Well-documented treatment methods must be tested following their implementation in community service agencies and across different cultures to ensure continuing effectiveness. This study was a randomized controlled trial (RCT) of Parent Management Training—the Oregon model (PMTO), conducted within a nationwide implementation in Iceland. Families of 102 clinically referred children with behavior problems were recruited from five municipalities throughout Iceland. Child age ranged from 5 to 12; 73% were boys. Families were randomly assigned to either PMTO or services usually offered in the communities (SAU). Child adjustment was measured with a latent construct based on parent, child, and teacher reports of externalizing and internalizing problems and social skills. Prepost intent-to-treat analyses showed that PMTO treatment led to greater reductions in child adjustment problems relative to the comparison group, obtaining a modest to medium effect size based on the construct score. Only one indicator (parent-rated Social Skills) showed significant change independently and information on amount and kind of treatment in the SAU was limited. Overall, findings indicate that PMTO is an effective method to treat children’s behavior problems in a Northern European culture and supply evidence for the method’s successful implementation in community settings in Iceland. This is one of few nationwide implementation studies of PMTO outside the United States and the first RCT in Iceland to test a treatment model for children’s behavior problems.

Keywords: Behavior Problems; PMTO; Treatment Effectiveness; Randomized Control Trial; Child Outcome

Behavior problems of children in Iceland have become the principal source for referrals to specialist services in municipalities throughout the country, indicating an emergent need for effective treatments to address children’s internalizing and externalizing problems (e.g., Skólaskriftstofa Suðurlands, 2006–2007). Children with behavior problems...
are at great risk of developing other disorders later in life, including depression and anxiety, learning difficulties, alcohol and drug abuse, as well as limited social skills (Karnik & Steiner, 2005; Kazdin, 1997, 2005; McMahon, Wells, & Kotler, 2006; Nock, Kazdin, Hirip, & Kessler, 2007). Parent management training (PMT) approaches represent one of the more widely tested and evidence-based efforts to address children’s internalizing and externalizing behavior problems (Brestan & Eyberg, 1998; Kaminsky, Valle, Filene, & Boyle, 2008; Kazdin, 2005; Silverman & Hinshaw, 2008). A newly published review of the efficacy of family systems therapy for childhood and adolescent externalizing disorders (e.g., treatments like Multisystemic Therapy and Functional Family Therapy) also shows positive results for externalizing behavior from the majority (Von Sydow, Retzlaff, Beher, Haun, & Schweitzer, 2013). This study reports findings from the nationwide implementation of the Oregon model of Parent Management Training (PMTO) in Iceland where the criterion outcome was operationalized as a latent construct of child adjustment problems measured by validated instruments of problem behaviors, social skills, and depressive symptoms.

PMTO is an evidence-based treatment (EBT) developed by Gerald Patterson and his colleagues at the Oregon Social Learning Center (e.g., Forgatch & Patterson, 2010; Patterson, Reid, & Eddy, 2002). PMTO meets EBT standards, including manual-based specification of program details, careful descriptions of client samples, demonstrated efficacy in several randomized between-group-design experiments, and replications by independent investigators (Chambless & Hollon, 1998). The main reason for implementing PMTO in Iceland was a growing need to address community-level increases in children’s behavior problems. This study reports an evaluation of child outcomes from a randomized control trial (RCT) of PMTO following its implementation in Iceland. Because this trial was funded with scarce resources provided by local communities and supplemented with some small national grants, the study must be viewed as an early step in the evaluation of a wide-scale implementation.

To some extent, PMTO is a prototype of other parent training EBTs (Brestan & Eyberg, 1998); these include: Positive Parenting Program (Sanders, 1999), Incredible Years (Webster-Stratton & Hammond, 1997), the Family Check Up (Dishion et al., 2008), and Parent Child Interaction Therapy (Eyberg & Robinson, 1982). PMTO was the method of choice in Iceland as it is theoretically informed and has been demonstrated effective across a range of developmental periods and contexts, including family, community, agency, and school settings (Forgatch & Patterson, 2010; Patterson et al., 2002). PMTO also employs a validated measure of competent adherence to the method (Fidelity of Implementation Rating System [FIMP]; Knutson, Forgatch, Rains, & Sigmarsdóttir, 2009). Variance in the FIMP measure has been shown to predict treatment outcomes in both an efficacy trial and in a nationwide implementation of the program (Forgatch & DeGarmo, 2011; Forgatch, Patterson, & DeGarmo, 2005; Hukkelberg & Ogden, 2013). Use of a valid fidelity measure enables program administrators to evaluate the extent to which the model is provided with fidelity during community practice, which is a critical factor for successful implementation (Fixsen, Naoom, Blase, Freidman, & Wallace, 2005).

**Theoretical Model of PMTO**

PMTO is based on the Social Interaction Learning model (SIL), which postulates that children learn behavior through their interactions with others. Parents’ child-rearing methods exert a primary influence on children’s adjustment and have a direct effect on how children adapt to their environments. Parenting methods that are characterized by coercion increase the likelihood that the child will develop behavior problems, and coercive patterns of behavior between parent and child can generalize from home to school as well.
as to relationships with others in the community (Ramsey, Patterson, & Walker, 1990). PMTO helps parents replace coercive interactions with positive parenting methods (i.e., *skill encouragement, setting limits, monitoring, problem solving, and positive involvement*). These parenting components form the foundation of the intervention and are readily adapted to the unique characteristics of each family (Patterson & Forgatch, 2005). The SIL model postulates that contextual factors have an indirect impact on child adjustment through their disrupting influence on effective parenting (Forgatch & DeGarmo, 1999; Forgatch & Patterson, 2010; Patterson & Forgatch, 2005).

