TRAJECTORIES OF CHANGE IN PARENT SKILL ACQUISITION DURING THE CDI PHASE OF PARENT-CHILD INTERACTION THERAPY FOR CHILD WELFARE-INVOLVED FAMILIES: A PRELIMINARY INVESTIGATION

by

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Title: Trajectories of Change in Parent Skill Acquisition during the CDI Phase of Parent-Child Interaction Therapy for Child Welfare-Involved Families: A Preliminary Investigation

Child Maltreatment (CM) is a costly social problem within the U.S. Most CM incidents are parent perpetrated and most child victims of CM remain in the home after a substantiated report. Parenting has therefore emerged as the most targetable area for intervention in cases of CM. The current study sought to understand the mechanisms of change among CM parents in an evidence-based parenting intervention for families involved in child welfare, Parent-Child Interaction Therapy (PCIT). PCIT has demonstrated significant effects on lowering observed harsh parenting, and reducing child abuse recidivism. Understanding parenting therapeutic change reflects a critical next-step in evidence-based research. The current study mapped session-by-session trajectories of parenting skill acquisition and decline through the first phase of PCIT, child directed interaction (CDI).

Participants (Mothers with their children, age 3 to 7; N = 20) were drawn from an RCT of PCIT for child welfare-involved families. Along with examining pre- post-CDI differences, multilevel growth curve modeling was used to analyze trajectories in total positive parenting skills taught (i.e., do skills), and behaviors to avoid (i.e., don't skills) via session-by-session (7-14 time points) observational coding of interactions to

determine the nature of change through the first phase of PCIT. Linear and nonlinear (i.e., quadratic and cubic models) were explored to determine the most appropriate model of fit for positive parenting skills and for behaviors to avoid. This study further sought to test whether rates of weekly homework completion moderated rates of skill acquisition.

Results indicated parents demonstrated significant growth in skill acquisition of positive parenting skills with some slowing of gains across the CDI phase of treatment. Parents also exhibited increases in negative parenting skills across CDI, then showed reductions in the don't skills. Significant random effects indicated that these changes varied across participants. Parents who completed higher rates of homework showed less acceleration of don't skills. Understanding change in PCIT is important to clarify pathways through which PCIT leads to positive changes for CM families. Exploring change trajectories in parenting skills has important implications in refining treatment and providing guidance for policy makers to implement cost-effective interventions that can reduce/prevent CM.

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CHAPTER I

INTRODUCTION

Child Maltreatment (CM) is a prevalent and costly social problem within the United States. CM is defined as an act or omission by a parent or caretaker, which results in serious physical or emotional harm, sexual abuse, or presents the risk of imminent harm for a child (U.S. Department of Health and Human Services, 2017). According to the National Child Abuse and Neglect Data System, about 9.2 children per 1,000 children (or about 683,000 children) are victims of substantiated child maltreatment (U.S. Department of Health and Human Services [USDHHS], 2017). Additionally, research indicates that children who are the subject of a CPS report are at high risk for CM, regardless of substantiation decisions (Fang, Brown, Florence & Mercy, 2012). In 2015, approximately 3.4 million children were the subject of at least one CPS report. Further, researchers argue that the number of reports grossly underestimate the total incidence of CM (Haugaard & Emery, 1989; Hussey, Change, & Kotch, 2006). The lifetime economic burden of CM in the United States is estimated at approximately $124 billion, or a lifetime cost of $210,012 per victim of nonfatal CM (Fang et al., 2012).

In addition to the prevalence and economic burden, family systems are greatly affected by CM. The majority of physical abuse and neglect are parent perpetrated (Sedlack et al., 2010), and many children remain in home after a report. Therefore, implementing effective parenting/family interventions is essential. Parents who perpetrate CM also risk losing physical and legal custody of their children. Although out-of-home placement is supposed to protect children, literature shows that children placed in foster care continue to suffer short- and long-term consequences including disproportionate

rates of mental health and adjustment problems (Horwitz, Chamberlain, Landsverk, & Millican, 2010). Thus, more research aimed at effective intervention after reported CM is exceedingly important. Although emphasis is often placed on trying to keep families together, little research exists on important treatments focused on keeping biological families together, and the types of parenting interventions that may improve quality of parenting and reduce the risk for re-abuse.

Exposure to CM is linked to many short- and long-term costs to children including serious cognitive, psychosocial, emotional and behavioral outcomes (e.g., Azar & Wolfe, 1998; Bentovim, 2014; Cicchetti & Toth, 2005; Fergusson, Boden, & Horwood, 2008; Gilbert et al., 2009; Kim & Cicchetti, 2010; Kolko, 2002; Skowron & Woehrle, 2012). Both neglected and physically abused children show poorer academic performance and disruptive behavior at school (Eckenrode, Laird, & Doris, 1993). Children who have experienced CM have disproportionate rates of developing internalizing and externalizing disorders (Azar & Wolfe, 1998; Horwitz et al., 2010; MacMillan et al., 2009; Stirling & Amaya-Jackson, 2008), revictimization (Widom, Czaja, & Dutton, 2008), and physical health problems (Chartier, Walker, & Naimark, 2007).

The lifetime economic, familial, and psychosocial costs of CM make research on effective CM interventions vital. The current study sought to further knowledge about the mechanisms of change and skill growth among CM parents in an evidence-based parenting intervention for families involved in child welfare, Parent-Child Interaction Therapy (PCIT; Eyberg & Boggs, 1998).

CM Parenting

Despite the evidence that CM leads to many negative short- and long-term consequences in child development, family health, and economic costs, there is relatively little research on efficacious treatments and interventions to improve parenting quality among parents who have already begun to maltreat their children, and ultimately reduce the rates of recurrence of CM reports (Skowron & Reinemann, 2005). Most perpetrators of CM are biological parents (80.8%; Sedlack et al., 2010), and the majority of child victims of CM who received post-response services remained in the home after a substantiated report (i.e., 63.7% received in-home services versus 23% who were removed and placed in substitute care; USDHHS, 2015). Thus, it is exceedingly important to develop effective services to prevent the recurrence of abuse and neglect in CM families.

