodevelopmental disorder that is characterized by a persistent pattern of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013). ADHD is one of the most prevalent disorders of childhood and, if left untreated, can persist throughout adolescence and into adulthood (e.g., Gordon & Hinshaw, 2015; Hinshaw et al., 2012; Modesto-Lowe, Danforth, & Brooks, 2008) resulting in significant impairments in family, academic, and peer settings (McConaughy et al., 2011; Wehmeier et al., 2010). Treatment of ADHD often involves reducing environmental risk and enhancing resilience processes in early childhood when behavior and brain patterns may be more plastic and easier to alter than in later childhood (Campbell et al., 2014; Sonuga-Barke et al., 2006). As such, the American Academy of Pediatrics (2019) recommends behavioral parent training (BPT) as the first line of treatment for preschool-aged children with ADHD.

BPT interventions focus on modifying parenting practices to treat children's problem behaviors and have been consistently identified as an efficacious treatment for disruptive behaviors and ADHD (for reviews, see Comer et al., 2013; Pelham & Fabiano, 2008). However, clinically significant improvements from BPT are not universal (Hinshaw, 2007). In fact, a pressing issue facing BPT interventions is predicting who will benefit from participation and how to adapt BPT to be responsive to individual child and parent factors potentially influencing treatment effectiveness. While parent behavior is the proximal target of BPT (Forehand et al., 2014), studies examining for whom and under which conditions BPT is effective or ineffective have almost exclusively focused on moderators and predictors of child behavior change (e.g., Beauchaine et al., 2005; Gardner et al., 2010). As a consequence, our understanding of for whom and under which conditions *parenting* behavior changes in BPT is limited. Thus, understanding what may drive improvements in the proximal mechanism of change throughout treatment is paramount to informing how to adapt these interventions so that they are responsive to individual child and parent factors. Doing so is critical to ensuring a holistic, family-centered approach that would maximize BPT's effectiveness for all children and families.

Numerous parent, child, and family factors have been explored as potentially influencing BPT efficacy. Parental psychopathology (e.g., ADHD, depression, anxiety) has been shown to impact parents' ability to modify parenting behavior. Specifically, parental psychopathology has been linked to more overt negativity and coercive behavior in parent-child interactions (Lovejoy et al., 2000) as well as having been shown to directly interfere with a parent's ability to effectively implement parenting techniques taught in BPT (see review Chronis et al., 2004). For example, cross-cutting symptoms, such as inattention and emotion dysregulation, may impair parents' ability to consistently implement differential attention skills (e.g., attending to positive behaviors and actively ignoring

minor misbehavior), maintain positive involvement, and limit hostility or reactive discipline (Chronis-Tuscano et al., 2013). Additionally, given the bidirectional nature of parent-child interactions (Patterson, 1982; Sameroff & Mackenzie, 2003), child symptom characteristics may also influence parents' ability to implement new parenting skills - a link that may be explained, in part, by increases in parenting-related stress (Moen et al., 2016). Parents of children with ADHD experience more parenting stress than children without a clinical diagnosis (Theule et al., 2013) which, in turn, increases parents' risk of maladaptive parenting (Williford et al., 2007) and may influence how effectively mothers and fathers implement parenting skills learned in interventions (e.g., Kaiser et al., 2011).

Despite substantial research examining individual-level predictors of treatment response, there have been a lack of holistic, family-centered approaches to identifying predictors of change in parenting behavior following BPT. Previous studies have exclusively utilized variable-centered approaches that examine individual characteristics separately and that have produced mixed or limited support for specific predictors of BPT treatment response (e.g., Weeland et al., 2017; Leijten et al., 2013). In the current study, we employ a person-centered approach to create subgroups of families based on the intersection of multiple parent, child, and family factors. Person-centered approaches (Bergman & Magnusson, 1997; Sterba & Bauer, 2010) allow for closer alignment between the data analysis methods employed and the holistic-interactional theoretical models that serve as the foundation of behavioral parenting interventions (e.g., Forehand et al., 2014; McMahon & Forehand, 2003; Patterson, 1982). Additionally, person-centered methods, such as latent profile analysis (LPA), are better suited for informing the development of personalized approaches to effective and efficient family-based treatment by simultaneously characterizing types of families presenting for early intervention services and determining differential treatment response (Lanza & Rhoades, 2013).

In the current study, we used a three-part model-based design to define holistic family-centered profiles and explore the utility of the identified profiles in predicting changes in parenting behavior following BPT and determining differences in child clinical outcomes. First, we used LPA to determine patterns of pre-treatment parent (i.e., parental psychopathology, parental stress) and child factors (i.e., child psychopathology), as measured via parent-, teacher-, and clinician-reports, in order to determine specific classes of families of preschoolers with ADHD. Second, we utilized these profiles as predictors of change in observed parental warmth and behavioral control during parent-child interaction tasks. Finally, we explored the possibility of utilizing these profiles as predictors of clinically significant change in child problem behaviors (i.e., improvements in oppositional defiant and ADHD symptoms) at post-treatment and follow-up.

We hypothesized that one profile would emerge characterized by high levels of parental psychopathology, parenting stress, and child problem behaviors and that families in this profile would be less likely to utilize parenting skills taught in BPT and consequently exhibit fewer clinically significant treatment reductions in child symptoms. Further, we hypothesized that multiple profiles would emerge with distinct patterns of parental psychopathology and parenting stress (e.g., high parental depression and moderate parenting stress; high parental ADHD and anxiety with high parenting stress) that would predict

differential changes in observed parenting practices. Across all family profiles, we expected child symptom severity to be the least useful indicator for determining latent class and differential BPT outcome. Eligibility for inclusion in the current study required a diagnosis of ADHD and, as a consequence, child symptom presentation was homogenous. Importantly, children receiving services for ADHD will likely exhibit elevations in symptomatology; therefore, we did not expect symptom severity to be an important factor in determining latent classes. To explore these hypotheses, we conducted secondary data analyses using a sample of preschoolers with ADHD receiving one of two forms of BPT that were found to have comparable clinical outcomes (Abikoff et al., 2015; Forehand et al., 2016; Forehand et al., 2017).