Numerous studies, some of which date back to the 1960s, show positive effects of the intervention (Patterson et al., 2002). An updated description of the main PMTO research evaluation outcomes is presented in a chapter by Forgatch and Patterson (2010). According to the review, the outcomes that favor children in the experimental groups relative to the control groups include the following: a decrease in child deviant behavior assessed by direct observations and repeated telephone interviews (i.e., *Parent Daily Reports: PDRs*), fewer delinquent behaviors assessed by PDRs and teacher ratings, fewer recorded police arrests, less observed noncompliance and aggression, better school adjustment according to teacher ratings and standardized testing, and reduced self-reported depression and deviant peer association (Bank, Marlowe, Reid, Patterson, & Weinrott, 1991; Chamberlain & Reid, 1998; Forgatch & DeGarmo, 1999; Forgatch, Patterson, DeGarmo, & Beldavs, 2009; Patterson, Chamberlain, & Reid, 1982).

The aforementioned studies were conducted in the United States under the carefully controlled conditions inherent in efficacy trials. The first wide-scale effectiveness trial, which was also the first PMTO study outside of the United States, was based on a nationwide implementation in Norway within two systems of care, that is, child welfare and child mental health (Amlund-Hagen, Ogden, & Bjørnebekk, 2011; Ogden & Amlund-Hagen, 2008). In that study, 112 children ages four to twelve, referred for conduct problems, were randomly assigned to a PMTO experimental group or a control group receiving services as usual (SAU) for these types of cases. The results from the multiple-method and agent assessment (i.e., parent, teacher and child ratings, and direct observations of parent–child interactions) favored the experimental group. Pre, post, and 1-year post-treatment assessments yielded reductions in the children’s externalizing problems and improvements in social competence. Improvements in parental discipline predicted better child outcome, especially for the younger children, hence supporting the SIL model (Ogden & Amlund-Hagen, 2008). The Norwegian program was designed and supported through the collaboration of two ministries, which provided substantial professional and financial support. Norway has maintained leadership in implementing EBTs in the Nordic countries.

**Implementation in Iceland and this Study**

The current RCT commenced in 2007 with the goal of conducting an effectiveness trial to evaluate the effects of the nationwide implementation of PMTO in community settings in Iceland. The project started with the implementation of PMTO in one community and morphed into rolling out the program to other sites around the country. This limited our ability to collect some relevant information, for example the details regarding the kind and amount of services that were provided by special services in all participating communities. Nevertheless, the study makes an important contribution to our understanding of the wide-scale implementation of an EBT program.

PMTO, which was developed and evaluated in the United States, was tested primarily in efficacy not effectiveness trials by the developers. However, results from effectiveness trials are often less positive than those from efficacy trials (Weiss, Catron, Harris, &
Phung, 1999). Although positive outcomes were shown in a nationwide effectiveness trial in Norway (Ogden & Amlund-Hagen, 2008), it is important to determine whether those findings replicate in community services in Iceland. It is particularly interesting to compare Iceland and Norway since those countries share a similar heritage, with a history woven from the Viking age when Norwegians settled Iceland as well as their current common government policies emphasizing equal access to education, health care, and social services. Interestingly, parents from Iceland and Norway seem to rate children’s behavioral problems with similar magnitude (Achenbach & Rescorla, 2007). Nevertheless, Iceland does not have Norway’s financial resources and government support when it comes to implementing intervention programs for children. Thus, this study sheds light on how well a treatment developed in the United States and successfully implemented in a resource-rich country functions in a country with more limited assets.

This study also provides information about how the PMTO program persists following an implementation from one culture to another. Iceland is the Scandinavian nation with the smallest population—320,000 people. In Iceland, parents rate their children one standard deviation lower on the CBCL problem scale than do parents in the United States (Achenbach & Rescorla, 2007), which could indicate that Icelandic parents tolerate behavior in their children that might not be acceptable to parents in the United States. As is true for Norway and Sweden, Iceland has one of the strongest child protection laws, making corporal punishment and verbal and emotional abuse illegal. Icelanders are protective of their national heritage and traditions.

In keeping with recommendations within the literature on cultural adaptation, no major changes were made to the core components of PMTO, but minor adaptations were made to fit contextual circumstances such as metaphors, language, and concepts (Domenec Rodríguez, Baumann, & Schwartz, 2011). We began by translating manuals and parent materials from English into Icelandic. Certain words had to be discussed. For example, Time Out (a discipline method) and Kid Bucks (a token) were not culturally relevant and other phrases had to be developed. Icelandic parents are less emotionally expressive and more silent than American parents. This required that role plays (an important PMTO teaching tool) had to be made less dramatic and other training exercises shaped to be in keeping with Icelandic preferences. Finally, graphical representations were changed for parent handouts and materials for children. Further description about the Icelandic implementation process can be found in two published articles (Sigmarsdóttir & Björnsdóttir, 2012; Sigmarsdóttir & Gudmundsdóttir, 2013).

A particularly important contribution to the field has to do with the introduction of the randomized controlled trial to evaluate an EBT. Although available as services in Iceland since 2000, PMTO had not been widely disseminated and rigorously evaluated in the country. In fact, this study represents the first RCT ever conducted in Iceland on a treatment model for children’s behavior problems.

On the basis of earlier studies, our overall present goal was to assess effectiveness of PMTO as a part of general services in community practice in Iceland. We expected that families randomly assigned to PMTO treatment would realize significantly greater improvements in child adjustment relative to those families provided services as usual in the comparison group.

METHOD

Participants

Participants in the study were 102 children referred for behavior problems, and their parents. A power analysis, based on data from the RCT of PMTO in Norway (Ogden &
Amlund-Hagen, 2008), indicated that the necessary sample size for our study was \( N = 100 \). The experimental group (receiving PMTO therapy) consisted of 51 families, 12 girls, and 39 boys; and the comparison group (receiving Services as Usual/SAU) consisted of 51 families, 16 girls, and 35 boys. The children’s age ranged from 5 to 12 years \( (M = 8.02, SD = 1.91) \). Basic demographics are presented in Table 1.