Research is generally consistent with the idea that the etiology of child maltreatment is complex, multidimensional, and transactional in nature; there is no one cause for child maltreatment (Belsky, 1993; Kolko, 2002; Stith et al., 2009). On the systemic level, common risk factors for child maltreatment include poverty, parent employment, parent history of CM victimization, stress, and family size (Milner & Chilamkurti, 1991; Stith et al. 2009; Urquiza & McNeil, 1996). These systemic and external risk factors for CM likely converge to compromise both parental availability and parenting quality, especially in the CM subtypes of physical abuse and neglect. In fact, more than 80% of cases of abuse and neglect are perpetrated by biological or custodial parents (Sedlack et al., 2010). While external or contextual factors are important to consider when understanding the multi-determined etiology of CM, parenting is the most

proximal and targetable area for intervention in cases of physical abuse and neglect, and thus an important target for intervention. Parent-training interventions can target parent behavior to improve the quality of parent-child interactions, and enhance individual parent and child well-being.

Overall, there are several differences in the quality of parenting observed in CM versus non-CM families (Ammerman, 1990; Reid, Taplin, & Lorber, 1981). Parents who perpetrate CM have been shown to be less affectionate, less positive, more negative, more withdrawing, and less flexible in their interactions with their children as compared to non-maltreating parents (Shook Slack et al., 2004; Trickett & McBride-Chang, 1995; Wilson, Rack, Shi, & Norris, 2008). Additionally, physically abusive parents engage in more hostile parenting and use more harsh, coercive discipline than non-maltreating families (Chaffin, Funderburk, Bard, Valle, & Gurwitch, 2011; Milner & Chilamkurti, 1991). When observing neglectful parents relative to controls, neglectful parents display less involvement and lower warmth (Shook Slack et al., 2004), less empathy (Shahar, 2001), and more strict control and discipline during interactions with their children (Shook Slack et al., 2004; Skowron, et al., 2011).

Despite some variance observed in CM parent-child interactions based on subtype of CM, both physically abusive and neglectful parents display less frequent and less positive interactions than do non-maltreating parent-child dyads (Wilson, Rack, Shi, & Norris, 2008). Given that parents are implicated in more than 80% of physical abuse and neglect cases (Sedlack et al., 2010), parenting is a critical target of interventions for CM families. Since the creation of the National Center on Child Abuse and Neglect (NCCAN) two decades ago, there has been a push to critically evaluate the effectiveness

of parenting programs for CM families (Barth et al., 2005; Hurlbert et al., 2007; Skowron & Reinemann, 2005). Just over a decade ago, a meta-analysis of CM treatments conducted through 2002 showed that CM interventions were capable of producing parent-reported improvements in functioning for CM families when compared to waitlist control or placebo groups, but no significant changes were observed in actual quality of parenting behavior (Skowron & Reinemann, 2005). Another review documented that commonly used CM intervention program, such as intensive family preservation programs have not shown robust effects in reducing re-abuse or preventing out-of-home placement (Barth et al., 2005), yet such services continue to be used across the United States in response to CM.

Parent-training is a commonly used method of intervention for biological and non-biological parenting services (Chamberlain, 2003) and is often part of reunification services (Barth, et al., 2005). Parent-training programs are employed in treating roughly half of CM families (Hurlbert et al., 2007), yet before 2004, there was little evidence that any CM focused parenting programs could measurably improve observed quality of parenting (Skowron & Reinemann, 2005) or prevent new instances of abuse or neglect in families where CM already occurred (Horwitz, Chamberlain, Landsverk, & Mullican, 2010).

Parent-Child Interaction Therapy is Effective for CM Parents

Although PCIT was originally developed to address child behavior concerns (Eyberg & Boggs, 1998) it has been adapted for use in CM populations (Urquiza & McNeil, 1996). Shortly following publications of the meta-analyses above, Chaffin and colleagues published a randomized clinical trial (RCT) of PCIT with child welfare-

involved families and demonstrated significant effects on lowering observed harsh parenting, improving observed positive parenting and reducing child abuse recidivism rates over one-year post-intervention (Chaffin et al., 2004; Chaffin et al., 2011). As such, PCIT has reached the level of an Evidence-Based Practice (i.e., is efficacious based on previous research) when delivered to CM families (California Evidence-Based Clearing House [http://www.cebc4cw.org]) and has been found effective for treating both child physical abuse and neglect (Batzer, Berg, Godinet, & Stotzer, 2018; Chaffin et al., 2004; 2011; Thomas & Zimmer-Gembeck, 2011Timmer, Urquiza, Zebell, & McGrath, 2005).

PCIT is comprised of many ingredients found in other effective parent training programs, but PCIT uniquely focuses on supporting in-vivo skills training while parents practice with their children, rather than relying solely on didactic lessons with parents learning skills separately, as is the case with most parent educational training models (Gardner, Hutchings, Bywater, & Whitaker, 2010). Additionally, parents practice skills directly with their children at home, during "special time" homework in order to consolidate parental learning and provide children with repeated exposure to the positive, therapeutic parenting skills. PCIT consists of two distinct, successive phases of treatment: child-directed interaction (CDI) followed by parent-directed interaction (PDI).

During the CDI phase, parents learn specific "do" skills (the PRIDE skills) and several "don't" skills to avoid during "special time" play, as well as instruction for providing their children with positive attention for pro-social behaviors with selective ignoring for disruptive or attention-seeking behavior. PRIDE is an acronym to help parents remember the do skills, and these are: praise, reflect, imitate, describe, enjoy. Labeled praise includes specific, labeled positive evaluation of a child's appropriate or

pro-social behavior (e.g., “thank you for sharing your blocks”); reflection involves repeating or paraphrasing a child’s pro-social verbalizations (e.g., child: “I have the red fire truck.” Parent: “…the red fire truck.”); imitation is to copy or mimic the child’s appropriate play (e.g., the child begins coloring a tree and the parent also colors a tree). Behavior descriptions describe or narrate the child’s pro-social play (e.g., “you’re stacking the blocks to build a tower”); and enjoyment is displayed when parent shows warmth and engagement in the play (e.g., smiling and laughing). Parents are assigned “special time” homework to practice the PRIDE skills at home with their child for 5 minutes each day in order to more effectively learn and consolidate positive parenting skills, and to increase the frequency of positive parent-child interactions at home between sessions. Therapists monitor and support homework completion each week by having parents track and report on frequency of homework completed.

Criteria for mastery of the PRIDE skills are assessed during weekly observational coding of PRIDE skills during a 5-minute CDI coding segment at the start of each CDI session. Mastery is achieved in the CDI phase of treatment when a parent displays 10+ labeled praises, 10+ reflections, and 10+ behavior descriptions during the 5-minute CDI coding period. These weekly observational assessments inform selection of a coaching focus for the session that day. Typically, the PCIT therapist will choose to focus coaching efforts on a low-frequency PRIDE skill, not yet at mastery.

