

Predictors for resolution of antisocial behavior among foster care youth receiving community-based services

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ABSTRACT

Youth in the foster care system are more likely to be diagnosed with mental illness than those in the general population. Within this system, youth with antisocial behavior (e.g., aggressive, oppositional) are overrepresented. The challenges youth with antisocial behavior present to foster care systems make understanding the factors that predict remission in this population important for improving placement stability. Using Optimal Data Analysis (ODA), this study examines potential moderating effects of various individual, social, and strength variables on clinically significant decreases antisocial behavior in a sample of foster care youth over time. Results revealed positive improvements in youths' wellbeing to be the optimal predictor of resolution, followed by positive changes in family functioning and positive changes in adjustment to trauma (i.e., symptoms of PTSD). These results indicate that clinically significant decreases over time in antisocial behavior were associated with concurrent improvement in individual and environmental variables. Implications for service providers working with this population are discussed.

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1. Introduction

Not surprisingly, youth in the foster care system are more likely to experience psychological problems compared to those in the general population (Burns et al., 2004; Landsverk & Garland, 1999). Youth with antisocial behavior are particularly overrepresented in the foster care population (Pilowsky & Wu, 2006). For example, White, Havalchak, Jackson, O'Brien, and Pecora (2007) found that 20% of youth in a foster care sample they studied had a diagnosis of Conduct Disorder, compared to only 7% in the general population. The presence of antisocial behavior presents a unique challenge to stakeholders in the foster care system, since it leads to more negative and severe long-term outcomes, including chronic deviant behavior such as theft, alcohol abuse, and sociopathy (Offord & Bennett, 1994). Further, these youth experience more challenges with placement in foster homes (Rolock, Koh, Cross, & Eblen-Manning, 2009) and have poorer placement stability (Barber, Delfabbro, & Cooper, 2001).

Youth with antisocial behavior in the foster care population are also at an increased risk of stepping up in care, due to difficulty managing their behavior issues in a community setting (Hussey & Guo, 2005). Further, the most significant predictors of stepping up to higher levels of care include a history of criminal and/or delinquent behavior, elopement risk, and inappropriate sexual behavior, all

which are included under the umbrella of antisocial behavior (Park, Jordan, Epstien, Mandell, & Lyons, 2009). Congregate care placement is particularly problematic for youth with antisocial behavior. Iatrogenic effects have been reported for youth in group-based care with disruptive behavior issues (Poulin, Dishion, & Burraston, 2001; Robst et al., 2011). When comparing congregate care to treatment foster care, Robst et al. (2011) found more negative effects following congregate care, including greater post-treatment felony charges and return to out-of-home and residential treatment placements. Negative effects have been found to be most robust for youth with initially low levels of delinquency (Poulin et al., 2001), highlighting the negative influence of group care on youth with antisocial behavior.

The evidence that youth with antisocial behavior are at an increased risk of stepping up to a higher level of care and that the experience of this type of care is associated with poorer outcomes underlines the importance of community-based care options for this group of youth. With the significantly increased rates of mental health needs among youth in foster care, the child welfare system has been described as a "de facto public behavioral health care system" (Lyons & Rogers, 2004), prompting state child welfare agencies to seek to put systems and policies in place to appropriately match youth needs with the most effective treatments. In 1986, the Child and Adolescent Service System Program (CASSP) put forth a landmark proposal that set the stage for what would become the System of Care (SOC) model. The most consequential element of the SOC model holds that the community should be the centerpiece of any service system and should always be considered the treatment setting of choice (Stroul & Friedman, 1986, 1994). The SOC model also calls for services to be

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(a) delivered in the least restrictive environment, (b) individualized, (c) coordinated, (d) delivered as close to youths' home as possible, (e) involve all available adults in youths' lives, (f) recognize youth strengths, and (g) be culturally competent.

The Wraparound approach to care is one of a few specific treatment modalities that is consistent with the SOC philosophy and has been found to be effective for youth with disruptive behavior disorders (Burchard, Bruns, & Burchard, 2002). Wraparound is a direct treatment application of the broad SOC model. Using existing community services and natural supports, the Wraparound system is a family-centered and child-focused intervention that capitalizes on youth strengths, creating an individualized, community-based treatment program that it is interagency coordinated and culturally competent (Burchard et al., 2002; Burchard, Burchard, Sewell, & VanDenBerg, 1993; VanDenBerg & Grealish, 1998).

In 2002, the state of Illinois responded to the call to serve youth in their communities by developing a statewide community-based program designed to provide multi-modal services to at-risk youth in substitute care. The program was designed by the Illinois Department of Children and Family Services (DCFS) for children and adolescents who are capable of community functioning but were either at-risk of stepping up to specialized foster or residential care or were stepping down from these higher-level placements. The Illinois model, called community "SOC," uses a Wraparound approach to treatment, which has been shown to be successful in the mental health, child welfare, and juvenile justice systems (Burchard et al., 2002). This approach is community-based and individualized; therefore, it is consistent with, but not identical to, an SOC approach to service planning and delivery.

Prior research has found positive mental health outcomes for Illinois' community "SOC." One study reported modest positive change in outcome trajectories on a composite measure clinical severity (Sieracki, Leon, Miller, & Lyons, 2008) and another stated that the SOC program is beneficial in preventing placement disruption in foster care youth (McClelland & Schneider, 2009). However, the limitation of this and other prior research in the behavioral health outcomes literature is that outcomes were studied using "main effects" predictors, and failed to test whether the outcome effects were moderated by other clinical variables, social context variables (e.g., caregiver issues) or individual strengths (e.g., psychological, educational). Further, prior research has used composite measures of emotional and behavioral problems and has not disaggregated youth by presenting problem type (e.g., diagnosis) to determine the potentially unique predictors of outcomes for these specific youth. Given the incidence of antisocial behavior in the foster care population, the unique risk these youth have of stepping up to higher levels of care, and the potentially chronic and severe negative outcomes associated with externalizing behavior, it is particularly appropriate to study the variables that specifically predict maintenance versus clinically significant decreases in antisocial behavior. The current study addresses these gaps in the literature by examining the potentially moderating effects of a range of individual, social, and strengths variables on decreases in antisocial behavior in a sample of foster care youth who are at risk of stepping up to residential care.