All parents and children in the sample were White Icelandic citizens, with Icelandic as their first language. Altogether, 52% of the children were living with both biological parents, 21% came from blended families, and 27% were from single-parent households. The distribution is in keeping with Icelandic demographics. Data from 2011 indicate that 72% of Icelandic children live in two-parent households and 28% in single-parent households (Hagstofa Islands, 2011). In our sample, 28% of parents had a college or a higher university degree, 43% had received high school or occupational education, and about 28% had finished elementary or junior high school. The educational level of the parents in the sample is in keeping with Icelandic national norms. The annual income of the majority of the families (77%) was below 8 million Icelandic kronas and just over half (58%) earned less than 6 million kronas per year. According to the national statistics, the annual income in 2009 for a two-parent household in Iceland was 8.1 million kronas per year (approximately $70,000) (Hagstofa Islands, 2010). Judging from these numbers, the financial standing of the majority of families in our sample was in the lower end of the spectrum.

### Design and Procedure

Results were examined using an Intention to Treat (ITT) analysis, which includes all participants in the sample. The study was a 2 (PMTO, SAU) \( \times 3 \) (pre, post, and follow-up) design.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PMTO group</th>
<th>SAU group</th>
<th>Mean or percentage between-group contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>51</td>
<td>51</td>
<td>ns</td>
</tr>
<tr>
<td>Girls</td>
<td>12 (24)</td>
<td>16 (31)</td>
<td>ns</td>
</tr>
<tr>
<td>Boys</td>
<td>39 (76)</td>
<td>35 (69)</td>
<td>ns</td>
</tr>
<tr>
<td>Child Age (5–12 years)</td>
<td>51</td>
<td>51</td>
<td>ns</td>
</tr>
<tr>
<td>Younger (5–8 years)</td>
<td>30 (59)</td>
<td>31 (61)</td>
<td>ns</td>
</tr>
<tr>
<td>Older (9–12 years)</td>
<td>21 (41)</td>
<td>20 (39)</td>
<td>ns</td>
</tr>
<tr>
<td>Child Education Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kindergarten</td>
<td>9 (18)</td>
<td>6 (12)</td>
<td>ns</td>
</tr>
<tr>
<td>Elementary School</td>
<td>42 (82)</td>
<td>45 (88)</td>
<td>ns</td>
</tr>
<tr>
<td>Family Living Structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Parent Household</td>
<td>39 (77)</td>
<td>35 (69)</td>
<td>ns</td>
</tr>
<tr>
<td>Single Parent Household</td>
<td>12 (23)</td>
<td>16 (31)</td>
<td>ns</td>
</tr>
<tr>
<td>Parent Education Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary—Junior High School</td>
<td>15 (29)</td>
<td>14 (28)</td>
<td>ns</td>
</tr>
<tr>
<td>High School—Occupational Degree</td>
<td>22 (43)</td>
<td>22 (43)</td>
<td>ns</td>
</tr>
<tr>
<td>College/Higher University Degree</td>
<td>14 (28)</td>
<td>15 (29)</td>
<td>ns</td>
</tr>
<tr>
<td>Yearly Income (8 million krona = $71,500)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 8 million Krona</td>
<td>35 (80)</td>
<td>30 (75)</td>
<td>ns</td>
</tr>
<tr>
<td>8 million Krona and Above</td>
<td>9 (20)</td>
<td>10 (25)</td>
<td>ns</td>
</tr>
</tbody>
</table>

*Note. ns = no significant difference; PMTO group = PMTO treatment; SAU = services as usually provided in community.*
design, which calls for assessment at baseline, treatment termination \((M = 11.28\) months, \(SD = 1.85\)), and follow-up at 9 months posttreatment termination. The data presented in this article are the results of the pre- or postassessment.

**Recruitment**

Recruitment began in the summer of 2007 following the approval of the National Bioethics Committee in Iceland. Families were recruited from five municipalities located throughout Iceland. Referrals followed standard procedures for children’s behavior problems in each of the five municipalities, mainly stemming from professionals at schools, and other social services (e.g., school counselors, special aid teachers, school psychologists, or social workers who had received a detailed description of the research and the criteria for participation). The criteria for participation in the study were that the child showed behavioral problems at home and/or school, had no history of sexual abuse, and did not meet diagnostic criteria for autism. Inclusion criteria were based on clinical judgments of the professionals rather than a formal screening or diagnosis of behavior problems. This is an efficient and cost-effective approach that has been applied in other effectiveness trials (e.g., Hautmann et al., 2009; Ogden & Amlund-Hagen, 2008). Parents with children meeting the admission criteria received an introduction to the study from a reference party. Those families that were interested in participating then signed a referral to the study. The services were provided in their community and right before the premeasures took place, they received a further description of the study design and procedures and signed relevant consent forms. All families that went through the premeasures participated in the study.

**Randomization**

When two families had been referred to a certain treatment site, PMTO therapists administered the battery of pretreatment measures. This assessment took place before randomization, which kept the assessors blind to group condition. We used simple randomization (1:1 allocation) where each family had a case number (from 1 to 102). When two families had been assessed at baseline, each of the two case numbers was written on separate slips. The slips were then double folded and placed in a container. The number drawn represented the family assigned to the PMTO group. The other number represented the family allocated to the SAU group. Allocation concealment was protected by having a person blind to the study design (a secretary) administer the randomization, in the presence of an impartial witness. All families, independent of group assignment, received posttreatment measures by trained assessors who were not PMTO therapists and who were blind to the group condition.

**Participant flow**

Figure 1 illustrates the participant flow from pre- to posttreatment measures. After receiving a detailed description of the study, all families agreed to participate. For PMTO cases, the therapist who administered the premeasures also provided the family with PMTO treatment. A copy of the relevant assessment battery was sent to the child’s teacher, who had been informed about the research project but was blind to the participant’s group condition. All families, independent of group assignment, received posttreatment measures by trained impartial parties at the treatment site. Since participants in the SAU group were expected to be less connected to the site than families in the PMTO group, the SAU group received a modest monetary reward (approximately $40) to ensure the completion of all postassessment measures. Overall, 95% of all participants completed posttreatment measures. Of the five families missing all posttreatment measures, one belonged to the PMTO group and four to the SAU group.
PMTO is a theory-based manualized intervention that is readily adapted to the unique characteristics of family contexts (Forgatch & Patterson, 2010). Parents received PMTO as individual family treatment, attending sessions on a weekly basis. The mean number of PMTO therapy sessions in this study was 22.63 ($SD = 6.2$), ranging from six to 38 sessions.