Once parents achieve “mastery” of the PRIDE skills, they are ready to transition to phase two of PCIT: Parent-Directed Interaction (PDI). During PDI, parents learn to utilize clear, effective, and positively stated commands with their child, and follow up with a specific labeled praise for child compliance, or a structured time-out procedure for

non-compliance. During PDI, parents continue to complete 5 minutes of CDI "special time" homework each day, and are assigned brief PDI skills practice homework that involves progressively more "real-life" situations to practice giving effective commands and following up in the home. PDI skill development is assessed each session via 5-minute observational coding of parents' effective command sequences, which then also informs the coaching focus for that day's session. PDI mastery is achieved when 75% of parent commands are coded as "effective" (i.e., direct, positively stated commands) and 75% of those effective commands show successful parent follow-through (i.e., ranging from labeled praise for child compliance to correct use of a time-out sequence for non-compliance). Thus, successful completion of both the CDI and PDI phases of PCIT are mastery-based, and treatment may vary in number of sessions completed on the way to PCIT graduation.

In each phase of PCIT, parents participate in an initial didactic "teach" session, followed by a series of joint parent-child "coaching" sessions. Sessions are assessment driven, such that each week parents report on child behavior concerns using the Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999), and therapists complete brief observational coding of parent skill acquisition, with observational coding of parent skills guiding the focus of sessions. Parents are coached by therapists via an audio device (bug-in-ear) from behind a one-way mirror. After coaching, parents are sent home with specific suggestions for at-home skill practice.

Urquiza and McNeil (1996) first theorized that PCIT could be applied to physically abusive families due to the focus on disrupting maladaptive parent-child relationship processes through use of selective attention for positive behaviors,

supporting parents to develop more frequent, positive interactions, and establishing a non-coercive, effective discipline strategy, in an intensive, behavioral play therapy format. PCIT emphasizes the importance of traditional play therapy techniques, delivered by the parent to build nurturing, warm relationships and providing ways to decrease negative affect and control during discipline (Urquiza & McNeil, 1996). Thus, PCIT involves many factors thought to be effective for treating CM, including both the parent and child in treatment to impact the parent-child relational pattern, and teaching plus live coaching of behavioral skills that decrease parental negativity and control during discipline (Urquiza & McNeil, 1996). Several RCTs have demonstrated that PCIT is effective in reducing new reports of child maltreatment (Chaffin et al., 2004; Chaffin et al., 2011), negative parental behavior, child disruptive behavior, and stress, and improving the quality of parent-child interactions (Thomas & Zimmer-Gembeck, 2011). Further, PCIT completers were less likely to have reported CM during treatment (Thomas & Zimmer-Gembeck, 2011) or substantiated CM up to 2-years post-treatment completion (Chaffin et al., 2004; Chaffin et al., 2011). Compared to a traditional group-based parent-training program PCIT was found to reduce physical abuse recidivism among CM parents (i.e., 19% CM recidivism for PCIT families as compared to 49% CM recidivism in traditional group-based parent training families (Chaffin et al., 2004). In addition, PCIT has been shown to be effective for low-income families and ethnic/racially diverse families including Black families (Chaffin et al., 2004), Native American and Latino families (Chaffin et al., 2011; Timmer et al., 2005) in many regions and in both laboratory trial settings (Chaffin et al., 2004) and clinical field settings (Chaffin et al., 2011; Lanier, Kohl, Benz, Swinger, Mousette, & Drake, 2011). Further, there is some

evidence of greater gains achieved when PCIT is delivered following a motivational enhancement training to child welfare-involved families, as compared to PCIT delivered in conjunction with other simultaneous services such as substance abuse treatment or individual therapy for parent depression (Chaffin et al., 2011).

Investigating change processes in PCIT. Although PCIT is effective in reducing new instances of abuse and neglect in families who have already begun to maltreat their children (Chaffin et al., 2004, 2011), there have been few studies conducted to investigate how PCIT exerts positive change in CM families. Recent calls for research clarifying the mechanisms of change in two-generational interventions recommend greater focus on understanding key moderators and mediators of treatment effectiveness, in order to understand how, why, and for whom/under what conditions clinical interventions are most effective (Cotter, Wilsie, & Brestan-Knight, 2018; Fisher & Skowron, 2017; Shonkoff & Fisher, 2013; Gottfredson et al., 2015; Kazdin & Nock, 2003). Such process-oriented studies of therapeutic change reflect critical next-step directions in evidence-based research (Kaminski et al., 2008), with important implications for clinicians, in terms of clarifying treatment focus, and providing guidance for policy makers to select and implement cost-effective interventions that can to reduce and prevent CM. Understanding processes of change within an RCT could help clarify which facets of an intervention are integral to retain when disseminating interventions to wider communities with possibly less rigorous adherence to intervention integrity (Kazdin & Nock, 2004).

Change Trajectories in Parenting During CDI

PCIT is a mastery-based treatment, and the CDI phase is considered foundational for enhancing the parent-child relationship and increasing child compliance through

positive attention. Additionally, PCIT has been shown to reduce re-abuse rates in CM families, and there is some evidence that reductions in negative parenting (e.g., criticism, sarcasm, and physical negatives) mediate this effect (Chaffin et al., 2004), yet the session-by-session process of change in parenting skills during CDI is not well understood. Further, most observational research on parenting changes in CDI measure pre- and post-test changes in skills, so the path to mastery is largely unknown. More investigation into the type, nature, and timing of changes in parenting behavior within and across sessions is needed to better characterize how change occurs in PCIT with child welfare families, the durability in family gains post-treatment, and individual differences in family response to treatment that may differentiate pathways to risk for and protection from future CM recidivism. In an effort to understand the trajectories of change in positive and aversive parenting behaviors achieved by CM families in PCIT, this study investigated session-by-session changes in parenting skills throughout the CDI phase of treatment.