Method

Design

In a three-group parallel design, children were randomly assigned to (a) the New Forest Parenting Program (NFPP; Thompson et al., 2009), (b) Helping the Noncompliant Child (HNC; McMahon & Forehand, 2003) or (c) a waitlist control (WL; see Abikoff et al., 2015, for complete details). The two programs have been found to be equally effective in reducing child ADHD symptoms and, with one exception, child disruptive behavior (Abikoff et al., 2015). Overall, both treatment groups were found to be more effective than a WL. In total, eight families dropped out of NFPP and four families dropped out of HNC (Abikoff et al., 2015). Block randomization to the three treatment conditions (NFPP, HNC, WL) was in a ratio (2:2:1) and was carried out in blocks of random sizes (5 or 10). Families were assessed at baseline (pre-treatment), at the end of treatment (post-treatment) and in October/November of the next school year (follow-up). All three groups were assessed at pre- and post-treatment. Only the two parent training groups were assessed again at a follow-up the next school year. Given that the focus of the current study was to explore the utility of family-centered pre-treatment profiles in predicting differential BPT treatment response at the distal follow-up, only the two active treatment groups were included in analyses. All families were compensated $70 per assessment visit; HNC parents received an additional $15 to cover the cost of travel to the clinic. The study was conducted at New York University (NYU) Langone Medical Center in New York, New York. NYU and NYC Department of Education institutional review boards approved the study. After reviewing a complete description of the study, parents provided signed informed consent.

Participants

Participants were children ($M_{age=}$ 3.57, SD=.50; range = 3.0 - 4.11, 73.8% male, 69.2 % White, 25.6% Hispanic, 16.4% African American, 8.8% Asian, and 5.6% identified with another race) attending preschool, daycare, or nursery school at least two-and-a-half days per week and their parents (92.7% mothers; See supplemental appendix A1 for further demographic information). Importantly, there were no significant differences on demographic or clinical variables across groups (Abikoff et al., 2015). Inclusion criteria required English fluency of the primary caretaker; children's IQ of ≥ 70 and a diagnosis of ADHD, as assessed on the Diagnostic Interview Schedule for Children-Parent Report Version 4 (Shaffer et al., 1998), modified Young Child Version (DISC-IV-YC; Lucas et

al., 1998). Reasons for exclusion included, but were not limited to, current medication or behavioral treatment for ADHD (see Abikoff et al., 2015, for further recruitment procedures and inclusion/exclusion criteria). Given that the current study aimed to compare families enrolled in treatment, the WL control group was not included in final analyses (n=35). The final sample included 130 parent-child dyads.

Measures

Pre-treatment family profile indicators.—A multi-informant, multi-method approach was used to assess parent, family, and child pre-treatment factors. Four domains were assessed by eight profile indicators using parent, teacher, and clinician ratings: general parental psychopathology (internalizing and externalizing symptoms), parental ADHD, parenting stress and parent-child relationship problems, and child symptoms severity (oppositional defiant and ADHD; see supplemental appendix A2 for complete details).

Parental internalizing and externalizing psychopathology symptoms.: The Brief Symptom Inventory (BSI; Derogatis & Spencer, 1975) was used to measure parent psychological distress level across two internalizing domains (i.e., depression and anxiety) and one externalizing domain (i.e., hostility). Parents self-rated each item on a 5-point Likert scale, ranging from 0 (not at all) to 4 (extremely). The BSI has been validated in several large-scale investigations (e.g., Derogatis & Fitzpatrick, 2004; Boulet & Boss, 1991). The Depression subscale assesses a range of clinical depressive symptoms including dysphoric mood and affect, withdrawal, anhedonia, and hopelessness. The Anxiety subscale assesses symptoms of general anxiety such as nervousness, worry, panic and some somatic manifestations of anxiety. The Hostility dimension assesses thoughts, feelings, and behaviors often associated with negative affect (i.e., anger). Hostility items reflect the expression of thoughts, feelings and behaviors and assess domains such as resentment, irritability, physical aggression and rage. For the current study, sum scores for the depression, anxiety, and hostility subscales at the pre-treatment assessment were utilized in LPA analyses as profile indicators (depression, $\alpha = .82$; anxiety, $\alpha = .72$ and hostility, $\alpha = .69$; see supplemental appendix A2 for complete details).

Parental ADHD symptoms.: The Assessment of Adult Attention-Deficit/Hyperactivity Disorder (AAA; Mannuzza et al., 2004) is a semi-structured clinical interview used to assess parents' overall ADHD symptoms as indicated by inattentive (9 items) and hyperactivity/impulsivity (9 items) symptoms. Reliability for assessing parental ADHD has been excellent in prior studies (Mannuzza et al., 2011), and there is support for validity of diagnoses (Klein et al., 2012). Each behavior is rated on a 0 (never or rarely) to 3 (very often) scale by clinicians. Interviewers in the current study were trained by the developers of AAA (Abikoff et al., 2015). A total score of pre-treatment parental ADHD symptoms, combining the inattentive and hyperactivity/impulsivity domains, was used in analyses as a profile indicator. In the current sample, the alpha coefficient was 0.89 for the total score (see supplemental appendix A2 for complete details).

Parenting stress.: Parents completed the 16-item *Parenting Stress Index-Short Form Revised* (PSI-R; Abidin, 1995) to assess parenting stress and parent-child dysfunctional

interaction. The parental distress subscale assesses how much distress a parent experiences within their parenting role (e.g., “I feel trapped in my responsibilities as a parent”). The parent-child dysfunctional interaction subscale assesses parents’ perceptions of whether their child meets the parents’ expectations (e.g., “When I do things for my child, I get the feeling that my efforts are not appreciated very much”). The PSI is an evidence-based assessment and has been validated for use across many age ranges and cross-culturally (e.g., Díaz-Herrero et al., 2011; Reitman et al., 2002). In the current sample, the alpha coefficient for parenting distress at baseline was 0.72 and the alpha coefficient for parent-child dysfunctional interaction at baseline was .76 (see supplemental appendix A2 for complete details).