Since parents are seen as the principal treatment agents for their children, they are the focus of the intervention. Therapists use active teaching approaches to introduce the five core PMTO components that are the putative mechanisms of child adjustment. Skill
encouragement, teaches parents to coach their children in prosocial behavior, focusing on small successes in a contingent way using incentive charts and token systems. Limit Setting helps parents reduce problem behavior with contingent, mild, noncorporal negative sanctions such as time out, privilege removal, and brief work chores. Supervision/monitoring teaches parents to monitor children’s whereabouts, those with whom they associate, how they travel between places, and which adults are supervising the child’s activities. The problem solving component trains parents in methods to resolve conflict and reach agreements on rules and consequences inside and outside the home. Positive involvement involves promoting the many ways in which parents show children interest, love, and support. Parents are given weekly assignments to practice at home between sessions and receive phone calls to troubleshoot and support their practice. Parents also receive assistance in establishing positive working relationships with the schools, social services, and significant others (Forgatch & Patterson, 2010; Forgatch et al., 2009; Patterson & Forgatch, 2005; Rains, Forgatch, & Knutson, 2010; Sigmarsdóttir, 2005).

Sixteen PMTO therapists, all females, working in community agencies in five municipalities throughout Iceland, treated the cases in the experimental group. In Iceland, therapists have been recruited for PMTO therapist training on basis of clinical background, education, motivation, and agency support. Therapists’ academic background in this study was mostly in psychology and social work. This reflects the educational background of mental health professionals in Iceland with psychologists in leadership of delivering therapy and other disciplines growing within that service. All therapists had completed or were in the final stages of PMTO certification training. The training requires approximately 18 months to complete and involves attending workshop seminars, treating cases in community agencies, and receiving coaching based on observations of video-recorded therapy sessions (Sigmarsdóttir, 2010). During training, PMTO trainers model treatment strategies and demonstrate great care and support supplemented with detailed practitioner manuals and parent materials. Therapists learn how to use problem solving strategies, effective questioning process, and role playing to help parents address family issues and practice procedures (Rains et al., 2010). Twenty cases (39%) in the experimental group received treatment from therapists who were working with their certification families. All of the PMTO therapists received regular ongoing coaching based on direct observations of therapy sessions. PMTO fidelity was measured with the FIMP system (Knutson et al., 2009), where therapists are rated on a 9-point scale; 1–3 reflects needs work, 4–6 acceptable work, and 7–9 good work. The mean FIMP score (rated by reliable FIMP raters) for the therapists in training, and of which treated the experimental group, was 7.16 (SD = 0.74), with individual scores ranging from 6 to 9. The FIMP scores for the whole study sample and its relation to treatment outcome will be published in a future paper, but a study by Sigmarsdóttir and Gudmundsdóttir (2013) on fidelity across three generations of PMTO practitioners in Iceland indicates that overall high levels have been sustained.

Services as usual

The study’s researchers did not oversee or influence services given to participants in the SAU group other than to report group assignment to the referring party. The most frequent referral source was special services for the school system. Services normally provided for children’s behavior problems include the following: diagnosis and/or counseling from a school psychologist, counseling from a school counselor, intervention offered by social services (e.g., home visits where parenting advice is given), and services provided by the health care system (e.g., individual or family therapy). In most cases, treatment is provided individually to children by psychologists or school personnel (see Sigmarsdóttir & Björnsdóttir, 2012). Unfortunately, we were unable to obtain the details of SAU services.
provided in most communities. In about 25% of the cases, parents specified the kind of treatment received: Individual therapy was indicated in 7% of these cases, one family mentioned family therapy, and 17% indicated other unspecified therapy. Given the tradition in psychological services for children in Iceland, it is likely that more services were provided directly to the child and less to the parents in the SAU group.

Measures

We created a latent construct for child adjustment representing data from multiple settings and informants using well-validated assessment instruments. The approach of testing hypothesized models using latent constructs drawing on multiple methods is a hallmark of PMTO studies (Forgatch et al., 2009; Gewirtz, DeGarmo, & Medhanie, 2011; Ogden & Amlund-Hagen, 2008). It builds on the premise that traits are better detectable across a variety of settings and with a variety of methods than with a single measure and in a single setting since the score provided by a latent construct represents the agreement among all the indicators (e.g., Bank, Dishion, Skinner, & Patterson, 1990). Our latent construct consisted of four indicators representing three reporting informants: problem behaviors rated by parents, social skills rated by parents as well as teachers, and children’s self-reported depressive symptoms. All of the instruments used in this study had been translated into Icelandic but none of them has been fully standardized for the Icelandic population. For this reason, raw scores were used in the analyses.

Problem behavior

We measured problem behaviors with the CBCL-Parent Report (Achenbach & Rescorla, 2001). An Icelandic translation of the scale was used (Hannesdóttir, 2002). The CBCL contains 113 items that assess children’s behaviors and problems across several dimensions. Example items are: Argues a lot; Disobedient at home; Feels too guilty. Items are rated on a 3-point scale where higher scores indicate problems of greater magnitude. T scores of 65 and above position a child within a clinical range. Cronbach’s alphas for the Total Problem scale on the CBCL were .91 for pretreatment measures and .94 for posttreatment. Since a proportion of the children in the sample were in kindergarten at baseline (n = 14) and posttreatment (n = 6), the CBCL 1-5 version was used in those cases. Cronbach’s alphas for the Total Problem scale on the CBCL 1–5 were .91 and .96 (pre- and posttreatment, respectively).