Few studies have researched session-by-session change in PCIT, and of those, only one study examined changes in parenting across CDI and PDI sessions (Hakman, Chaffin, Funderburk, and Silovsky, 2009), two studies (one published and one unpublished dissertation) focus specifically on parent behavior changes in the CDI phase (Legato, 2015; Pemberton, Borrego, & Sherman, 2012), and no research to date appears to have concentrated solely on study of session-by-session processes in PDI. Perhaps the best example to date of studying the process of change in PCIT was conducted by Hakman et al. (2009), who focused on tracking changes in positive and negative parenting across the CDI and PDI phases of treatment, using data from the last 18 months

of Chaffin et al.'s (2004) randomized trial of PCIT for physically abusive parents. Hakman and colleagues (2009) mapped sequences of behavioral observations of positive parenting in response to child appropriate behavior (i.e., do skills in CDI and do skills plus direct commands in PDI) and aversive parenting behaviors (don't skills) in response to pro-social child behavior across selected CDI and PDI sessions during the course of PCIT. Participants were drawn from the last 18 months of Chaffin et al.'s (2004) study of PCIT for CM families. The subsample of 22 parent-child dyads whose data was included in the growth modeling study (Hakman et al., 2009) were those participating in PCIT or PCIT in conjunction with other simultaneous services who completed 4+ video recorded PCIT sessions. Of the total 49 families who were enrolled in the last 18 months of the Chaffin study, 18 families were excluded due to participating in fewer than 4 coded sessions and 9 were excluded due to non-codable sessions due to equipment malfunctioning or inaudible tapes. Traditional PCIT coding (Dyadic Parent Child Interactive Coding System-II; DPICS-II) was utilized to behaviorally code parent and child behavior into categories, using the following parent behavioral codes: behavior description, reflection, unlabeled praise, labeled praise, indirect command, direct command, question, criticism, negative behavior, information description (i.e., declarative sentence providing information about objects or people), other, or no response to child-appropriate behavior). Child behavioral codes included: compliance (to parental command), noncompliance (to parent command), no opportunity to comply, appropriate behavior (i.e., appropriate playing with toys, engaging parent in conversation, or asking questions), other positive (i.e., child engages in other positive behaviors that do not fall into another category), other negative (e.g., throwing toys, hitting parent), and child

negative affect (e.g., child whines or cries; Hakman et al., 2009). Using sequential coding, researchers collapsed parent behaviors into categories of positive parenting (i.e., labeled praise, behavior description, reflection, information description, and direct command in PDI), neutral parenting (unlabeled praise and other), and negative parenting (questions, criticism, indirect commands, no response to child appropriate behavior, and direct command in CDI).

Child response behaviors were collapsed into appropriate behavior (Compliance, asking questions, playing with toys), inappropriate behavior (e.g., whining, noncompliance, & throwing toys) and neutral behavior (all other). Growth curve modeling of the pre-treatment intake, 5 CDI coaching sessions, 4-coded PDI sessions (PDI coaching sessions 3, 4, and 5), and post-service observation revealed significant linear and quadratic growth in parents' positive do skills in response to appropriate child behavior, and linear and quadratic declines in negative parenting don't skills displayed in response to appropriate child behaviors. The majority of change in parents' do and don't skill responses occurred early in treatment (i.e., the first three CDI sessions). In this study, knowledge was gained about how quickly parents learn to respond positively to their child's appropriate behavior (i.e., within the first three sessions). However, the full-time course of change trajectories in parents' do and don't skills across the CDI phase of treatment was not entirely clear given that all CDI sessions from study families were not modeled. Instead, CDI coding was included, whether it occurred during the CDI phase and PDI phase of treatment if available, in the growth curve analyses (i.e., 5 CDI coding sessions and 4 coding sessions in PDI, plus intake and post-observations could have been included. Additionally, data obtained during PDI sessions may have included behavioral

coding during "PDI" practice (i.e., practicing direct commands and child compliance), or during "CDI" practice (i.e., parent use of PRIDE skills while following the child's lead). Further, not all sessions included in the growth models were consecutive, since some participants completed an additional CDI session, and all participants completed several PDI sessions which were not included in the analyses. Although this study advanced the field's knowledge about session-by-session reductions in negative parenting in PCIT, there were several limitations to their findings, namely modeling a mix of CDI and PDI sessions with some sessions omitted, thus not mapping full mastery trajectories, and using a homogeneous high-risk sample (i.e., only physically abusive families).

In an unpublished dissertation, Legato (2015) examined associations between PCIT coaching exposure, homework completion and session-by-session change in parents' do skill acquisition and don't skill reduction across 5 CDI sessions in a sample of 46 families seen in a community mental health center. Using linear growth modeling, Legato (2015) found significant linear increases in do skills, and linear decreases in don't skills across early sessions of CDI. Parent attendance significantly impacted skill acquisition such that fewer days between sessions were related to steeper increases in do skills and steeper declines in don't skills. In examining homework completion as a possible predictor of skill acquisition, there was surprisingly no significant difference attributable to parents' homework engagement in predicting different rates of skill acquisition (Legato, 2015). This study provided important foundational knowledge about the process of change in early CDI, and information about treatment engagement; however, the focus on growth in parents' do skills was again limited to only 5 CDI sessions because Legato was interested primarily in early CDI as a foundation to later

treatment success, citing that most attrition occurs early in treatment, making the first 5 sessions especially important. Yet some research indicates that CM families may need greater than 5 sessions to achieve CDI mastery (Thomas & Zimmer-Gembeck, 2011). In a study of PCIT for CM families, Thomas and Zimmer-Gembeck (2011) found that parents typically engaged in 11.8 CDI coaching sessions before achieving mastery, and CDI sessions needed to achieve mastery ranged from 4 to 25 coaching sessions. Finally, Pemberton, Borrego & Sherman (2012) employed a case-study approach with $n = 3$ families to examine changes in session-by-session parental differential attention, child prosocial behavior, and the impact of differential attention for subsequent child prosocial behavior using time-ordered observations. In this study, parent skill use and child prosocial behavior remained steady across sessions, and support was found for parental differential attention predicting child prosocial behavior in the next minute in two out of three families (Pemberton et al., 2012). Although progress toward mastery criteria was described, growth trajectories in parent skill use were not analyzed.