Child symptom severity.: Child ADHD and ODD symptoms were assessed by teacher-rated ADHD and parent-rated ODD severity on the 80-item Conners Rating Scales-Revised (CTRS-R & CPRS-R; Conners, 1997). The CTRS-R and CPRS-R are used to assess behavioral difficulties across settings (e.g., school, home). In the current study, the teacher-reported ADHD index and parent-reported oppositional problem subscales were utilized. The ADHD index consists of items that best discriminate between children diagnosed with ADHD and those that do not meet criteria, (e.g. “Fails to finish things he/she starts”). To assess oppositional and defiant symptoms, the oppositional problems subscale was utilized (e.g., “Actively defies or refuses”). In the current study, parent-reported oppositional behavior was utilized, as it has been suggested that the effects of BPT do not transfer into the school setting (Forehand et al., 1979) and, therefore, may not represent the effect of BPT on oppositional behavior when utilizing a teacher-report of child symptoms. Teacher-reported ADHD symptoms were used to account for symptomatology at school; thus, symptomatology in both the school and home setting were assessed. Further, the aforementioned indices have been shown to have strong psychometrics properties (Conners, 1997) and have been validated in samples which include preschool-age children (Conners, 1997; Conners et al., 1998). The pre-treatment alpha coefficients for teacher-rated ADHD and parent-rated ODD were .85 and .87, respectively (see supplemental appendix A2 for complete details).

Treatment mechanisms and clinical outcomes.—After creation of baseline family-centered profiles using the above measures, we sought to determine the utility of these profiles in predicting response to BPT intervention. First, we examined profiles as predictors of observed parental warmth and behavioral control at post treatment and follow-up after accounting for baseline observed parenting. After determining if profiles differentially predict proximal mechanisms of change in BPT (Forehand et al., 2014), we examined if profiles differed in rates of clinically significant change following BPT in child ADHD and ODD symptomology using the reliable change index (RCI; Jacobson & Truax, 1991).

Observed parenting practices.: The Global Impressions of Parent–Child Interactions–Revised (GIPCI–R; Brotman & Dawson-McClure, 2003) was used to assess observed parenting behavior during a 15-min semi-structured play interaction that increased in structure and parent directedness (i.e., free play, 7-min; puzzle task, 5-min; clean-up, 3-min). At the end of each segment, independent observers masked to condition assessed multiple

aspects of warmth, behavioral control, and hostility on a 5-point rating scale. The GIPCI-R subscale scores have been reported to have adequate inter-rater reliability and correlate significantly with parent ratings of global symptoms, hyperactivity and aggressive behavior (e.g., Brotman et al., 2011). The current study created two primary composites based on the theoretically relevant parenting constructs of warmth and behavioral control. The observed warmth composite was comprised by the parental valence, responsiveness, and enjoyment subscales (α ranged between .89 - .93 across baseline, post, and follow-up). The observed behavioral control composite was comprised of the parental use of praise, parental use of scaffolding, and parental effectiveness subscales (α ranged between .67 - .72). Praise was conceptualized as positive behavioral control, in contrast to negative behavioral control practices (i.e., laxness or physical control); therefore, it was included within the behavioral control composite. Further, initial correlations suggested praise fit well within the behavioral control domain. The observed hostility subscales (i.e., parental aggression or parent critical, punitive, or intrusive comments) were not used in the current study due to insufficient variability and reliability (m = 1.04, SD = .15, α = .45; see supplemental appendix A2 for complete details).

Clinically significant change in child ADHD and ODD symptoms.: The Reliable Change Index (RCI) assesses if the amount of change in symptoms following treatment was large enough to be clinically meaningful. Additionally, RCI indicates statistically reliable (i.e., not accounted for by chance) change in scores on a measure (Jacobson & Truax, 1991) and demonstrates in what direction and to what degree scores have changed (Zahra & Hedge, 2010). An RCI score of 1.96 or higher is indicative of clinically significant change (Jacobson & Truax, 1991). We examined the RCI across two child clinical outcomes by parents and teachers: ADHD and ODD symptoms. For ADHD symptoms we used the ADHD index from the CPRS-R and CTRS-R (Conners, 1997). Alpha coefficients for teacher-rated and parent-rated ADHD ranged from .84 - .93 and .75 - .84 at baseline, post and follow-up, respectively. For ODD symptoms, we used the defiance subscale of the 38-item preschool version of the New York Teacher and Parent Rating Scales (NYTRS; Miller et al. 1995; NYPRS; Brotman et al., 2008). The defiance subscale has adequate psychometric properties (e.g., Brotman et al., 2008; Collette et al., 2003; Miller et al., 1995). Alpha coefficients for teacher-rated ODD ranged from .94 - .95 at baseline, post and follow-up. Overall, alpha coefficients ranged from .69 – .95 across all measures.

BPT Interventions.

New Forest Parenting Program—(NFPP; Sonuga-Barke et al., 2002, Thompson et al., 2009). The NFPP is a home-based manualized intervention for preschoolers with ADHD and involves eight weekly 1-to-1.5-hour sessions. NFPP focuses on issues related to a child with ADHD's ability to self-regulate and utilizes parents as the agents of change. NFPP shares similar features of standard BPT (i.e., behavioral strategies for managing problematic behaviors, improving the quality and frequency of positive parent-child interactions, reducing negative responses) and overall, aims to improve the quality of parent-child interactions and their relationship.