Social skills

The Social Skills Rating System (SSRS) measures social skills and problem behaviors in children and adolescents (Gresham & Elliott, 1990). The SSRS is standardized by age and gender in the Unites States and has been translated into Icelandic. In our study, we administered only the social skills subscale. The parent version of the scale contains 38 items describing positive social behaviors in the domains of cooperation, assertion, responsibility, and self-control. Example items are: Responds appropriately when hit or pushed by other children; Makes friends easily; Controls temper when arguing with other children. The teacher version of the social skills subscale includes 30 items measuring cooperation, self-control, and assertion. It includes items such as: Controls temper with peers; Cooperates with peers without prompting; Receives criticism well. Respondents are asked to rate the items according to the frequency of occurrence on a 3-point scale: 0 (never), 1 (sometimes), or 2 (often), where higher scores indicate greater skills and competence. Cronbach’s alphas for the parental ratings on the SSRS social skills subscale were .87 and .79 (pre- and posttreatment, respectively) and .90 for the teacher version at pre- and post-treatment.
**Child depression**

We assessed children’s depressive symptoms with the Children’s Depression Inventory (CDI), a 27-item symptom-oriented summative index (Kovacs, 1992). For each item, the child selects sentences that most accurately describe his or her feelings in the past 2 weeks. Each item consists of three response choices, from 0 to 2, in the direction of increasing severity. Example items are I am sad, and I feel like crying. The CDI has shown adequate reliability in Icelandic samples and the Icelandic version of CDI was used in this study (e.g., Arnarson & Craighead, 2009).

**Other measures**

Two other measures of child outcome were assessed: Teacher ratings on the TRF-Teacher Report of the Achenbach scales (Achenbach & Rescorla, 2001) and the Parent Daily Report (PDR; Patterson et al., 1982). Since neither the parental or teacher ratings on these scales had significant loadings in our latent construct for child adjustment, data from these scales were excluded in the analyses.

**Control variables**

Child Age is given in years. Child Gender was coded 0 for girls and 1 for boys. Single parent status was coded 1 for single parent and 0 for two parent families. Assessment Interval was time in months between the pretreatment baseline assessment (Time 1) and the posttreatment assessment (Time 2). The ITT random assignment contrast was coded 1 for the PMTO condition and 0 for the SAU condition.

**Analytic Strategy**

Analyses were specified in four basic steps. First, we tested for significant between-group differences at baseline. Second, we evaluated the missing data patterns using a standard attrition analysis and a test for random missingness. Then, we employed structural equation modeling (SEM) to conduct a confirmatory factor analysis (CFA) of the child adjustment construct indicators, and finally, we employed SEM to test the main intent-to-treat hypotheses. SEM is particularly suited for multi-method multi-source covariance matrices because of its ability to partial measurement error of constructs and, more specifically, to specify error between same source indicators or across time (Byrne, 2009, 2011). The ITT analysis specified change in child adjustment as an auto-regressive factor analysis regressed on the PMTO group contrast for random assignment and control variables. We employed the Mplus6 program (Muthén & Muthén, 1998–2012).

**RESULTS**

First, the data were analyzed to test for significant between-group differences at baseline. The analyses revealed no significant between-group differences in main baseline characteristics such as age, gender, or parent demographics, as presented in Table 1. Nor were there any significant between-group differences in any of the outcome measures. The means, standard deviations, and bivariate correlations of the child adjustment indicators are presented in Table 2.

The second step of the analyses evaluated missing data patterns due to attrition or item nonresponsiveness. At posttreatment assessment ($M = 11.28$ months, $SD = 1.85$), 97 of the 102 cases were evaluated (attrition in the PMTO group was 2% vs. 8% for the SAU group), thus the overall retention rate was high (95%). For standard attrition analyses, we compared those families lost and those families retained at posttreatment on the Time 1 control variables and indicators for child adjustment. There were no mean differences. We
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Child Sex (Boy)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Child Age</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Single Parent</td>
<td>-.02</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. T1 Child Depression-Child</td>
<td>.06</td>
<td>.34</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. T1 Total Problem Behaviors-Parent</td>
<td>-.15</td>
<td>.07</td>
<td>-.00</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. T1 Total Problem Behaviors-Teacher</td>
<td>.45</td>
<td>.22</td>
<td>-.06</td>
<td>.00</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. T1 Social Skills-Parent</td>
<td>.04</td>
<td>.03</td>
<td>-.13</td>
<td>-.20</td>
<td>-.47</td>
<td>-.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. T1 Social Skills-Teacher</td>
<td>-.38</td>
<td>-.05</td>
<td>.15</td>
<td>-.08</td>
<td>-.15</td>
<td>-.69</td>
<td>.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. T2 Child Depression-Child</td>
<td>.08</td>
<td>.20</td>
<td>.10</td>
<td>.45</td>
<td>.17</td>
<td>.12</td>
<td>-.17</td>
<td>-.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. T2 Total Problem Behaviors-Parent</td>
<td>-.07</td>
<td>.06</td>
<td>-.07</td>
<td>.10</td>
<td>.59</td>
<td>-.07</td>
<td>-.29</td>
<td>-.02</td>
<td>.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. T2 Total Problem Behaviors-Teacher</td>
<td>.35</td>
<td>-.04</td>
<td>-.15</td>
<td>.00</td>
<td>.24</td>
<td>.46</td>
<td>-.18</td>
<td>-.43</td>
<td>.31</td>
<td>.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. T2 Social Skills-Parent</td>
<td>.06</td>
<td>.13</td>
<td>.0111</td>
<td>-.08</td>
<td>-.28</td>
<td>.07</td>
<td>.43</td>
<td>.06</td>
<td>-.28</td>
<td>-.42</td>
<td>-.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. T2 Social Skills-Teacher</td>
<td>-.34</td>
<td>.01</td>
<td>.03</td>
<td>-.02</td>
<td>-.12</td>
<td>-.45</td>
<td>.18</td>
<td>.53</td>
<td>-.28</td>
<td>-.22</td>
<td>-.67</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>.73</td>
<td>8.02</td>
<td>.28</td>
<td>10.58</td>
<td>56.87</td>
<td>54.21</td>
<td>40.54</td>
<td>29.69</td>
<td>9.42</td>
<td>48.12</td>
<td>50.89</td>
<td>44.15</td>
<td>31.64</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>1.84</td>
<td>1.91</td>
<td>.45</td>
<td>7.59</td>
<td>21.31</td>
<td>30.04</td>
<td>10.91</td>
<td>9.66</td>
<td>6.09</td>
<td>22.00</td>
<td>29.48</td>
<td>10.03</td>
<td>8.75</td>
</tr>
</tbody>
</table>