Although each of these process studies (Hakman et al., 2009; Legato, 2015; Pemberton et al., 2012) contribute to the scarce literature about session-by-session changes in PCIT, there remains more to be learned about the parenting change process throughout this evidence-based intervention. The rate at which the quality of parenting skills shift within the entire CDI phase of treatment is important to further investigate in order to identify whether the transition to increases in positive parenting skills and reductions in negative parenting skills occurs gradually, or whether parents gain skills early and quickly. Some researchers (Chaffin et al., 2004, 2011; Thomas & Zimmer-Gembeck, 2012) who have implemented PCIT with child welfare families, adapted PCIT

from its original mastery-based variable treatment length, to a brief, standard session length for all families (usually 6 coaching sessions per phase, or 12 coaching sessions overall with an introductory motivational enhancement training). Consequently, understanding CM families' skill progression throughout sessions is particularly important. For example, if linear growth is observed throughout the entire course of CDI, or steep changes occur near the end of CDI, shorter duration treatment may not be clinically indicated. On the other hand, if the majority of parenting change happens in the early sessions of PCIT as observed by Hakman et al. (2009), briefer, less costly intervention that maximizes engagement and minimizes attrition may be effective. Thus, discovering the rate of change in parenting skill acquisition can inform decisions about the dosage of CDI recommended for CM families engaged in PCIT. In addition to understanding rates of change in parents' overall positive parenting skills, and negative, critical parenting, it is also important to learn about how each individual parenting skill changes over time during CDI. No known studies to date have examined growth in the individual PRIDE skills (e.g., labeled praise, reflection, and behavior description), though weekly coding of PRIDE skills is used to inform which skill is designated as the focus of coaching for a particular session. It is possible that some PRIDE skills are easier to grasp in early sessions, whereas other skills are more difficult to learn and require a longer time frame to achieve mastery. The possible differences in rates of skills uptake could inform the focus of coaching in early versus later treatment sessions. Discovering if parents' trajectories of skill use vary greatly or by a small amount could influence therapists' adaptations of treatment depending on the family (Hakman et al., 2009).

The CDI phase of treatment is particularly important to explore when implementing PCIT within the child welfare population, in which the primary target of the intervention may be parenting rather than disruptive child behavior. According to Timmer et al. (2005), CM families tend to report fewer and less intense child behavior concerns as compared to non-CM families who seek PCIT. Additionally, under certain conditions, some researchers recommend implementation of the CDI phase only, rather than the standard two-phase PCIT treatment (Dombrowski, Timmer, Blacker, & Urquiza, 2005). If the CDI phase of PCIT may become a stand-alone treatment for CM families, it is especially important to understand the patterns of session-by-session change in parenting.

In summary, few studies have examined session-by-session changes in PCIT, and no studies to date have fully mapped trajectories of parent skill acquisition across the CDI phase of treatment from onset to CDI mastery. Studies of session-by-session change have not explored growth in each parent do skill separately, and patterns of change in each of the mastery do skills may be important for shaping treatment focus and informing treatment planning. The current study aimed to uniquely contribute to our understanding of PCIT for child welfare families by mapping change in the individual and overall positive parenting skills and problem parent behaviors throughout the entire course of the CDI phase of PCIT.

Impact of Homework Engagement on Parenting Skill Acquisition

In PCIT, change is posited to occur via improvements in positive parenting and reductions in negative parenting that, in turn, support improvements in child behavioral functioning, yet there is little known about how differences in parental engagement may

influence parent acquisition of skills. One important area to explore is parent engagement in weekly "special time" homework and whether variations in the frequency of at-home practice of the parenting skills (homework engagement) shape the trajectories of change in parenting do and don't skills over the course of CDI. Homework is often used as a proxy for treatment adherence in parent training programs and is positively associated with session attendance (Clarke et al., 2013). However, there are few studies that explore homework adherence as a predictor of change in parent training programs, and few published studies have explored homework completion in PCIT. Specifically, Lyon and Budd (2010) found that families who dropped out of treatment were less likely to complete homework. In another study exploring homework completion as a possible predictor of parent skill use, researchers found that greater average homework completion was related to greater parent do PRIDE skills and lower parent reports of child externalizing behaviors (Ros, Hernandez, Graziano, & Banger, 2016); however, greater homework completion did not predict reductions in don't skills or increased child compliance (Ros et al., 2016). Similarly, Stokes and colleagues (2016) found that greater homework completion reports were associated with parents taking fewer sessions to meet mastery in CDI. In contrast, Legato (2015) found no significant effect of parents' homework engagement in predicting differences in parenting skill acquisition. These sparse and mixed findings about homework completion warrant further exploration of homework and its effects on the rates of change observed in parents' skills acquisition, especially among CM families. Although regular weekly homework (i.e., special time) is prescribed between CDI sessions, there have been no direct tests of whether frequency of

family engagement in homework in PCIT translates into observed benefits in parenting skills acquisition within a CM population.

The current study aimed to contribute new understanding about homework completion by exploring homework as a possible predictor of rates of session-by-session change in parenting skills.

In summary, the current study focused on understanding the process of session-by-session change in positive and negative parenting skills as a function of PCIT intervention, and examined the impact of homework engagement on trajectories of parenting skills change. Understanding change trajectories and the impact of homework engagement on those trajectories are important first steps in clarifying pathways through which PCIT leads to positive changes in family functioning for CM families. The current study was designed (a) to assess pre-CDI and post-CDI changes in parenting behaviors amongst child welfare families, (b) to map the entire trajectory of parenting do skills acquisition and don't skills declines across sessions to CDI mastery, and (c) to explore homework engagement as a possible moderator of parenting skill acquisition in order to better understand the change process in CDI.

Current Study

Despite the evidence that PCIT is effective for reducing harsh parenting and CM recidivism in child welfare-involved families, few studies have examined the processes through which positive parenting skills and aversive parenting behaviors change over the course of PCIT. This study will map trajectories of session-by-session change in positive and aversive parenting throughout the CDI phase of PCIT within a sample of child welfare families. Specifically, the current study sought to replicate the work of Hakman,

et al. (2009) by examining the trajectories of the parent do and don't skills over time in the CDI phase of treatment, and to extend their efforts by mapping trajectories of growth in each of the individual positive parenting do skills, because little is known about the patterns of change in specific PCIT PRIDE skills throughout the entire course of CDI. It is hypothesized that increasing linear trajectories of change in positive parenting skills will be observed and linear declines in aversive parenting behaviors will be observed across CDI sessions over time. Further, although regular CDI homework (i.e., special time) in between sessions is prescribed, only one published and one unpublished study have examined homework completion within the analysis of skill acquisition (Legato, 2015; Ros et al., 2016), so the impact of at-home daily skill practice on skill acquisition needs to be clarified. Thus, this study further sought to test whether rates of weekly homework completion moderate rates of skill acquisition, specifically with greater homework engagement predicting steeper increases in positive parenting skills across time in CDI sessions and steeper declines in aversive parenting behaviors over time.