In order to create a model for predicting clinically significant decreases in antisocial behavior among youth in foster care, Optimal Data Analysis (ODA) was used (Soltysik & Yarnold, 1993; Yarnold & Soltysik, 2005). ODA is an exploratory, non-parametric data analysis method that maximizes the accuracy of the model created from the data sample. ODA's method of statistical analysis is best suited for the current study. The approach to the testing of multivariate interactions used by ODA allows for an unlimited number of variables to be tested to fit into the optimal predictive model. Traditional analyses, such ANOVA and regression, require the selection of specific predictors to be tested in a pre-described model. ODA permits the inclusion of an unlimited number of possible predictors without the specification of

hypothetical interactions. Although some researchers argue that only those variables with supporting evidence in the literature should be included in the model of analysis, the techniques used by ODA are able to accommodate an unlimited number of variables without increasing the chance of error (Yarnold & Soltysik, 2005). By not placing restrictions on those variables included in the model, ODA allows variables not previously explored to be examined for involvement in mental health outcomes for youth in foster care. Additionally, ODA permits the creation of subgroups and the examination of moderators within the context of the model, rather than each variable needing to have a predictive effect for the entire group, as is the case in traditional models. For example, gender may moderate the effect of family functioning on the remission of antisocial behavior in youth in foster care. The methodology of ODA allows for the creation of a model that identifies the strongest predictors for each subgroup of the sample (Yarnold & Soltysik, 2005).

Based on the previous literature with this clinical population (e.g., Coie & Dodge, 1998; Hinshaw & Lee, 2003; Moffitt, 1993), a range of variables across the individual and his or her ecologies are suggested to predict outcome. However, it is important to note that the overwhelming majority of variables studied in the child and adolescent antisocial behavior literature have been main effects variables. The literature offers very little guidance on what will emerge from an exploratory statistical analysis designed specifically to unearth highly distinct moderations — many ODA studies unearth up to four or five total interactions. Therefore, the hypotheses below apply to the univariate ODA analyses that will be run and not to the final multivariate ODA results. With this caveat in mind, in the present study, we propose that being female, and the individual and social/ecological variables of having low reported danger to others, positive social behavior, high interpersonal strengths, and/or positive family functioning will predict decreases in antisocial behavior among youth.

2. Method

2.1. Participants

The subsample used for this study consisted of 77 children and adolescents referred to community-based SOC treatment who were rated by their caseworker team as exhibiting significant antisocial behavior; these youth were taken from a larger sample of 503 youth. The study period was between September 1999 and December 2004. The participants received treatment from 16 different service agencies from throughout Illinois. The sample was 36% female and 64% male. At initiation of treatment, the average age of the participants was 12.05 years old. The race/ethnicity of the sample was as follows: 71% African American, 21% European American, 4% Latino/a, 3% Asian American.

2.2. Materials

Youth outcomes were evaluated using the 44-item version of the Child and Adolescent Needs and Strengths-Mental Health (CANS-MH; Lyons, 1999). This assessment tool was developed to guide service delivery for children with emotional and behavioral healthcare needs. The CANS-MH instrument assesses the needs and strengths of a child or adolescent across multiple domains and is used as an assessment, decision-support and outcome measure instrument (State of Illinois Department of Child and Family Services, 2009) and has been consistently shown to be a reliable and valid assessment tool (Anderson, Lyons, Giles, Price, & Estes, 2002; Lyons, 1999).

The CANS-MH consists of 44 items across 6 factors: symptoms, risk factors, functioning, care intensity and organization, placement/system factors/caregiver needs and strengths, and child strengths. Severity ratings are reported along a four-point scale, from 0 to 3. Across all needs

items, a score of 0 indicates “no evidence” or reason to believe that the rated item requires action; a 1 indicates a need for “watchful waiting”, monitoring or possibly preventative action; a 2 indicates a need for action and the implementation of some strategy to address the problem or need, and a 3 indicates a need for immediate or intensive action and specifies an immediate safety concern or a priority for investigation. For strength items a 0 indicates a centerpiece strength, a 1 represents a strength that can be used in treatment planning, a 2 indicates an identified strength in need of bolstering, and a 3 represents the absence of that particular strength.

According to the DCFS protocol, the CANS-MH is completed by a DCFS community-based SOC worker and Child and Family Team of the youth when the client is accepted into the program as well as at discharge from the program (State of Illinois Department of Child and Family Services, 2009). The CANS-MH is also given at regular intervals throughout each client's placement, every 6 months of receiving SOC services, and after the Individual Plan of Care (IPC) for the client has been updated or renewed. It is expected that all Illinois DCFS SOC staff be competent in administering the CANS-MH. A CANS-MH training course is offered by Northwestern University. Each SOC service provider is expected to send at least one staff member to receive training to become a CANS-MH Certified Trainer. In order to become a Certified Trainer, trainees must achieve a competency of 80% correct on two test vignettes, which corresponds to a Kappa value of over .75. The remaining SOC staff is then trained by the CANS-MH Certified Trainer in how to administer the CANS-MH, and must achieve a reliability of 80% correct on the two test vignettes. Chart reviews are regularly conducted throughout the year to ensure that reliability remains high.

The 77 youth who were selected for this study out of the larger sample of 503 youth received a rating of a “2” or a “3” on the CANS-MH Antisocial Behavior item (see Appendix), indicating a need for action by the treatment team in this domain. The variable Antisocial Behavior was selected because it most closely represents the presenting problem associated with placement disruption, the need for higher levels of care, and the goals of the current study. In fact, data suggest that youth who receive a score of “2” or “3” on this CANS-MH item are at significantly greater risk of placement disruption: Youth who scored at or above a “2” experienced a placement disruption almost 100 days sooner than youth who scored below a “2” on Antisocial Behavior (see McClelland & Schneider, 2009), which was statistically significant ($t = 2.98, p < .001$). The odds ratio for placement disruption within a year of entering SOC treatment for the Antisocial Behavior item is 1.6 ($\chi^2 = 15.4, p < .001$), indicating a significant increase in the likelihood of placement disruption with each increase of a point on the scale.