*Note.* T1 = Time 1; T2 = Time 2.
next conducted a missing values analysis comparing partial data participants and complete data participants. Little’s test of missing data revealed the data were missing completely at random [Little’s MCAR Chi-Square (95) = 113.48, \( p = .10 \)]. Following recommendations for missing data, the data were modeled using full-information maximum likelihood (FIML), which uses all available information from the observed data. FIML estimates are computed by maximizing the likelihood of a missing value based on observed values in the data (Jelisić, Phelps, & Lerner, 2009).

Next, we conducted a set of CFA using SEM. First, a model was specified using scale scores for child reported depressive symptoms, parent and teacher reported problem behaviors, and parent and teacher reported social skills modeled for pre- and post-PMTO treatment. The CFA specified a factor variance of 1 for the child adjustment construct and a mean of 0. The factor loading parameters were freely estimated for each of the indicators. Error term co-variances were also included across time for each respective pre–post indicator since repeated measurement of the same variables often results in correlated measurement error (Farrell, 1994). The CFA involving all indicators did not obtain adequate fit to the data (McDonald & Ho, 2002). The chi-square minimization fit statistic comparing the observed covariance structure with the hypothesized measurement model was significantly different and the comparative fit index was lower than .90, \( \chi^2(29) = 64.56, \ p = .00, \text{CFI} = .88 \). We then conducted a set of trimmed models removing each respective indicator. The best-fitting model that removed the teacher reported total problem behaviors scale score resulted in a model with excellent fit to the data, \( \chi^2(15) = 8.95, \ p = .89, \text{CFI} = 1.00, \) and with a significant improvement in fit compared to the original model, \( \Delta \chi^2(14) = 55.61, \ p < .001 \). Therefore, the only input from teachers was from teacher ratings of social skills and it obtained the weakest loading as an indicator in the construct.

To test the main ITT study hypothesis, we next specified an SEM change model with the Time 2 child adjustment construct factor regressed on Time 1 and adding the ITT contrasts for PMTO and control conditions as predictors. Results are shown in Figure 2 in the form of standardized beta paths. The key study hypothesis was supported. Controlling for child age and gender, the PMTO group showed greater reductions in child adjustment problems relative to the services as usual group (\( \beta = -.27, \ p < .01 \)). Age and gender were not associated with change in outcomes. The model obtained adequate fit to the data, \( \chi^2(50) = 64.72, \ p = .08, \text{CFI} = .92 \). In total, 41% of the variance was explained in the post-treatment construct of child adjustment.

Examination of the individual indicators revealed that only one indicator showed significant change between the SAU and the PMTO group from pre- to posttreatment. Analysis of covariance (ANCOVA) revealed a significant difference in change scores on the Social Skills scale of the SSRS between the SAU group (\( M\text{change score} = 1.30, \ SD = 10.51 \)) and the PMTO group (\( M\text{change score} = 5.62, \ SD = 11.48 \)) after controlling for initial status, \( F(1,97) = 6.43, \ p < .05 \). The other indicators did not show significant changes when evaluated independently. However, we note that convergent multiple informant constructs are more reliable than single item, source or scale measures alone (Conger & Elder, 1994; Eddy, Dishion, & Stoolmiller, 1998).

**Effect Size**

We estimated the PMTO effect size using two methods. First we estimated Cohen’s \( d \) using factor scores for Time 1 and Time 2 saved from an unconditional SEM model specified with the indicators shown in Figure 2, unconditional meaning no predictors were entered in the model. This method obtained a factor mean of .36 and −.36, respectively, for the controls and the PMTO conditions (\( SD = 2.35 \) and 2.24, respectively). Cohen (1988) characterizes .20 as small, .50 as medium, and .80 as large. The unconditional factor
scores obtained a $d$ of .31, characterized as a modest to medium-sized effect. In the second approach, we decomposed the explained variance for the Time 2 latent variable construct in the conditional path model shown in Figure 2. This method indicated that 6% of the total variance was explained by the PMTO group condition, which is characterized as a medium effect when converted to Cohen’s $d$ ($r^2 = .07, r = .26, d = .54$). Therefore, the construct model indicated that the PMTO intervention had a modest to medium effect.

**Clinical Significance**

Finally, we calculated clinical significance using the Reliable Change Index (RCI) and the Edwards-Nunally RCI to evaluate change in the treatment group adjusting for reliability of measurement and potential regression to the mean (Jacobson, Roberts, Berns, & McGlinchey, 1999). We focused on recommendations for composite scores by saving the estimated latent variable construct for child adjustment problems (Pretest construct Control Group $M = .14$, $SD = 1.78$; Intervention Group $M = -.14$, $SD = 1.76$; Posttest Control Group $M = .42$, $SD = 2.27$; Intervention Group $M = -.42$, $SD = 2.26$, $t = .83$, $p = .41$). For the observed latent construct score, 57% of the intervention showed improvement over time compared with 45% in the controls. The RCI indicated 20% of the PMTO group demonstrated reliable improvement compared with 6% in the control condition; while the Edwards-Nunally RCI indicated that 24% of the PMTO condition showed reliable improvement.
improvement relative to only 6% in the control condition. We note a more appropriate test of RCI would be conducted with community normed data and replicated test-retest information on the criterion outcome.