Research question 1: Do parents who received PCIT display greater do skills and fewer don't skills from baseline to CDI mastery (i.e., mid-treatment assessments) as observed during in 5-minute child-directed session interactions?

Hypothesis: Significant increases in positive parenting do skills and decreases in aversive parenting don't skills were expected be observed over the course of CDI sessions (i.e., from baseline to mid-treatment assessment).

Research question 2: Do trajectories of change in parents' "do" skill acquisition take a linear or non-linear (i.e., quadratic, cubic) course over time?

Hypothesis: Previous literature modeled and documented linear changes in parenting do and don't skill changes in PCIT (Hakman et al., 2009; Legato, 2015), thus linear increases in positive parenting do skills were hypothesized over the course of CDI. However, non-linear rates of change were also explored. Further, trajectories of linear and/or non-linear growth in each individual positive parenting do skill (i.e., behavior description, labeled praise, and reflection) were modeled over time.

Research Question 3: Do trajectories of change in parents' don't skills take a linear or non-linear (i.e., quadratic, cubic) course over time?

Don't Hypothesis: Per existing research (Hakman et al., 2009), aversive parenting don't skills were expected to show significant, linear decreases over time. Non-linear trajectories of change were also explored.

Research Question 4a: Greater homework completion rates were expected to be associated with change in parenting skills, and **4b:** predictive of steeper trajectories of change in parents' do skills acquisition and don't skills reductions across CDI treatment.

Hypothesis: Based on PCIT International guidelines that brief, daily skills need to be practiced at home in order to receive the full benefits of PCIT, as well as based on at-home practice being a part of all evidence-based parenting programs, parents who reported higher average weekly homework rates were expected to show (a) greater increases in do skills and decreases in don't skills, and (b) steeper increases in do skill acquisition and steeper declines in don't skills across weekly CDI sessions, as compared to parents who completed less average weekly homework.

CHAPTER II

METHODS

Participants

Participants were drawn from a randomized clinical trial of PCIT for families involved with child welfare, entitled the Coaching Alternative Parenting Strategies project (CAPS; NIDA R01DA036533). Over two hundred (n = 200) parents and children are expected to participate in the five-year study. Participants included in the current study were the first study families randomized to PCIT who completed the CDI phase of treatment by January 2018, yielding a sample of 20 mother-child dyads. Families were eligible for inclusion in the larger study if their children were 3-7 years old at the time of study entry. Parents were biological mothers who were the main custodial caregiver of the child, and who resided in the same home setting with the child at least 50% of the time and spoke English fluently. Exclusion criteria for the larger study included: if a child was placed in foster care at the time of the study; if the child was living with a caregiver or adult who has perpetrated sexual abuse (PCIT is contra-indicated in such cases); or if the child could not complete the assessment procedures due to a severe developmental, medical, or physical disorder. At the baseline assessment, the mean age of mothers was 30.05, with a range of ages from 18-36 years old. Mothers completed a range of years of education, from 8-14 years, with an average of 11.95 years of education, 75% of mothers (n = 15) identified as European American/White, 25% (n = 5) identified with more than one race or ethnicity, and 60% of mothers identified as single, 25% married, 5% separated, 5% living with a partner, and 5% "other." Mothers ranged in employment status, with 50% identifying as unemployed, 25% with part-time employment, and 25%

full-time employment. Families ranged in income level from $432-5,500 per month, with a mean of $1,394.12 per month. For children, 55% were males (n = 11), and parent-identified child ethnicity was 55% European American/White and 45% more than one race or ethnicity. Children ranged in age from 3 to 7 years old, with a mean age of 4.75, and ranged in grade-level by 20% in 2nd grade, 5% in first grade, 5% in kindergarten, 40% in preschool/head start, and 15% not in school.

Measures

Demographics. Participants completed a brief demographic questionnaire to assess child age, child sex, child grade, mother's age, mother's highest completed grade level, household income, race/ethnic background, and romantic relationship status. In order to obtain an estimate of socio-economic status (SES), a composite score of maternal education (years of education completed) and total monthly household income was calculated by converting both to standardized scores (i.e., z-scores) and summing the two standardized scores. The composite variable of standardized income and maternal education will hereby be referenced as SES.

Adverse Childhood Experiences. Mothers' and children's experiences of adversity before the age of 18 were measured with the 10-item Adverse Childhood Experiences Survey (ACES). Surveys were administered to mothers, to assess the number of abusive, neglectful, or household challenge events that can result in trauma or chronic stress responses, and are related to negative health outcomes (Felitti et al., 1998). ACEs were included in the present study to describe the participants' exposure to early life adversity.

Parenting behaviors. The *Dyadic Parent-Child Interaction Coding System-IV (DPICS-IV*; Eyberg, Chase, Fernandez, & Nelson, 2013) was used to observationally code parenting behaviors. DPICS is a behavioral coding system used to assess caregiver-child interactions. Detailed behavioral coding definitions are reported in the DPICS-IV manual (Eyberg et al., 2013). Parent verbalization categories are as follows: behavior descriptions, reflections, labeled and unlabeled praises, neutral talk, questions, direct and indirect commands, and negative talk. Child behaviors will not be used in this study but are coded as compliance, noncompliance, or no opportunity to comply to parent commands. The DPICS has been used within many clinical populations including CM families, and has been used broadly to assess changes in relationship quality and parenting resulting from treatment (Eyberg, Nelson, Ginn, Bhuiyan, & Boggs, 2013; Thomas & Zimmer-Gembeck, 2011). The DPICS has gone through psychometric study and refinement since the first published edition (Eyberg & Robinson, 1983). It has been normed on parents of varying genders (Eyberg et al., 2013) races/ethnicities (Eyberg et al., 2013; e.g., McCabe, Yeh, Argote, & Liang, 2010).

PCIT Therapists completed live-DPICS coding in-session to provide parents feedback on skill use, establish session focus, and to determine "mastery" of skills. However, data employed in this study was conducted by trained DPICS coders who coded each 5-minute play segment during the baseline assessment, each CDI session, and the mid-treatment assessment. For each CDI coding sessions, DPICS coders coded in two-passes, once in live-time to mimic the session coding in order to determine therapist-coding team reliability, the second coding was done using a stop-start coding software in order to determine the most accurate/valid codes.