2.3. Statistical procedure

In order to create a prediction model for recovery from antisocial behavior for youth in foster care, ODA was used (Soltysik & Yarnold, 1993; Yarnold & Soltysik, 2005). ODA is an exploratory data analysis method that works to maximize the accuracy of the model created from the sample of data. For the present study, the selection of the best predictors of foster care youth's recovery from antisocial behavior was conducted with the aid of ODA software for Windows. All individual CANS-MH variables were entered into the analyses. Additionally, difference scores were computed by subtracting Time 1 CANS-MH scores from the CANS-MH scores from the final time point available and entered into the analyses to account for change in each individual variable over time in treatment. Youth exhibiting clinically significant symptoms (i.e., a score of a 2 or 3 on the CANS-MH antisocial behavior item) at admission to community-based SOC treatment were used as the sample for the analysis. The ODA analysis will reveal those factors that significantly predict decreases in antisocial behavior (i.e., a score of a 0 or 1 on the CANS-MH Antisocial Behavior item at discharge) and those that predict “no improvement”

of symptoms (i.e., a score of a 2 or 3 on the CANS-MH Antisocial Behavior item at discharge).

ODA techniques allow for the identification of both main effects and interactions. Main effects are tested using univariate ODA (UniODA; Yarnold & Soltysik, 2005). First, UniODA is performed for each variable of the CANS-MH, revealing which variables significantly predict remission of antisocial behavior in foster care children. After identifying those variables with a significant main effect, a Classification Tree Analysis (CTA) is performed to provide information about other variables that interact with the variables with significant main effects in predicting decreases in antisocial behavior.

The optimal predictors, those variables with the greatest effect strength, were selected for the CTA. ODA analyses provide a decision rule that divides the sample into subgroups. Once the sample has been partitioned, ODA is again performed with all of the original variables, but this time only for those members of the particular subgroup. For example, if gender is determined to be the optimal predictor for remission of antisocial behavior in youth in foster care, the second ODA selects one group, males or females, and determines the greatest main effect for that subgroup, further dividing the original sample. This process continues, forming “branches” of the CTA, until the sample can no longer be subdivided (Yarnold & Soltysik, 2005). ODA is then conducted on each branch of the ODA tree until it cannot be partitioned further. Significance is determined using the Dunn and Sidak adjusted per-comparison p values (Yarnold & Soltysik, 2004) for an experiment-wise alpha of 0.05. This procedure determines the adjusted Type I error rate according to the number of contrasts conducted in the multivariate classification trees.

3. Results

3.1. Descriptive statistics

Descriptive statistics were computed for the sample of youth with antisocial behavior problems used in the analyses (see Table 1). Overall, 77 individual youth were included in the analyses. Youth ranged from 4 to 18 years old, with a mean age of 12.05 years ($SD = 3.77$), and males comprised more of the sample than females (63.4%). Services were received from 16 distinct agencies, with treatment periods averaging 297.42 days ($SD = 125.05$).

The descriptive statistics for the CANS-MH composite scales (problem presentation, risk behavior, care intensity and organization, caregiver needs and strengths, and youth strengths) suggest that this sample's needs and strengths are consistent with other samples of child welfare youth being served in community settings (Lyons, 2004). However, the individual CANS-MH items comprising the various composite scales varied in their rated severity. For example, examining items from the problem presentation scale, antisocial behavior ($M = 2.09, SD = 0.29$) and adjustment to trauma ($M = 1.62, SD = 0.82$) were the highest rated items, with average scores nearing the moderate range of impairment across youth (i.e., a “2” rating on the CANS-MH item). This result is intuitive given that this sample was chosen due to their score on the antisocial behavior item of the CANS-MH and that, as a whole, the sample is a higher-risk group of youth in the child welfare system, where PTSD and externalizing behavior are likely to be prevalent and symptoms have been present for a relatively longer period of time.

Regarding risk behaviors, temporal consistency ($M = 2.07, SD = 0.82$) and situational consistency ($M = 1.79, SD = 0.79$) were the items rated highest across the sample of youth, both items reaching moderate impairment. These findings are consistent with a population of foster care youth with complex needs, requiring multiple foster care placements. In terms of functioning challenges, absence of school ($M = 2.00, SD = 0.89$) and family ($M = 1.75, SD = 1.00$) strengths had the highest mean ratings across the sample. Again, this is consistent with a sample of youth who were referred because they were at-risk of

Table 1
Descriptives and UniODA results for youth with antisocial behavior.