**DISCUSSION**

This study evaluated effects of a nationwide implementation of PMTO in Iceland before and after community treatment in a randomized controlled trial of 102 children ages 5–12. Findings supported our hypothesis: Children whose parents received PMTO treatment showed greater improvement in the child adjustment construct in contrast to the families in the comparison group, who received services normally provided in Icelandic communities for behavior problems. In this study, child adjustment was assessed with SEM, where a latent construct consisting of four indicators, representing three reporting agents (problem behaviors rated by parents, child depressive symptoms rated by the child, and social skills rated by parents and teachers) was modeled. Our analysis indicates that PMTO treatment produced benefits to the construct measure of children’s adjustment assessing behavior problems, depressive symptoms and social skills. When examined independently, only the parent-reported measure of social skills showed a significant effect of the intervention.

The results are consistent with earlier studies of PMTO conducted in the United States (e.g., Bank et al., 1991; Chamberlain & Reid, 1998; DeGarmo, Patterson, & Forgatch, 2004; Forgatch & DeGarmo, 1999; Forgatch et al., 2009; Patterson et al., 1982) and in Norway (Amlund-Hagen et al., 2011; Ogden & Amlund-Hagen, 2008). In our study, the effect size obtained from the construct was modest to medium, a finding that is in keeping with other studies of PMT approaches (Kaminsky et al., 2008). These data, evaluated within a nationwide implementation, indicate that PMTO is an effective method for treating children’s behavior problems in Iceland and that the method can be implemented in community service agencies with positive outcomes.

Child adjustment was evaluated with a latent construct, as recommended by Bank et al. (1990). They argue that more representative sampling of methods and informants leads to more generalizable models than does sampling of mono-method indicators. All four indicators representing our latent construct for child adjustment have been employed in earlier studies of PMTO. The Problem behavior indicator was formed with parental ratings on the CBCL scale (Achenbach & Rescorla, 2001), a frequently used instrument in PMTO studies (e.g., Forgatch & DeGarmo, 1999; Ogden & Amlund-Hagen, 2008). Children’s self-reported depressive symptoms on the CDI scale (Kovacs, 1992) have also been used in prior PMTO studies (e.g., DeGarmo et al., 2004; Gewirtz et al., 2011). The Social skills indicator, formed by parental and teacher ratings on the SSRS scale (Gresham & Elliott, 1990), was used by researchers in Norway (Ogden & Amlund-Hagen, 2008). As the scale includes a wealth of items measuring children’s skills in this important domain, the Social skills indicator allowed us to expand evaluation of outcome beyond behaviors that reflect negative symptoms or weaknesses. Since, generally speaking, one of the aims of psychotherapy is to build clients’ repertoires of skills and coping strategies, the importance of measuring positive behaviors in outcome studies is emphasized here.

Our findings reflected minimal effects of the PMTO intervention on the school setting. The TRF (total problem scale) did not load on our latent construct for child adjustment, and teacher ratings of social skills obtained the weakest loading as an indicator in the construct. Some factors may account for this. First, Positive Behavior Support (Sprague, Sugai, Horner, & Walker, 1999), an empirically validated behavior intervention consonant with PMTO principles, was in effect in more than half of the schools (including both PMTO and SAU conditions) so it cannot be ruled out that some of the children in the SAU group
were influenced by methods similar to PMTO and the teacher ratings reflected this. Teachers for children in the SAU group may have known that treatment was being provided whereas teachers for the PMTO group may have been blind to this fact. Additionally, studies have found an association between antisocial behavior at home setting and in the school setting, particularly for more extreme cases (e.g., Ramsey et al., 1990). Although the overall mean sample T score in our sample was within the clinical range, about 27% of the children were below the clinical range at baseline assessment, as measured by parent ratings on the total problems CBCL scale. It may be that some of the children’s behavior problems were not severe enough to generalize to the school settings. Whatever the reasons, these results are in harmony with findings in other PMTO Norwegian studies that have found little generalization of effects from home to school (Kjøbli & Ogden, 2012; Ogden & Amlund-Hagen, 2008).

Although both groups showed some change, about 60% of the PMTO group showed improvement in child adjustment compared to 45% in the comparison group. Furthermore, the PMTO group showed clinically significant improvement in child adjustment for roughly one-quarter of the sample relative to only 6% in the control condition.

It is interesting to note that in our study, children’s age did not influence the outcome of treatment. While some studies have found parent training to be equally effective in early and middle childhood (e.g., Dishion & Patterson, 1992), others have shown treatment effects in favor of younger children (e.g., Ogden & Amlund-Hagen, 2008; Webster-Stratton & Hammond, 1997) or older children. For example, in the United Kingdom, Scott (2005) found greater effects of the Incredible Years program for the older children in their sample (age ranged from 3 to 8 years). Following a review of data from numerous random assignment outcome studies, Patterson, Dishion, and Chamberlain (1993) concluded that evidence for treatment effects favors younger children and they speculated that families of older antisocial children may be less amenable to treatment. Ogden and Amlund-Hagen (2008) reached a similar conclusion; a longer history of difficulties may result in more coercion between parents and children, which consequently makes the therapy-process more demanding. Whatever reason for lack of convergence across studies, we believe, as Kazdin (2005) has pointed out, that age as a moderator for treatment effects needs further evaluation.

When conducting research in community service agencies, numerous factors can threaten the internal validity of a study, including a high rate of attrition among participants (e.g., Amlund-Hagen et al., 2011; Hautmann et al., 2009). In our study, overall loss of participants was very low (5%), especially when compared to attrition rates in other similar studies (see Hautmann et al., 2009; with attrition of 35% postassessment, and Ogden & Amlund-Hagen, 2008; 13%). Possibly, the low attrition rate in this study reflects well-organized retention methods, which in part may owe success to Iceland’s small population and direct contact with professionals in the field, which indeed contributes to a high external validity (Green & Nasser, 2012). It is also in sync with Minkler and Salvator (2012), saying that increased consultation between researchers, implementers, and community professionals has been shown to result in higher recruitment, lower attrition, and fewer cultural barriers in implementation research.