Helping the Noncompliant Child—(HNC; McMahon & Forehand, 2003). HNC is a clinic based manualized BPT intervention for treating young children with oppositional behavior and noncompliance. Families were asked to complete eight intervention sessions with parents and child jointly attending each session. In the current study, in order to ensure that families received the treatment for the same length and amount of therapist contact, HNC was delivered in eight 1-hour weekly sessions. HNC utilizes behavior modification principles and methods to reduce noncompliance in children in accordance with Hanf (1969)-based BPT protocols. Specifically, the HNC intervention in the Abikoff et al. (2015) study provided parents with strategies to attend to appropriate behaviors, ignore negative behaviors and encourage compliance through strategies such as attending, rewarding, ignoring, clear instructions, and time out.

Both NFPP and HNC have been shown to be effective in decreasing disruptive behaviors in preschool children. Moreover, NFPP and HNC have exhibited largely equivalent results in Abikoff et al. (2015). Further, attendance (NFPP, M = 7.40, SD = 1.88; HNC, M = 7.73, SD = 1.11) and treatment fidelity (NFPP: 96.3%; HNC: 96.6%) were equally high for each treatment (see supplemental appendix A2 for complete details).

Data Analytic Plan

Latent Profile Analysis (LPA; Lazarsfeld & Henry, 1968) was employed to assess groups of individuals with similar profiles of baseline parent and child factors (Marsh et al., 2009). LPA analyses allow for the clustering of observations or variables that have similar indicator means and variances in order to identify patterns (Pastor et al., 2007), through which, homogeneity within groups and heterogeneity between groups is elucidated (Roesch et al., 2010). Overall, the goal of LPA is to determine the most accurate number of profiles to describe the associations within the observed variables (Pears et al., 2008).

Multi-informant multi-method approach.—In order to account for familial factors across school and home settings when creating profiles, a multi-informant approach was employed. The use of a multi-informant approach has been suggested to be key in evidence-based assessment (Dirks et al. 2012, Hunsley & Mash, 2007). For example, parental anxiety and depression were assessed via parent-report; however, parental ADHD was based on clinician-reported via semi-structured clinical interview. Child ADHD symptomatology at baseline was teacher-reported; however, child ODD symptomatology was parent-reported. Finally, to assess distal outcomes, parenting practices at post and follow-up were provided from observational data, whereas clinically significant multi-setting change in child externalizing symptom was determined from both parent and teacher report.

Profile enumeration.: In order to determine the optimal number of profiles, the Lo-Mendel-Ruben adjusted likelihood ratio test (LMR-A; Lo et al., 2001), the bootstrap likelihood ratio test (BLRT), the Bayesian Information Criterion (BIC; Schwarz, 1978), the Akaike Information Criteria (AIC; Akaike, 1974), the corrected Akaike Information Criteria (cAIC, Hurvich & Tsai, 1989), the sample size adjusted BIC (ssBIC; Sclove, 1987), and entropy (Ramaswamy et al., 1993) were utilized in selecting the best fitting model (see Table 1). The LMR-A is an indicator of statistically significant improvements in a model as compared to

the model with one fewer profile (i.e. a three-profile vs. a two-profile model), with *p*-values <.05 indicating a statistically significant and greater model fit in the model when a profile is added (Roesch et al., 2010). A statistically significant BLRT also suggests that the model is superior to the model with one fewer profile (Cloitre et. al., 2013). The AIC, corrected AIC (cAIC), BIC, and sample size adjusted BIC (ssBIC) aid in determining model fit, with lower values on each index indicating better relative fit. Entropy determines the accuracy of classifying individuals into the profiles identified in each model, with values closer to 1 indicating more certainty in group division. Finally, it is necessary to integrate theoretical principles in determining the number of profiles, as each group should be theoretically informed for interpretability.

Profile covariates.—Although families in each treatment group benefited from participating in BPT (Abikoff et al., 2015), we conservatively account for any possible group differences when determining profiles. In addition, baseline observed parental warmth and behavioral control were included in the model as covariates in order to account for parenting practices prior to enrollment in treatment. This was important given our goal of examining family profile as a predictor of distal parenting outcomes.

Predicting distal outcomes.—When examining profiles as predictors of treatment outcomes, profile identification is often conducted through “hard classification,” in which individuals are fixed to profiles where they had the highest likelihood of membership (e.g., Muthén, 2001). Therefore, we employed a one-step approach, through which we first fit the model without covariates (specifically, observed parental warmth and behavioral control). Next, the best fitting model was determined based on the fit indices described above. Once the best-fitting model was selected (the three-profile model), covariates were integrated into the model to determine differences in each covariate among the profiles (Masyn, 2013). This method allowed the observed parenting practices to covary across timepoints. Finally, Wald parameter constraint tests were conducted to assess mean differences among profiles on warmth and behavioral control at post and follow up.

Lastly, we explored the likelihood of clinically significant changes in child symptoms differed by family profile. In order to reduce the number of outcome variables included during profile estimation, for this final step only, we hard classified families into profiles and used binary logistic regression with profiles as predictors and clinically significant change as the outcome. For this final set of analyses, we created two sets of binary outcome variables by categorizing families as clinically significant treatment responders based on an RCI above 1.96 at the post-treatment or follow-up assessments. First, we examined clinically significant change in child ADHD symptoms based on parent report (1a) and teacher report (1b). Next, we examined clinically significant change in child defiance symptoms based on parent report (2a) and teacher report (2b). Finally, we report estimates of the probability of treatment response based on pre-treatment family-centered profile.