Study variables	%	Time 1 M (SD)	Time 2 M (SD)	ODA time 1 predictors (p-value)	ODA time 2 – time 1 difference score predictors (p-value)
Age		12.05 (3.77)	NA	0.229	NA
Sex (male)	63.6			0.152	NA
Treatment days		297.42 (125.05)	NA	0.133	NA
Psychosis		0.25 (0.59)	0.23 (0.51)	0.489 ^a	0.351
Attention problems		1.55 (0.93)	1.32 (0.83)	1.00 ^a	<0.001 ^{***}
Depression		1.51 (0.84)	1.34 (0.64)	0.99 ^a	0.001 ^{**}
Substance abuse		0.57 (0.91)	0.51 (0.74)	<0.001 ^{***}	0.160
Adjustment to trauma		1.62 (0.82)	1.27 (0.68)	0.015 [*]	<0.001 ^{***}
Attachment		1.39 (0.86)	1.12 (0.85)	0.150	<0.001 ^{***}
Situational consistency of problems		1.79 (0.79)	1.47 (0.80)	1.00 ^a	<0.001 ^{***}
Temporal consistency of problems		2.07 (0.82)	1.76 (0.88)	1.00 ^a	<0.001 ^{***}
Danger to self		0.42 (0.70)	0.46 (0.72)	0.048 [*]	1.00 ^a
Elopement		0.73 (0.87)	0.64 (0.88)	0.029 [*]	0.067
Sexually abusive behavior		0.38 (0.71)	0.30 (0.59)	0.079	0.053
Social behavior		1.43 (0.85)	1.14 (0.84)	1.00 ^a	<0.001 ^{***}
Crime/delinquency		1.00 (0.97)	0.81 (0.99)	0.095	0.001 ^{**}
Intellectual functioning		0.57 (0.72)	0.61 (0.71)	0.126	0.024 [*]
Physical functioning		0.34 (0.68)	0.25 (0.61)	0.592 ^a	0.702 ^a
Family functioning		1.75 (1.00)	1.60 (0.90)	0.034 [*]	<0.001 ^{***}
School functioning		2.00 (0.89)	1.64 (0.98)	0.045 [*]	<0.001 ^{***}
Sexual development		0.66 (0.87)	0.49 (0.68)	1.00 ^a	0.032 [*]
Monitoring		0.99 (0.95)	0.86 (0.85)	0.087	0.045 [*]
Treatment		1.03 (0.97)	1.03 (0.93)	0.062	0.109
Transportation		0.64 (0.67)	0.51 (0.62)	0.078	0.033 [*]
Service permanence		1.29 (1.05)	1.12 (0.97)	1.00 ^a	0.049 [*]
Behavioral health		0.32 (0.57)	0.44 (0.73)	0.280 ^a	0.242
Supervision		0.56 (0.79)	0.74 (0.93)	0.009 ^{**}	0.008 ^{**}
Involvement with care		0.67 (0.78)	0.81 (0.97)	0.139	0.160
Knowledge		0.85 (0.69)	0.85 (0.78)	0.144	0.054
Organization		0.55 (0.68)	0.62 (0.83)	0.059	0.933
Resources		0.81 (0.87)	0.74 (0.85)	0.039 [*]	0.016 [*]
Residential stability		0.19 (0.43)	0.30 (0.62)	0.208	0.131
Safety		0.40 (0.62)	0.40 (0.68)	0.106	<0.001 ^{a,***}
Family strengths		1.55 (0.88)	1.54 (0.87)	0.202	0.001 ^{**}
Interpersonal strengths		1.48 (0.82)	1.38 (0.86)	0.271	0.001 ^{**}
Relationship permanence		1.78 (0.75)	1.52 (0.75)	1.00 ^a	0.004 ^{**}
Educational strengths		1.50 (0.90)	1.34 (0.90)	0.059	0.012 [*]
Vocational strengths		1.86 (1.03)	1.66 (0.99)	0.999 ^a	0.168
Wellbeing		1.91 (0.65)	1.55 (0.79)	0.033 [*]	<0.001 ^{***}
Spiritual strengths		1.39 (1.06)	1.21 (1.10)	0.921 ^a	0.019 [*]
Talents		1.56 (0.80)	1.28 (0.91)	0.288	<0.001 ^{***}
Inclusion		1.58 (0.90)	1.37 (0.93)	0.167	0.045 [*]

The LOO approach insures the stability of the predictive model. CANS variables at time 1 and difference scores between time 2 and time 1 were entered into the ODA model as predictors of change in the CANS variable Antisocial Behavior.

^a Variable was not LOO (leave-one out) stable and, therefore, was not eligible to be entered into the overall classification tree model.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

stepping up to higher levels of care. Family and school are environmental contexts and the absence of support in these domains is among the most common reasons youth are referred to residential placements (Stroul & Friedman, 1996).

Regarding youth strengths, means were highest across the sample for absence of wellbeing ($M = 1.91$, $SD = 0.65$), vocation ($M = 1.86$, $SD = 1.02$), and relationship permanence strengths ($M = 1.78$, $SD = 0.75$). Absence of strength in wellbeing may be a psychological consequence of the trauma of being within the foster care system. Impairments in relationship permanence are an intuitive result of being a part of the foster care system, as children are often subject to not only removal from their biological parents, but also multiple foster home placements. In terms of the absence of vocational strengths, this sample had a mean age of approximately 12 years, so it is unlikely that these youth would have vocational strengths.

3.2. ODA results

UniODA analyses were used to determine the optimal predictors of resolution of antisocial behavior (see Table 1). The identified optimal

predictors established subgroups of youth predicted to experience resolution and those not predicted to experience resolution. Multivariate classification trees were created, first for the resolution group and then for the no resolution group, by using UniODA analyses for subsequent predictor variables, controlling for the optimal predictor, until variables no longer significantly predicted resolution. Many variables emerged as having high classification accuracy, both in the initial UniODA and subsequent analyses, however, a strategy was developed where all possible classification trees were created and that with the best overall classification accuracy was retained.

Fig. 1 depicts the final ODA classification tree model for youth with clinically significant antisocial behavior at Time 1. Each rectangle signifies a decision point and arrows represent pathways of prediction. P values for each decision point are listed within the rectangles to show significance. The fractions and percentages included within the rectangles represent the number of correctly predicted individuals of the total number included in that category at that particular endpoint. The numbers listed next to the prediction pathway arrows specify the cutoff values for designation into classification categories. Dunn and Sidak adjusted per-comparison p