Limitations

This study has some important limitations that must be considered when evaluating the overall outcomes of this effectiveness trial. One problem is the lack of information about the treatment provided to families in the SAU group, which may reflect how unstructured and undefined treatments are for children with behavioral problems in Icelandic communities. We assume there were two main treatment sources: psychologists

Fam. Proc., Vol. x, xxxx, 2014
and school personnel. The professional tradition for psychologists in Iceland is to work directly with the child and less so with the parents. It is also likely that most direct services were provided to children by school personnel in the SAU group since special services for the school system was often the referring party. Thus, we presume that direct services were provided more to children than to parents in the SAU group. Furthermore, we have no information on the differential amount of treatment time that was provided to families in the two groups.

One more potential confound must be mentioned: The baseline assessment was conducted for all families by PMTO therapists. Fortunately, they were blind to condition because randomization was not conducted until after the assessment. The randomization was then conducted by a person blind to the conditions of the study and in the presence of a witness. Finally, the postassessment was conducted by trained assessors who were not therapists in the study for either condition.

Research and Clinical Implications

Findings from this nation-wide implementation of an evidence based treatment have important implications. First, this study extends previous studies showing that PMTO is beneficial for children’s adjustment and therefore contributes to the intervention science. PMT methods in general have excellent support as an effective treatment for externalizing behavior problems (Kazdin, 2005). In addition, PMTO has shown positive results for internalizing behaviors, academic functioning (e.g., DeGarmo et al., 2004; Forgatch & DeGarmo, 1999), and social skills (Ogden & Amlund-Hagen, 2008).

Second, these findings lend further support to the notion that PMTO, which was developed and tested in the United States, primarily in efficacy trials, generalizes to community samples in Northern European cultures, contributing to the implementation science. This was first evidenced in Norway (Amlund-Hagen et al., 2011; Ogden & Amlund-Hagen, 2008) and is now evident in Iceland. It is worth mentioning that in Norway, as well as in Iceland, minimal adaptations were needed to adjust the treatment to cultural and contextual circumstances, which is in accordance to recommendations within the literature (Domenech Rodríguez et al., 2011). The PMTO therapists participating in this Icelandic study were all White females with a professional background either in psychology or social work and the parents were all White as well. In the Norwegian RCT, the therapists and clients were also of similar ethnic background. In a PMTO study with Spanish-speaking Latinos in Detroit Michigan, practitioners and clients were of similar cultural background, few adaptations were made to the intervention, and there was excellent retention in the intervention and high levels of satisfaction reported by parents (Parra-Cardona et al., 2012). Some recent work shows that it is possible to intervene with cultural and language differences between practitioners and clients. For example, in an innovative RCT study conducted in Norway, ethnic Norwegian practitioners provided the PMTO intervention to Pakistani and Somali immigrant mothers through translators. Findings showed that the intervention produced significant improvements for child outcomes in the PMTO condition. Furthermore, the PMTO parenting practices mediated the intervention’s effect (Bjørknes, Kjøbli, Manger, & Jakobsen, 2012). That is an important clinical implication and there is a similar study currently underway in Northern Uganda where mothers are receiving the PMTO intervention in groups provided by American and German practitioners (Wieling et al., 2014).

Another important implication of the study is the implementation approach. In both Iceland and Norway in which the program was tested nationwide, although the studies were conducted independent of participation by the developers, there were strong channels of communication between the developers and national implementers, which is a
critical factor for successful implementation (e.g., Fixsen et al., 2005; Minkler & Salvator, 2012). In comparison to Norway, the implementation in Iceland was conducted with scarce resources, as the financial support for the program was minimal. Thus, our findings indicate that adequate implementation of PMTO in community settings is possible in resource-poor conditions. The implementation approach was full transfer of the program from the developer to the adopting community (Forgatch, Patterson, & Gewirtz, 2013). An important question with this strategy is whether or not fidelity will suffer. Two studies have now been published demonstrating that method fidelity is sustained after the developer leaves and the program is managed by community leadership (Forgatch & DeGarmo, 2011; Sigmarsdóttir & Gudmundsdóttir, 2013). Further reading about the implementation process of PMTO in Iceland can be found in two published papers; Sigmarsdóttir and Gudmundsdóttir (2013) showing good fidelity to the method following transfer of the model to local implementation, and Sigmarsdóttir and Björnsdóttir (2012) exploring positive influences at community level. Further reading about the implementation of PMTO around the world can be found in a newly published paper by Forgatch et al. (2013).

CONCLUSIONS

Overall, our results provide support for the effectiveness and generalizability of PMTO in Iceland. The study was carried out nationwide in community treatment settings, with minor adaptations to address Icelandic culture and conditions. It is important to note, however, that the SAU group may not have received the same amount of services as the PMTO group. The effects of this study were reached through a construct model, not individual indicators.

When theoretical models are replicated with independent samples that are significantly different on important dimensions, or when the test uses variables that are theoretically consistent but methodologically different, confidence in generalizability is strengthened for both the underlying theoretical model and the measured constructs (Conger, Patterson, & Ge, 1995; Dishion, Patterson, & Kavanagh, 1992). It will be important to evaluate longer-term follow up and monitor the magnitude of effect size over time. Since the results are largely in harmony with those of Ogden and colleagues in Norway (Ogden & Amlund-Hagen, 2008; Amlund-Hagen, Ogden, & Bjørnebekk, 2011), and because of cultural similarities, this study provides important information about the effectiveness of PMTO in reducing children’s adjustment problems in Northern European communities. PMTO therefore serves as an extremely valuable addition to treatment resources in those countries, with findings that have implications for policy makers.

REFERENCES


www.FamilyProcess.org