Results

Latent Profiles

Latent profile analyses were conducted using M*plus* version 8.3 (Muthén & Muthén, 2017). Parental distress, ADHD, and psychopathology, and child ADHD and ODD outcomes were converted into z-scores. All profile indicators were entered into LPA models ranging from one to five profiles and models were run with 200 random starts. Fit indices for one-profile to five-profile models are presented in Table 1. The four- and five-profile models were uninterpretable due to small sample sizes (e.g., n= 3 and 4, respectively) within these profiles; therefore, we did not investigate the four- and five-model profiles further. The three- and two-profile models all exhibited optimal entropy (entropy > .91); however, the three-profile model surpassed the two-profile model on all other fit indices. Evaluating across a combination of fit indices indicated the three-profile model provided the most optimal fit (E = 0.92, *cAIC*=3554.48, *ssBIC* = 3246.50, *LMRa* p = .012, BLRT, p<.001). Additionally, the three-profile model consists of approximately equitable division of participants through each profile (39%, 30%, and 31% of the sample in each profile). Finally, the three-profile model delineates a clear theoretical division among each profile (to be addressed below; see Figure 1 for complete profiles).

The first profile (n = 48) and third profile (n = *38)* were labeled predominately parental depression (PD) and predominately parental anxiety (PA), respectively. Both profiles exhibited similar levels across many factors (for example, parental distress and child symptoms); however, the clear delineation between profiles was explained by parental anxiety and depression. Specifically, the PD profile exhibited high levels of parental depression and the lowest levels of parental anxiety. Additionally, this family profile demonstrated moderate levels of child ADHD symptomatology; however, this profile shows similar levels of parental hostility and ADHD, parenting stress, and child ODD severity compared to the PA profile. In contrast, the PA profile exhibited the highest levels of anxiety and lowest levels of parental depression as compared to the other profiles. Additionally, this profile exhibited average levels of child ADHD and ODD symptomatology, parenting stress, and parental ADHD and hostility. The second profile (n = 37) was labeled high family stress (HFS) as families in this profile exhibit consistently elevated scores across each of the categories, specifically, the highest levels of parenting stress, parental ADHD, and child oppositionality. Additionally, the HFS profile reported equally elevated levels of parental depression and anxiety and average levels of parental hostility and child ADHD.

Covariates

Treatment group, baseline parental warmth and baseline parental control were assessed as covariates and were included in the model. No significant differences in treatment group were exhibited across the three profiles. Additionally, no differences across profiles on baseline behavioral control were exhibited, p > .20. The PD and HFS profiles did not exhibit differences in baseline parental warmth, p >.31; however, when the PA profile was used as the reference group, the PA profile was significantly different on baseline observed warmth, β = 1.207, p < .01, such that the PA profile was associated with a 1.207 unit increase in parental warmth, relative to the PD and HFS profiles, prior to treatment. Therefore, all three

variables (treatment group, baseline parental warmth and baseline parental control) were accounted for in the model. For an additional sensitivity test, we ran analyses with and without outliers (+/− 3SD) and with and without the WL group and all variations supported the same three-profile model.

Profile differences on parental warmth and behavioral control.

The three profiles were utilized as predictors to assess parental warmth and behavioral control post-treatment and follow-up. Wald parameter constraints results suggest significant differences at post, Wald χ^2= 16.733(4), p < .002, and follow up, Wald χ^2= 10.777(4), p < .029. Z-scored means for each parenting outcome are presented in Figures 2a and 2b. The PA profile exhibited the most improvement in parental warmth at post and follow up (m_{post} = .58; $m_{followu\,p}$= .32) as compared to the HFS (m_{post} = −.03; $m_{followup}$ = −.08) and PD profiles (m_{post} = −.13; $m_{followup}$ = −.23) which exhibited the least improvement in parental warmth following treatment. However, the HFS profile exhibited the most improvement in parental behavioral control at post and follow up (m_{post} = .35; $m_{followup}$ = .21), as compared to the PA profile (m_{post} = .32; $m_{followup}$ = .09) and the PD profile which, again, exhibited the least improvement (m_{post} = −.11; $m_{followup}$ = −.30). Overall, the PA profile exhibited improvements in warmth and behavioral control at both post and follow up, whereas the HFS profile only improved in behavioral control and the PD profile did not improve on either parenting practice.

Profile differences on clinically significant change in child ADHD and ODD.

Finally, binary logistic regression was used to examine family profile differences in the probability of demonstrating a clinically significant treatment response. Treatment response (coded as 1) was determined based on an RCI above 1.96. All results were marginally or non-significant and, therefore, should be interpreted with caution. Nonetheless, marginally significant findings were included as there is potentially utility in presenting these findings for future research. For ADHD symptom outcomes, based on parent report, the PA (74%), PD (79%), and HFS (72%) profiles showed similar treatment response patterns, comparisons all p > .15. However, based on teacher report, there was a marginally significant difference between the PD and PA profiles, OR 2.5 [.93, 6.76], p = .07, such that PA profile families were less likely to achieve a clinically significant treatment response based on teacher report (59%) than the PD group (78%), whereas the PD (78%) and HFS (70%) groups were similar, p > .15. Regarding ODD symptoms outcomes, family profile differences in treatment response were mixed across settings. Based on parent report, PA families were less likely (42%) than the PD (62%), OR 2.37 [.99, 5.71], p = .054, and HFS (62%), OR 2.24 [.89, 5.67], p = .088, profile families to achieve a clinically significant response to intervention. However, based on teacher report, the PD profile was reported to have the highest likelihood of a clinically significant treatment response (60%) compared to the PA (42%), OR 2.1 [.88, 4.99], p = .093, and HFS (43%), OR 2.00 [.84, 4.78], p = .118, profiles. Overall, while the results suggest medium effect sizes across the above outcomes, results were marginally significant or non-significant and, therefore, interpretability may be limited.