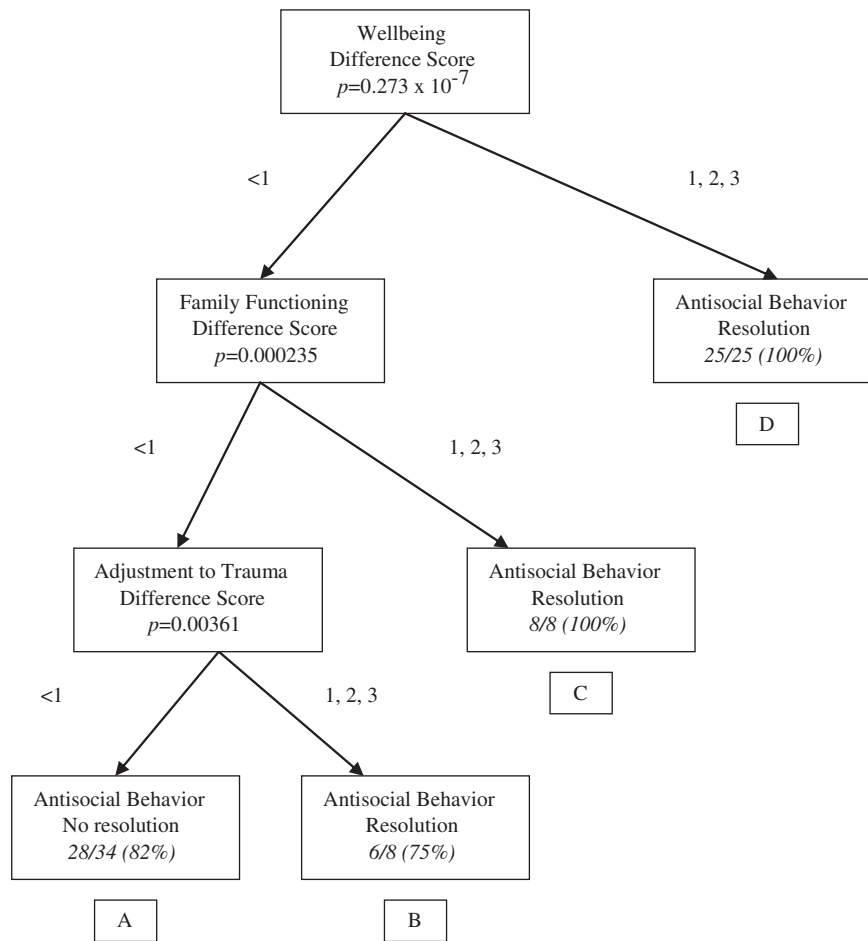


Fig. 1. Predictors of outcome in a sample of youth with antisocial behavior: Optimal Data Analysis (ODA) results.

adjustments (Yarnold & Soltysik, 2004) were used to decrease Type I error. Only those decision points that met the Dunn and Sidak criteria were included.

3.2.1. Classification tree analysis

Initial UniODA results indicated that predominately difference score variables emerged as significant predictors of resolution of antisocial behavior (see Table 1). Change in family functioning emerged as the optimal predictor of resolution. Positive change in family functioning (difference of “1”, “2”, or “3”) formed the group predicted to experience resolution (labeled node C) and those with a difference score less than “1” comprised the group predicted to not experience resolution. The subgroup predicted to experience resolution was not subjected to additional UniODA analyses because all youth in this subgroup were correctly classified (i.e., 100% of those with positive change in family functioning experienced resolution). An additional UniODA was run for the group predicted to not experience resolution from antisocial behavior (those with a family functioning difference score less than “1”). Change in adjustment to trauma entered the multivariate analyses next as it emerged as the next best predictor of resolution for this subgroup. Youth with positive change in their adjustment to trauma score (difference of “1”, “2”, or “3”) formed the subgroup predicted to experience resolution while those with no change or negative change in their adjustment to trauma score (difference of less than “1”) comprised the subgroup predicted to not experience resolution. Additional UniODA analyses for both groups did not reveal any variables that further classified the sample significantly. Those with no change or negative change in their adjustment to trauma score (difference of less than “1”) were

predicted to not experience resolution with 82% accuracy (labeled group A) and those with positive change in their adjustment to trauma score (difference of “1”, “2”, or “3”) were accurately predicted to experience resolution of antisocial behavior on the CANS-MH in 75% of cases (labeled group B).

Classification performance statistics were computed for the full CTA model for antisocial behavior, as well as the statistics for each of the resolution and no resolution group (see Table 2). The overall model was predicted with 89.3% accuracy. The mean sensitivity across classes was 90.8%, with a sensitivity of 87.2% for the resolution of antisocial behavior group and 94.4% for the group that did not experience resolution. The mean specificity across classes was similar, with a mean of 90.0% for the full CTA model. Specificity for the group that experienced resolution was 86.7% and 93.3% for the group whose antisocial behavior did not resolve. The overall classification tree predicted resolution 78.6% above chance, which is considered to be a “strong” effect strength according to parameters set forth by Yarnold and Soltysik (2005).

4. Discussion

The foster care youth in the current study were referred to an intensive community-based treatment program (“SOC”) because they were at risk of stepping up to higher levels of care, due in part to high ratings of antisocial behavior on a reliable and valid scale. The subsample of youth represented in this study entered treatment in the clinically significant range on the Antisocial Behavior variable of the 44-item version of the Child and Adolescent Needs and Strengths-Mental Health (CANS-MH). A longitudinal design was then used to

Table 2

Classification performance summary for the classification tree model of resolution vs. no resolution of antisocial behavior (N = 75).

Performance index	Performance parameter	Effect strength
Overall classification accuracy	67/75 (89.3%)	78.6%
Sensitivity (resolution)	41/47 (87.2%)	74.4%
Sensitivity (no resolution)	34/36 (94.4%)	88.8%
Mean sensitivity across classes	90.8%	81.6%
Specificity (resolution)	39/45 (86.7%)	73.4%
Specificity (no resolution)	28/30 (93.3%)	86.6%
Mean specificity across classes	90.0%	80.0%
Mean performance across classes	90.4%	80.8%

Overall cross-classification table			
		Predicted status	
		No resolution	Resolution
Actual status	No resolution	28	2
	Resolution	6	39

Overall classification accuracy is the percentage of the total sample that is correctly classified by the overall tree model. Sensitivity is a predictive indicator of the percentage of the predicted classifications into a given category that were correct. Specificity is a descriptive index of the percentage of the actual members of a given category (i.e., those who experienced resolution of their antisocial behavior) that the classification tree correctly categorized. Effect strength is a standardized index of the performance of the model, defined as the percentage above chance that the model correctly predicts, on a 0–100 scale, where 0 is the performance expected by chance and 100 is perfect classification accuracy. The statistic is computed using the following formula: $[(1 - ((100 - \text{model performance statistic}) / (100/C))) \times 100\%]$, where C is the number of response categories for the class variable (Yarnold, Soltysik, & Bennett, 1997, p. 1454). Effect strengths of 25% or less are considered weak, values between 25% and 50% are considered moderate, and those above 50% are considered strong (Yarnold & Soltysik, 2005).

explore the demographic, clinical, risk, caregiver needs, and strengths variables from the CANS-MH that were associated with either positive or negative treatment outcomes from intake to the final data point using a classification method known as Optimal Data Analysis (ODA; Yarnold & Soltysik, 2005). Previous research with this population has examined trajectories of change using composite measures of outcomes and has not adequately explored the potentially moderating role of individual demographic, clinical, risk, caregiver needs, and strength variables on outcome (e.g., Sieracki et al., 2008). The approach used in this study explored clinical outcomes at the item level, disaggregating statistically and clinically distinct variables (i.e., the Antisocial Behavior item on the CANS-MH), and identified which variables were associated with resolution versus persistence of these symptoms at follow-up. The exploratory approach of ODA allows for the inclusion of all variables assessed in the CANS-MH, without compromising the likelihood of Type I error, and permits unique interactions to emerge across a wide range of variables.