DPICS coders completed 30 hours of training, including studying the coding manual, watching/coding practice worksheets and videos, taking quizzes within the manual, and comparing coding to master-coders in practice videos. Training occurred in weekly meetings as well as weekly coding homework assignments. All coders reached inter-rater correlations above .80 with master-coders before beginning to code participant data. To ensure accuracy of coding, each 5-minute segment was coded by two members of the coding team independently Inter-rater reliability was calculated at 79%, and then coding team members completed consensus coding to determine final codes. A larger consensus team met to grand-consensus code 20% of the videos.

For pre-and post-CDI coding, DPICS coders coded all parent and child verbalizations (i.e., neutral talk, unlabeled praise, labeled praise, reflection, behavior description, question, indirect command, direct command, and negative talk for parents; compliance, noncompliance, and no opportunity to comply for children). Each code was summed for the 5 minutes of observational coding in the child-led interaction situation. For each CDI coach session, the CDI coding protocol was used, i.e., the standard DPICS coding, in which commands are coded (including both indirect and direct commands). Child behaviors are not coded in DPICS coding of CDI sessions. Again, each code was summed across the 5 minutes of observational coding at the start of each CDI session. Thus, only parent verbalizations were coded, as is standard practice for DPICS coding during CDI sessions. For purposes of my analyses, similar to other PCIT study methodology, two aggregate categories were used to summarize the encouraged parent behaviors (do skills: labeled praise, reflection, and behavior description) and the discouraged parent behaviors (don't skills: questions, commands, and negative talk),

which were calculated by summing the frequency of behaviors within each respective category for each observation. Individual do skills were also summed separately (e.g., behavior descriptions, labeled praise, and reflections) for follow-up analyses. Analyses in this study included the following variables: 1) do skill frequency count, 2) do skill proportion value (computed by taking the sum of the do skills divided by total parent utterances), the individual do skills of 3) behavior description, 4) reflection and 5) labelled praise, 6) don't skill frequency count and 7) don't skill proportion value (computed by taking the sum of the don't skills divided by total parent utterances).

Homework completion. Each week, parents completed the standard CDI homework sheet adapted from the PCIT treatment manual (Eyberg & Funderburk, 2011). Parents were sent home with a CDI homework sheet to fill out throughout the week. When parents did not bring in completed homework sheets, they were instructed to complete homework self-report at the beginning of each session to review with the therapist. The homework sheet consisted of a column for day/date, homework completed (yes or no), which activity was completed, and notes about the homework. Homework was calculated as number of days of homework completed between the session, divided by the number of days between sessions. Average ratios of weekly homework completion ranged from .16 to .79, with a mean of .42 and *SD* of .16. For several families, there were long breaks between the second to last and the very last treatment sessions, likely impacting the homework ratio.

Procedure

All procedures used in this study were approved by the University of Oregon and State of Oregon Department of Human Services (DHS) Institutional Review Boards.

Recruitment and assessment procedures began in 2016 and parent-child dyads were invited to participate due to involvement with Oregon Child Welfare and were recruited via a DHS liaison at the CAPS study. Parents with children between the ages of 3 and 7 years old at the time of study entry were invited to participate. For parents without legal custody, caseworker written consent was obtained for child participation in the study.

All parents and children were invited to participate in baseline and post-intervention assessments over a 12-month period, with families randomized to PCIT also completing one mid-treatment (i.e., post-CDI) assessment. Each assessment was comprised of two visits and had similar protocol, consisting of a series of demographic, psychosocial, cognitive performance, and bio-behavioral assessments conducted by three trained research assistants. For the purposes of the current study, a selection of the baseline assessment measures were utilized, including participant demographic information from questionnaires and observational parent-child interactive data from videotaped and coded observations of parent-child interactions in a standard child-led play situation.

Upon completion of the baseline assessment, parents were randomly assigned to the PCIT intervention group (PCIT) or the control/services as usual (SAU) group. The research assistants were blind to treatment condition until the participant opened the sealed envelope with group status. For this current study, data was included only for mother-child dyads in the intervention group. Parents were compensated between $90 and $125 to complete the two visits to the university and were provided with transportation, snacks and children's small toys/gifts.

Intervention procedure. All treatment took place in a university research clinic, performed by masters-level therapists and a licensed psychologist formally trained in PCIT by PCIT International master trainers. Parent-child dyads attended weekly 60-90-minute sessions. Parents received $10 for transportation costs at each session, plus several $15 bonuses during initial sessions in each phase of treatment. Childcare and snacks were offered at each session.

Treatment procedures followed the standard PCIT protocol (Eyberg & Funderburk, 2011). After completing an intake session, participant treatment continued with the two manualized phases of PCIT: (1) Child-Directed Interaction (CDI), and (2) Parent-Directed Interaction (PDI). Each phase of PCIT consisted of 5-14 sessions, depending on participant mastery of the skills taught in each phase. For research purposes, the CDI phase was capped at 12 "coach" sessions at the beginning of the study procedures until July, 2017, at which point newly enrolled families (n = 6) received a maximum of 8 CDI coach sessions to better align with previous RCTs of PCIT with CM families (Chaffin et al., 2004), and in an effort to minimize risk of treatment attrition associated with allowing a longer time-course for intervention delivery.

CDI phase. CDI was delivered via one didactic "teach" session with parents, followed by 5-12 live-coached parent-child sessions in which parents were coached via a headset and tiny earpiece worn by parents during session (i.e., "bug-in-ear"). Parents learned to use the "PRIDE" skills (praise, reflection, imitation, description, enjoyment) and to avoid using "don't skills, or commands, questions, and negative talk. The guiding principle of CDI is to follow the child's lead during play. Minor misbehavior was dealt with by ignoring child misbehavior and using selective, positive attention for child's

appropriate behavior (and praising opposites). Rare, major misbehavior (e.g., violent or destructive behavior) was handled by ending the play. Parents were expected to complete 5 minutes of daily practice of CDI skills during "special time" with the child. Each CDI "coach" session consisted of parents completing a survey about the child's behavior, 3-5 minutes of discussion between the parent and therapist about parent stressors unrelated to treatment, review of previously completed homework, and then the therapist departing from the treatment room into an observation room with a one-way mirror. The therapist assessed parent skills during 5-minute observational coding at the beginning of play. The therapist then used that assessment to determine the session focus, targeting increasing PRIDE skills not yet at mastery, and/or decreasing don't skills (mastery criteria includes 10 labeled praise, 10 behavior descriptions, 10 reflections; no more than three combined questions, commands, and negative talk during the 5-minute assessment). The therapist provided positive feedback, support, and guidance while the parent-child dyad play (for roughly 30 minutes). Sessions concluded with review of parent skills during session and a discussion of the focus of the homework assignment for the following week. Each week, parents were sent home standard homework sheets adapted from the PCIT treatment manual (Eyberg & Funderburk, 2011). Therapists instructed parents to focus on a specific skill or set of skills not yet at mastery.