Discussion

The current study explored a family-centered approach to identify pre-treatment profiles that differentially predict changes in parenting behavior following BPT and utilized these profiles to determine differences in child clinical outcomes. We hypothesized that one profile would emerge characterized by high symptomatology across all domains, with limited post-treatment improvements in parenting practices and child outcomes, whereas subsequent profiles would exhibit distinct patterns of parental symptomatology and family stress that would be differentially associated with changes in parenting practices and child outcomes. Additionally, we hypothesized that child symptoms would not meaningfully aid in distinguishing profiles. Findings supported a three-profile model, which consisted of one profile with elevated symptomatology across all domains (parental psychopathology, ADHD and stress, as well as child symptomatology), one profile with elevated parental anxiety, and a final profile with elevated parental depression. In addition, profiles were differentially associated with changes in observed parenting practices. Specifically, the PD profile was associated with fewer improvements in behavioral control and warmth at both time points following treatment compared to the other profiles. Further, the HFS profile only demonstrated improvements in behavioral control, and the PA profile was associated with improvements in both parenting practice domains following the end of treatment. Finally, profiles were only marginally associated with reliable change in child symptomatology following treatment, and warrant additional assessment in future studies.

The PD and HFS profiles are consistent with previous literature in that BPT has been consistently shown to be less effective in the context of elevated parental psychopathology (Chronis et al., 2004). In fact, it has been suggested that parental psychopathology may inhibit acquisition of parenting techniques and skills taught within treatment and may prevent or hinder engagement during sessions (Nix et al., 2009). Parental depressive symptoms have consistently been linked to more expressed negative, coercive behavior and less warmth, in parent-child interactions (Lovejoy et al., 2000). Further, depressed parents may experience difficulties in their parenting role such that the symptoms of depression (e.g., helplessness, irritability, withdrawal) may make increasing positive parenting behaviors or decreasing negative parenting behaviors more difficult, as well as impact their perceived competence and satisfaction in their role as a parent (see review by Downey & Coyne, 1990). Taken together, parental depressive symptoms may interfere with a parent's ability to implement effective parenting techniques taught in BPT (see review by Chronis et al., 2004) as well as increase the likelihood of parents utilizing negative parenting practices in response to child disruptive and ADHD behaviors. Conversely, the literature on the effect of parental anxiety on BPT outcomes is sparse and mixed (Harvey et al., 2011). Nonetheless, the findings of the current study suggest that elevated levels of parental anxiety may be promotive of improvements in parental warmth and behavioral control. Woodruff-Borden and colleagues (2002) found that anxious parents are more likely to withdraw during a parent-child interaction than non-anxious parents, unless their child exhibits negative affect within the interaction (i.e., completion of a difficult puzzle), thus providing attention to negative behaviors. Given that BPT directly targets skills to improve parent-child interactions with positive attention, while simultaneously ignoring negative

child behaviors, it may be particularly effective in modifying anxious parents' parenting behavior. Further assessment of the implications of parental anxiety on BPT response is warranted.

The HFS profile is consistent with Patterson's (1982) theory of coercive family dynamics, through which children's negative behaviors are inadvertently reinforced by parents' use of negative parenting practices. In particular, these families often exhibit higher stress and overall increased parent-child dysfunction in their interactions. A child's noncompliance is met with and/or may elicit an emotional or ineffective reaction from a caregiver, thus heightening the child's negative response and, ultimately, leading the child to learn that oppositionality is an effective modality to avoid engaging in undesirable activities. Through this process, children learn a pattern of interaction that may generalize to other settings, such as school or after school activities (Smith et al., 2014). Overall, this model has been applied within the context of family interventions and has been shown to be effective in targeting coercive parenting practices and preventing further escalation of children's negative behaviors (Dishion et al., 1992). Additionally, given that ADHD is highly heritable (Farone et al., 2005), parental ADHD is likely a common feature in families with children with disruptive behavior disorders and may exacerbate familial stress (Theule et al., 2011) and other co-occurring psychopathology within these families. This profile aligns with previous findings in that parental ADHD has been associated with fewer improvements in BPT (e.g., Sonuga-Barke et al., 2002), such that parental ADHD may prevent parents from engaging with skills taught throughout treatment (Wang et al., 2014). However, the literature on the impact of parental ADHD on BPT treatment outcomes is mixed. Chronis-Tuscano and colleagues (2011) suggest that an alternative and combined approach to address both parental and child ADHD symptoms may be useful in improving BPT outcomes. Forehand and colleagues (2017), on the other hand, found that overall, parental ADHD did not reduce the effectiveness of parent training, using the current sample. Nonetheless, families exhibiting high parental stress and psychopathology, in conjunction with elevated child symptomatology, are likely to experience limited gains throughout BPT and may warrant additional or alternative interventions to account for the elevations in symptomatology across domains. Future studies should assess modifications to BPT that address parent, child and family factors in order to increase the likelihood of clinically significant symptom reductions for families exhibiting similar profiles.

Clinically significant change implies that symptoms have reduced below clinical cutoff points, which are commonly used to determine if symptoms are severe enough to meet diagnostic criteria. RCI assesses if the amount of change in symptoms following treatment was large enough to be clinically meaningful and account for individual levels of change, rather than change based upon diagnostic criteria. In the current study, RCI outcomes of child ODD and ADHD symptoms were created to assess clinically significant changes in symptoms following BPT. Results revealed marginally significant differences between the PA and PD profiles, suggesting that more anxious parents were less likely to achieve clinically significant ODD symptom reductions as compared to more depressed parents (assessed via teacher-reports). These findings suggest that improvements for children of parents with elevated anxiety may not generalize to other settings, whereas children of parents with elevated depression may be more likely to experience improvements outside of

the home setting (i.e., at school). Nonetheless, future studies should assess RCI outcomes to determine replicability of these marginally significant findings.