4.1. Overview of results

Two overarching themes emerged from the results. First, difference scores, rather than Time 1 CANS-MH scores, stood out as the primary predictors of resolution. Although Time 1 CANS-MH scores are not controlled for when using ODA, as they can be in logistic or linear regression, the results of the multivariate analyses clearly indicate that CANS difference scores have a larger impact, in terms of effect size, on outcome than the Time 1 score only. The results suggest that it matters less how youth enter community-based SOC treatment in terms of clinical severity (e.g., risk behaviors), caregiver needs and strengths, or absence of strengths, but rather how much they change during their episode of care on these key variables that predicts resolution status. Improvement of antisocial behavior is strongly correlated with improvement on distinct sets of clinical and strengths variables. This has implications for treatment planning and monitor-

ing, and can inform theories of psychopathology and our understanding of the change process.

The second overarching theme to emerge from the results is that the CANS-MH items that correlated with outcome for youth with antisocial behavior problems represent a wide range of intra-individual and broader social and environmental variables. For clinicians, these findings point to the importance of working at multiple contextual levels (e.g., child, family, and broader social environment) when treating youth with psychopathology.

4.2. Resolution of antisocial behavior

Resolution of antisocial behavior was achieved in 60% of the sample of youth who exhibited clinically significant antisocial behavior at Time 1. The rate found in this study is consistent with the 58% remission rate from Conduct Disorder reported in the literature (Biederman, Mick, Faraone, & Burbach, 2001). Three typologies of changes in antisocial behavior were identified by the multivariate analyses. Change in youth's wellbeing score emerged from the UniODA analysis as the best predictor of resolution from antisocial behavior. For this subgroup of youth, resolution of antisocial behavior is associated with coping skills and psychological strengths (see endpoint D, Fig. 1). Resolution from antisocial behavior was associated with concurrent bolstering of wellbeing of the youth, supporting the use of behavioral interventions to control anger and develop effective coping skills and problem solving abilities. Theorists propose that dysfunctional social-cognitive processing contributes to the expression of aggressive and antisocial behavior (Coie & Dodge, 1998). For this subgroup of youth, an evidence-based treatment that focuses on the impaired social cognitions and behaviors that accompany antisocial behavior, such as interpersonal deficits, identification of social cues, generating solutions to social problems, and a negative cognitive bias, like Problem-Solving Skills Training (PSST; Spivak & Shure, 1974), may allow youth to develop more adaptive coping skills, bolster psychological strengths, and reduce antisocial behavior.

For those youth who reported no change or negative change in their wellbeing scores, change in family functioning emerged as the next predictor associated with decreases in antisocial behavior (see endpoint C, Fig. 1). For this subgroup of youth, a dysfunctional family environment may be driving their antisocial behavior. The association between impaired family functioning and antisocial behavior is consistently found in the literature. Youth with antisocial behavior often report inconsistent and insecure family relationships (Moffitt, 1993). Parenting style and quality of parent-child interactions have been found to mediate the effects of poverty and family structure variables on antisocial behavior (Coie & Dodge, 1998; Rutter, Giller, & Hagell, 1998). Additionally, according to the coercive model of family processes, parental involvement, supervision, and discipline strategies mediate youth behavioral outcomes (Patterson, 1982; Patterson, Reid, & Dishion, 1992). The relationship proposed in the coercive model is bidirectional in nature, with harsh parenting practices exerting a negative influence on the parent-child relationship and children retaliating with noncompliant behavior, prompting the parent to make further demands on the child (Keiley, 2007). This coercive cycle brings about increased family conflict and decreased family cohesion, which is associated with a more persistent course of antisocial behavior (Biederman et al., 2001). The case becomes additionally complex within a foster care context since biological as well as foster parents are implicated. The current study supports the use of empirically supported family interventions in the treatment of foster care youth with antisocial behavior problems. Multidimensional Treatment Foster Care (MTFC; Chamberlain, 2003) was developed specifically to address negative coercive processes within the foster care population, providing behavioral training and support for foster parents, family therapy for biological parents, skills training

and support for youth, school-based interventions and support, and psychopharmacological consult and management when necessary. Evidence supports the use of MTFC to reduce antisocial behavior and promote appropriate behavioral expression within this population (Leve, Fisher, & Chamberlain, 2009).

Change in adjustment to trauma emerged as the final significant predictor of resolution for those youth who reported no change or negative change in family functioning (see endpoint B, Fig. 1). A history of child abuse and neglect, an experience shared in the foster care population, has been found to predict antisocial behavior and is associated with poorer behavioral outcomes (Coie & Dodge, 1998; Hinshaw & Lee, 2003; Moffitt, 1993). A traumatic experience may interact with a biological predisposition to exhibit antisocial behavior in these youth (Coie & Dodge, 1998; Rutter et al., 1998). Therefore, for a subgroup of youth in this sample, antisocial behavior may be in reaction to a traumatic event, rather than embedded and fueled by a family environment, supporting the use of trauma-focused services for this subsample of youth exhibiting antisocial behavior. Trauma-Focused Cognitive Behavioral Therapy (TF-CBT; Cohen & Mannarino, 1996) aims to address the bio-psycho-social needs of children with histories of trauma through combined trauma-sensitive, cognitive-behavioral approach, as the name suggests. TF-CBT has been found to reduce symptoms of PTSD in 80% of traumatized youth after 12 to 16 sessions and is associated with improvement of externalizing behavior (Cohen, Deblinger, Mannarino, & Steer, 2004). Trauma-focused evidenced-based treatments, such as TF-CBT, that address both symptoms of trauma and externalizing behavior may be particularly suited to working with youth in the foster care system whose antisocial behavior may be associated with the experience of trauma.

4.3. Implications

This study identified variables that were associated with resolution of antisocial behavior. Change variables were found to be better predictors of remission than Time 1 variables. It may be that when key factors improve, psychopathology in general is reduced. These findings suggest that treatments should focus on improvement of target variables, such as comorbid conditions, trauma, and internal strengths, to promote remission from psychological disorders. The emergence of both individual and environmental factors as predictors of resolution status supports treatment across contexts and the bolstering of home, school, and social supports as well as psychological strengths. The identification of predictor variables across contexts also supports training in multiple modalities for service providers working with this population. By utilizing the classification trees, service providers have the potential to focus on core variables at different levels in the youth's life (e.g. individual, family, school) to promote internal strengths and reduce problem behaviors.