The current study has several limitations. First, the sample composition consisted of predominately White and well-educated parents and parent participants were primarily mothers therefore, generalizability may be limited. Second, the current study assessed clinically elevated symptoms of parental depression or anxiety, not clinical diagnoses. Assessing parents who meet diagnostic criteria for depression and anxiety disorders, in addition to continuing to assess for parental ADHD, may be beneficial in further determining if these patterns persist in the context of clinically elevated symptomatology (i.e., meeting diagnostic criteria), given that these symptoms may pose a barrier to engagement and improvements throughout BPT. Additionally, it may be beneficial for future studies to intentionally recruit families with such elevations and use a more nuanced assessment strategy in order to assess the implications of clinically-significant parental psychopathology. Third, the current study utilized a sample of children meeting diagnostic criteria for ADHD, which may lead families to enroll who are experiencing elevations across the domains assessed. As such, no adaptive profile was elucidated from the current sample. Future studies may benefit from evaluating profiles when meeting diagnostic criteria is not required to conduct an assessment utilizing a broader range of symptom severity. Fourth, parental warmth and behavioral control were assessed within the context of a laboratory setting; this format may not capture the full range of parenting. A more naturalistic, home-based assessment of parenting could be beneficial for future studies to capture parental warmth and behavioral control. Fifth, the study was limited to 130 parent-child dyads. Given that our study was only sufficiently powered to detect medium-large differences across groups, we may not have had a sufficient sample size to fully elucidate RCI and changes in behavioral parenting practices. In particular, the differences between family profile and clinically significant child change outcomes were medium effect sizes and marginally significant; thus, these findings should be viewed with caution and future studies should aggregate BPT studies for a larger sample size. Sixth, within profile clinically significant treatment response probability ranges were large (i.e. 26 – 52% for teacher-reported ADHD). As such, there is likely to be variability within each profile that requires further assessment beyond pre-treatment family factors. For example, within treatment factors, such as the therapist alliance with each family type or factors influencing between session skills practice, may influence the clinically significant child symptom change outcomes. Finally, the analyses in the current study excluded the wait-list group because of the small sample size (n = 34) and lack of follow-up data for this group. Future studies would benefit from the inclusion of a no-treatment control sample in order to contrast the association between the family-centered profile and longitudinal parenting change in a no-treatment group compared to a BPT group.

Notwithstanding its limitations, the current study has several strengths. Strengths include its use of LPA to assess patterns of factors associated with treatment outcomes as well as its extension in assessing the association between profiles and clinically significant improvements in child oppositional and ADHD symptoms following treatment. Additionally, the current study utilized a multi-informant and person-centered methodological approach to assess child and parent factors, parenting practices and

child outcomes. Finally, findings support the notion that movement towards personalized interventions may be beneficial for determining whom BPT treatments are most effective, which, in turn, may reduce the temporal and financial burden associated with mental health intervention in the United States.

Aligning with the field of medicine in its shift towards personalized medicine, the field of psychology has slowly begun to move from empirically supported treatment towards personalized intervention. Personalized intervention "…includes as critical components reliable assessment of clinically relevant individual characteristics and treatments tailored for individuals who share those characteristics to optimize treatment gains" (Ng & Weisz, 2018, Pg. 2). By utilizing this individualized approach, clinicians may be better able to determine the most effective and cost-efficient treatment for each individual family. More specifically, the creation of pre-treatment family-centered profiles may be useful in helping treatment providers tailor BPT to target the specific needs of each profile. Future studies should evaluate the utility of pre-treatment profiles throughout BPT to determine modifications (e.g., additional attention focused on reducing parental psychopathology prior to BPT) that may lead to clinically significant improvements following treatment. While further assessment of personalized interventions is warranted, this modality of decision-making in treatment may provide an optimal route for parents and clinicians to jointly determine the most effective and relevant treatment plan for their individual families.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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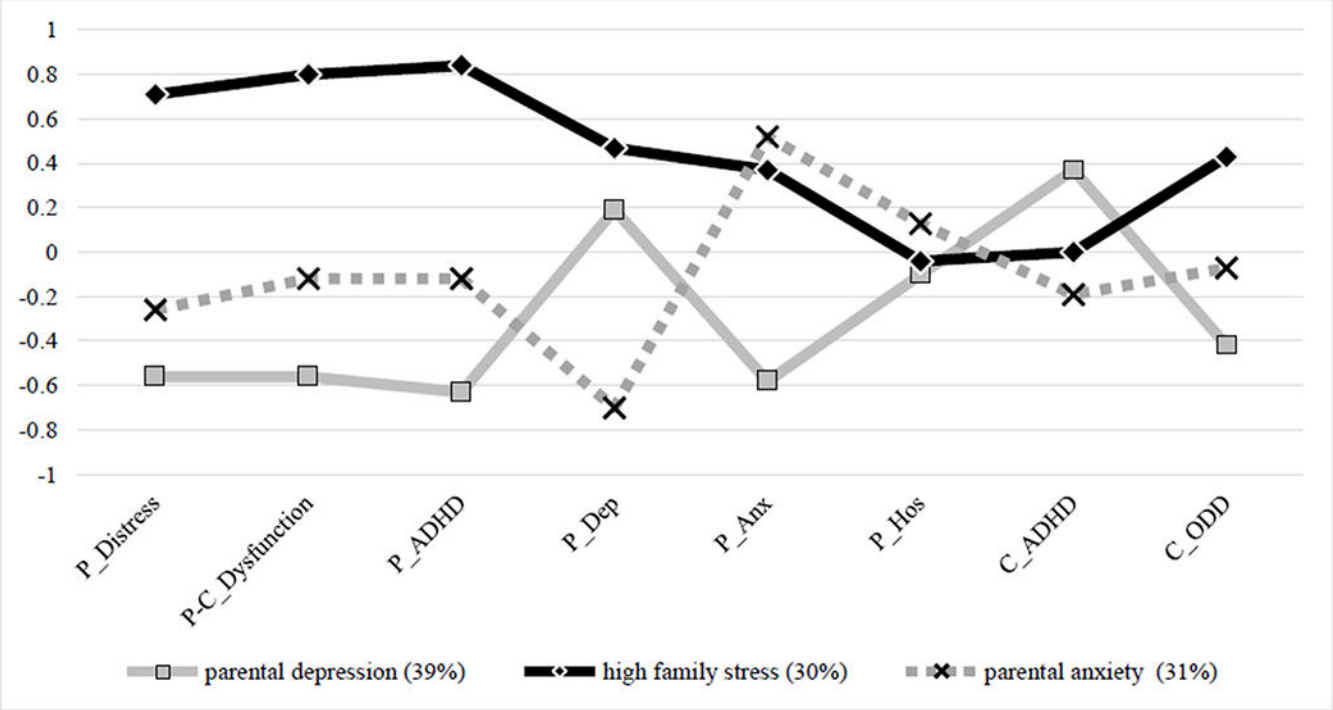
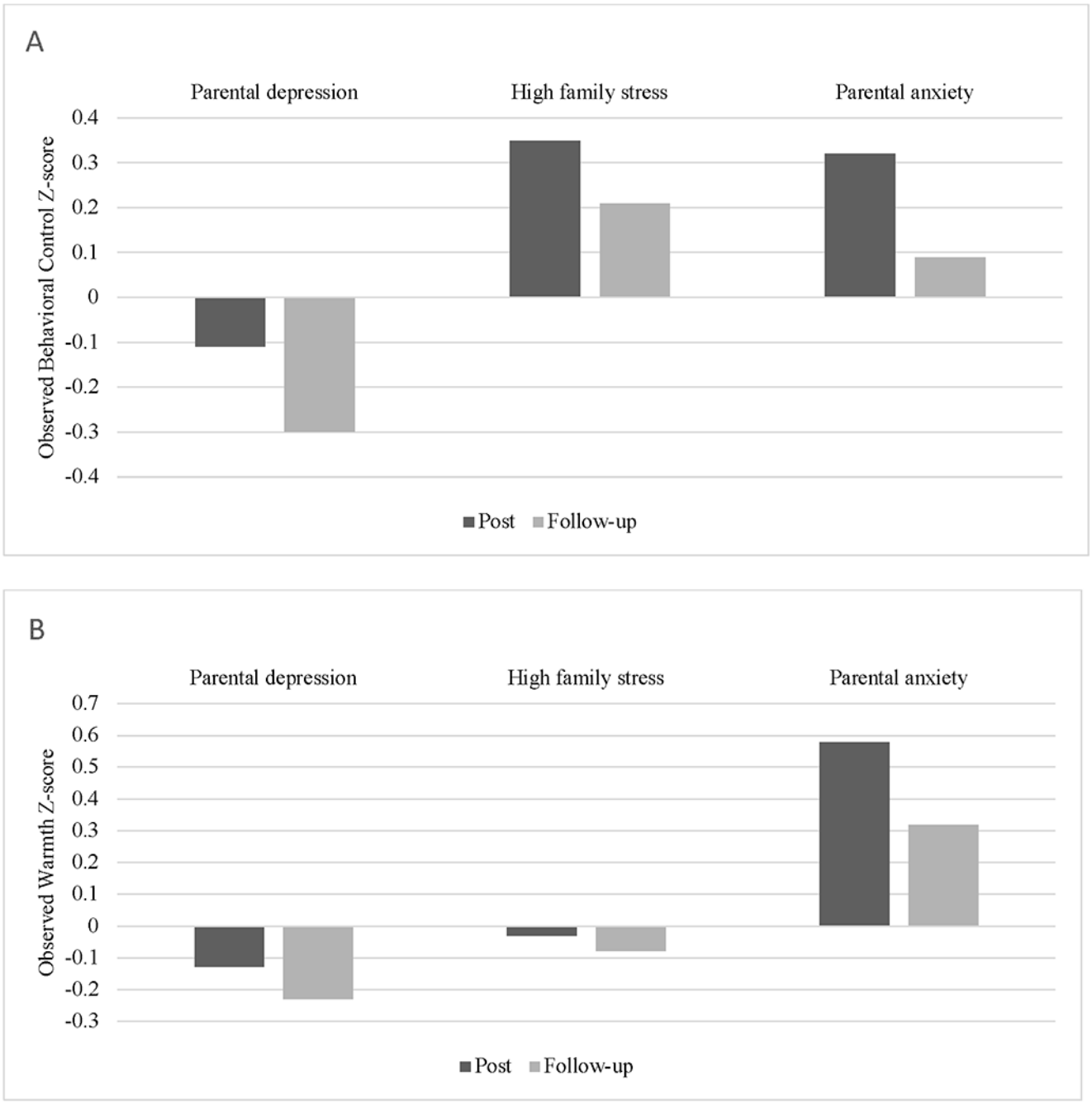


Figure 1. Z-Scored Parent, Child and Family Factors within Three Latent Profiles

Note. P_Distress = Parental Distress (PSI); P-C_Dysfunction = Parent-Child Dysfunctional Interaction (PSI); P_ADHD = Parental ADHD (AAA); P_Parental Depression (BSI); P_Anx = Parental Anxiety (BSI); P_Hos = Parental Hostility (BSI); C_ADHD = Child ADHD (CTRS-R); C_ODD = Child ODD (CPRS-R)



Figures 2a and 2b.
Observed Parenting at Post-Treatment and Follow-up by Family Profile

Table 1.

LPA and model fit indices

					Parsimony Criteria				LRT p Value	
Profiles	**N**	**Params**	**LL**	**Entropy**	**AIC**	**BIC**	**cAIC**	**ssBIC**	**LMRa**	**BLRT**
1	130	22	−1685.430	*N/A*	3414.86	3477.95	3499.95	3408.36	*N/A*	*N/A*
2	123	50	−1637.980	0.916	3375.96	3516.57	3566.57	3358.47	0.0808	<.0001
3	123	74	−1562.189	0.915	3272.38	3480.48	3554.48	3246.50	0.0116	<.0001
4	123	98	−1520.605	0.929	3237.21	3512.80	3610.80	3202.94	0.4119	<.0001
5	123	122	−1496.586	0.941	3237.17	3580.26	3702.26	3194.50	0.6257	0.6667