4.4. Limitations and future directions

Although this study extends the current literature by examining outcomes at the item-level and identifying unique interactions predicting remission from problem behaviors, it has several limitations. The primary limitation is in the use of the CANS-MH to measure predictor and outcome variables. The CANS-MH is a single-informant measure, completed by the caseworker of the foster care youth. Although provider agency did not emerge as a predictor of remission status, which if it had emerged as a predictor would suggest either that providers are associated with outcome or that providers rate the CANS-MH in a systematically biased manner, single measure, single informant strategies are associated with threats to external validity. Future research should include both parent and teacher reports to assess the youth's behavior across contexts and explore the environmental variables, such as family functioning, which emerged in the classification tree. Youth report measures should also be used,

especially when assessing internalizing symptoms. Second, each of the factors included in the analysis was measured by one item. Although there is evidence of unique variability in the individual items within the subscales of the CANS-MH (Anderson et al., 2002; Miller, Leon, & Lyons, 2007), and a major goal of the study was to offer a more nuanced, item-level analysis of the data, the use of a multi-item measure of the domains assessed would increase the reliability and validity of the results found. Third, causality cannot be inferred in this study. The results indicate that co-occurring changes in key variables predict remission. For example, the results of this study suggest that for a subgroup of youth, remission from antisocial behavior is associated with concurrent improvement in family functioning (see endpoint C, Fig. 1). However, the results cannot determine if change in family functioning causes change in antisocial behavior or if it is change in the youth's antisocial behavior that causes change in family functioning. Knowledge of causality would make a major contribution to treatment planning and would determine at what level (e.g., individual youth or family-system) the intervention should focus. Future studies should use a longitudinal approach to monitor change in the variables identified as predictors and determine causality. Fourth, due to the pervasiveness of trauma in the foster care population, more information is needed regarding the youth's experience of trauma and its relation to the expression of antisocial behavior. Positive change in adjustment to trauma emerged as a predictor of resolution of antisocial behavior; however, this study did not take the trauma history of the youth (e.g., type of trauma, number of traumatic experiences) into account. Future studies should further explore the relationship between trauma experiences and antisocial behavior and investigate the influence of variables such as age at exposure and type of trauma on the expression of antisocial behavior. Lastly, ODA is limited to identifying moderating variables and does not provide any information regarding the process that leads to positive outcomes. Future studies should explore the effects of potential process variables, such as attribution style for this subgroup, on clinical outcomes using a mediation model. Information on mediating variables would identify the key ingredients driving change and would inform the development of individualized treatment plans for youth.

The multivariate classification trees created using ODA identified subgroups of youth whose resolution of antisocial behavior is associated with co-occurring change in other variables. These subgroups are presented as different "typologies" of the problem behavior. Future research should explore group differences in clinical and demographic characteristics at intake for these different typologies of problem behaviors so that youth can be identified early and directed to the appropriate treatment according to their clinical presentation typology.

Appendix A.

Antisocial behavior (compliance with society's rules)

These symptoms include antisocial behaviors like shoplifting, lying, vandalism, cruelty to animals, and assault. This dimension would include the symptoms of Conduct Disorder as specified in DSM-IV.

- 0 This rating indicates a child with no evidence of behavior disorder.
- 1 This rating indicates a child with a mild level of conduct problems. Some antisocial behavior in school and/or home. Problems recognizable but not notably deviant for age and sex and community. This might include occasional truancy, lying, or petty theft from family.
- 2 This rating indicates a child with a moderate level of conduct disorder. This could include episodes of planned aggressive or other anti-social behavior. A child rated at this level should meet the criteria for a diagnosis of Conduct Disorder.
- 3 This rating indicates a child with a severe Conduct Disorder. This could include frequent episodes of unprovoked, planned aggressive or other anti-social behavior.

References

- Anderson, R. L., Lyons, J. S., Giles, D. M., Price, J. A., & Estes, G. (2002). Examining the reliability of the Child and Adolescent Needs and Strengths–Mental Health (CANS–MH) scale from two perspectives: A comparison of clinical and research ratings. *Journal of Child and Family Studies*, 12, 279–289.
- Barber, J. G., Delfabbro, P. H., & Cooper, L. L. (2001). The predictors of unsuccessful transition to foster care. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, 42, 785–790.
- Biederman, J., Mick, E., Faraone, S. B., & Burback, M. (2001). Patterns of remission and symptom decline in conduct disorder: A four-year prospective study of an ADHD sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 290–298.
- Burchard, J. D., Bruns, E. J., & Burchard, S. N. (2002). The wraparound approach. In B. J. Burns, & K. Hoagwood (Eds.), *Community treatment for youth* (pp. 69–90). New York: Oxford University Press.
- Burchard, J. D., Burchard, S. N., Sewell, R., & VanDenBerg, J. (1993). *One kid at a time: Evaluative case studies and descriptions of the Alaska Youth Initiative Demonstration Project*. Juneau, AK: State of Alaska, Division of Mental Health and Mental Retardation.
- Burns, B. J., Phillips, S., Wagner, H., Barth, R., Kolko, D., Campbell, Y., et al. (2004). Mental health need and access to mental health services by youths involved with child welfare: A national survey. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 960–970.
- Chamberlain, P. (2003). *Treating chronic juvenile offenders: Advances made through the Oregon Multidimensional Treatment Foster Care model*. Washington, DC: American Psychological Association.
- Cohen, J. A., Deblinger, E., Mannarino, A. P., & Steer, R. (2004). A multisite randomized controlled trial for sexually abused children with PTSD symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 393–402.
- Cohen, J. A., & Mannarino, A. P. (1996). A treatment outcome study for sexually abused preschool children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 1228–1235.
- Coie, J. D., & Dodge, K. A. (1998). Aggression and antisocial behavior. In W. Damon, & N. Eisenberg (Eds.), *Handbook of child psychopathology (5th ed.)*. Social, emotional, and personality development, Vol. 3. (pp. 779–862) New York: Wiley.
- Hinshaw, S. P., & Lee, S. S. (2003). Conduct and oppositional defiant disorders. In E. J. Mash, & R. A. Barkley (Eds.), *Child psychopathology* (pp. 144–198). (Second edition). New York: The Guilford Press.
- Hussey, D. L., & Guo, S. (2005). Characteristics and trajectories of treatment foster care youth. *Child Welfare*, 84, 485–506.
- Keiley, M. K. (2007). Multiple-family group intervention for incarcerated adolescents and their families: A pilot project. *Journal of Marital and Family Therapy*, 33, 106–124.
- Landsverk, J., & Garland, A. F. (1999). Foster care and pathways to mental health services. In P. A. Curtis, G. Dale, & J. C. Kendall (Eds.), *The foster care crisis: Translating research into policy and practice* (pp. 193–210). Lincoln, NE: University of Nebraska Press.
- Leve, L., Fisher, P., & Chamberlain, P. (2009). Multidimensional Treatment Foster Care as a preventive intervention to promote resiliency among youth in the child welfare system. *Journal of Personality*, 77, 1869–1902.
- Lyons, J. S. (1999). *The child and adolescent needs and strengths for children with mental health challenges*. Winnetka, IL: Buddin Praed Foundation.
- Lyons, J. S. (2004). *Redressing the emperor: Improving our children's public mental health system*. Westport, Connecticut: Praeger Publishing.
- Lyons, J. S., & Rogers, L. (2004). The U.S. child welfare system: A de facto public behavioral healthcare system. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 971–973.
- McClelland, G. M., & Schneider, A. (2009). *Annual report of performance of SOC program*. (Report to IDCFS) Chicago, IL.
- Miller, S. A., Leon, S. C., & Lyons, J. S. (2007, May). The Child and Adolescent Needs and Strengths Scale: Factor analytic investigations. *Poster presented at the meeting of the Midwestern Psychological Association, Chicago, IL*.
- Moffitt, T. E. (1993). "Life-course persistent" and "adolescence-limited" antisocial behavior: A developmental taxonomy. *Psychological Review*, 674–701.
- Offord, D. R., & Bennett, K. J. (1994). Conduct disorder: Long-term outcomes and intervention effectiveness. *Journal of the American Academy of Child and Adolescent Psychiatry*, 33, 1069–1078.
- Park, J. M., Jordan, N., Epstien, R., Mandell, D. S., & Lyons, J. S. (2009). Predictors of residential placement following a psychiatric crisis episode among children and youth in state custody. *The American Journal of Orthopsychiatry*, 79, 228–235.
- Patterson, G. R. (1982). *Coercive family process*. Eugene, OR: Castalia.
- Patterson, G. R., Reid, J. B., & Dishion, T. J. (1992). *A social learning approach. IV. Antisocial boys*. Eugene, OR: Castalia.
- Pilowsky, D. J., & Wu, L. T. (2006). Psychiatric symptoms and substance use disorders in a nationally representative sample of American adolescents involved with foster care. *The Journal of Adolescent Health*, 38, 351–358.
- Poulin, F., Dishion, T. J., & Burraston, B. (2001). 3-year iatrogenic effects associated with aggregating high-risk adolescents in cognitive-behavioral preventative interventions. *Applied Developmental Science*, 5, 214–224.
- Robst, J., Armstrong, M., & Dollard, N. (2011). Comparing outcomes for youth served in treatment foster care and treatment group care. *Journal of Child and Family Studies*. doi:10.1007/s10826-011-9447-2.
- Rolock, N., Koh, E., Cross, T., & Eblen-Manning, J. (2009). *Multiple move study: Understanding reasons for foster care instability*. Available at. Urbana, IL: Children and Family Research Center <http://cfcf.illinois.edu>.
- Rutter, M., Giller, H., & Hagell, A. (1998). *Antisocial behavior by young people*. Cambridge, England: Cambridge University Press.
- Sieracki, J. H., Leon, S. C., Miller, S. A., & Lyons, J. S. (2008). Individual and provider effects on mental health outcomes in child welfare: A three level growth curve approach. *Children and Youth Services Review*, 30, 800–808.
- Soltysik, R. C., & Yarnold, P. R. (1993). *ODA 1.0 Optimal Data Analysis for DOS*. Chicago, Ill: Optimal Data Analysis, Inc.
- Spivak, G., & Shure, M. B. (1974). *Social adjustment of young children*. San Francisco: Jossey-Bass.
- State of Illinois Department of Child and Family Services (2009). Procedures 301: Placement and visitation services. Retrieved October 24, 2009 from http://dcfswebresource.dcf.illinois.gov/procedures/procedures_301/homepage.phtml?page=2#P10_85.
- Stroul, B., & Friedman, R. (1986). *A system of care for children and youth with severe emotional disturbances* (Rev. Ed.). Washington, DC: Georgetown University Child Development Center, National Technical Assistance Center for Children's Mental Health.
- Stroul, B., & Friedman, R. (1996). The system of care concept and philosophy. In B. A. Stroul, R. M. Friedman, & B. A. Stroul (Eds.), *Systems of care for children's mental health series: Children's mental health: Creating systems of care in a changing society* (pp. 1–22). Baltimore: Paul H. Brookes Publishing Co.
- VanDenBerg, J. E., & Grealish, M. E. (1998). *The wraparound process training manual*. Pittsburgh, PA: The Community Partnerships Group.
- White, C. R., Havalchak, A., Jackson, L. J., O'Brien, K., & Pecora, P. J. (2007). *Mental health, ethnicity, sexuality, and spirituality among youth in foster care: Findings from the Casey Field Office Mental Health Study*. Seattle, WA: Casey Family Programs.
- Yarnold, P. R., & Soltysik, R. C. (2004). *Optimal data analysis: A guidebook with software for Windows*. Washington, DC: American Psychological Association Books.
- Yarnold, P. R., & Soltysik, R. C. (2005). *Optimal data analysis with software for DOS and Windows*. Washington, DC: American Psychological Association Books.
- Yarnold, P. R., Soltysik, R. C., & Bennett, C. L. (1997). Predicting in-hospital mortality of patients with AIDS-related Pneumocystis carinii pneumonia: An example of hierarchically optimal classification tree analysis. *Statistics in Medicine*, 16, 1451–1463.