Parents attended "coach" sessions until mastery criteria were met during 5-minute observational coding. Once CDI mastery was met (or families reach the maximum 8 coaching or 12 coaching sessions offered), families then completed a mid-treatment assessment before continuing onto the PDI phase of treatment. Of the 20 participants, 14 families were permitted the lengthier treatment (i.e., up to 12 CDI coach sessions); and 6

families were able to receive up to 8 CDI coach sessions. Of the n = 10 families who met CDI mastery, 8 did so at or before 8 sessions, and only 2 achieved mastery between sessions 9-12 sessions. Of the 10 families who did not meet CDI mastery, 2 families discontinued treatment after CDI session 8, 5 families failed to reach mastery after 12 sessions, and 3 families did not meet mastery after completing the 8-session maximum. Therapist adherence to PCIT protocol was monitored by a trained non-therapist integrity team, and 20% of sessions were integrity coded. On average therapists were observed to have 95.68% adherence to the standardized PCIT protocol. Further, treatment integrity coders posted a 96% interrater reliability.

Mid-treatment assessment. During the mid-treatment assessment, participants completed a shortened version of the original baseline assessment tasks, including parent-child interactive tasks, family and stress related questionnaires, and bio-behavioral assessments. Participants were compensated for their time and provided transportation, snacks, and childcare. The parent-child dyads again completed the three coded, standardized play situations, and the child-led play situation was used for the current study.

Analytic Strategy

All preliminary data analyses were conducted using IBM SPSS version 24.0. To address the first research question, "Do parents who receive PCIT display greater do skills and fewer don't skills from baseline to mid-treatment assessments in 5 minute child-directed interaction segment?" baseline and mid-treatment means were compared using bivariate analyses including paired *t*-test and repeated measures analysis of variance (RM-ANOVA) for cumulative do and don't skills, and for individual do skills.

To address the 4a question "greater homework completion rates will be associated with greater change in parenting skills over time," average homework was included as a covariate in each RM-ANOVA model.

The remaining research questions and hypotheses were examined using growth curve modeling (multilevel modeling; MLM). There are a number of benefits of using growth curve analysis rather than traditional analysis of variance or multiple regression (Francis, Schatschneider & Carlson, 2000). Growth curve modeling allows for consideration of all the data points to represent change over time as a function of both intercept (level of a trait at a given time) and slope (rate of change over time). MLM can handle non-normal data and data with missing time-points.

To address the next two research questions, (2) "Do trajectories of change in parents' do skill acquisition take a linear or non-linear (i.e., quadratic, cubic) course over time?" (3) "Do trajectories of change in parents' don't skills take a linear or non-linear (i.e., quadratic, cubic) course over time?" Individual growth curve analyses were used to analyze parent skill use over time across CDI sessions. It was expected that do skills would increase linearly over the course of CDI and don't skills will decrease linearly over the course of PCIT. The first step in the growth modeling was to determine the unconditional growth model, which was the parent skill growth trajectory pattern over the course of treatment and the random effects without any covariates. All models in this study were run in RStudio (Version 1.1.442 – © 2009-2018 RStudio, Inc.) using the lme4 package (Bates, Maechler, Bolker, & Walker, 2015) for R (R Core Team, 2013). I assessed models that differed in functional form (i.e., linear, quadratic, and cubic) for each of the collective parenting skill category (do and don't skills) and each individual do

skill. Time was measured in sessions. Time was centered in the middle of the treatment (i.e., -6.5, -5.5, -4.5 to 6.5) to ensure the slope terms were uncorrelated. Therefore, the intercept represented parent skills between session 7 and 8 of CDI.

To address the fourth moderation test: (4b) "Greater homework completion rates will predict steeper trajectories of change in parents' do skills acquisition and don't skills reductions across CDI treatment," average weekly "special time" homework completion was included as a level 2 variable in the cumulative do and don't skill growth models to see if skill acquisition varied by the amount of homework completed. It was expected that parents who completed greater frequency of homework would have steeper growth in do skills and steeper reductions in don't skills as compared to parents who completed less homework.

For each model, the level 1 variable included time (by session). Outcome variables included parenting behaviors (do skill frequency count; do skill proportion value, each do skill frequency count separately, and don't skill frequency count and proportion value) and level 2 covariates of SES and child gender, and average homework completion for 4b.

CHAPTER III

RESULTS

Preliminary Analyses

Descriptive statistics for all demographic variables are presented in Table 1. Information in Table 1 indicates the study sample included high-risk parent-child dyads who participated in this study. For example, education ranged from parents completing 8th grade, to earning a 2-year associate or technical degree, with the average parent education equating to just under a high school diploma (*M* = 11.95 years of education). Parents ranged in household income from $432-$5,500 per month, with the family who earned $5,500 as an outlier. Parents self-reported stressful or traumatic childhood experiences (per the parent ACES questionnaire), parents on average reported experiencing 5.5 adverse childhood experiences, and parents' scores ranged from 1-10 ACES. Most parents were single (n = 13), half (n = 10) were unemployed. Children experienced on average 3.95 adverse life events (per parent report on the child ACES), with a range of 1-7 adverse experiences. There were slightly more girls (n = 11) than boys (n = 10), and most children (n = 8) were in preschool or head start, followed by kindergarten (n = 4) and second grade (n=4).

Table 1
Individual Characteristics of Sample at Baseline

Variable name	*N*	*M*	*SD*	Range	Skew
Child age (in years)	20	4.75	1.37	3-7	0.09
Child ACES (possible range 0-10)	20	3.95	2.01	1-7	-0.53
Mother's age (in years)	20	30.05	5.17	18-36	-.85
Maternal education (in years)	20	11.95	1.50	8-14	-.94
Monthly household income (in dollars)	17	1394.12 *Mdn:* 1200	1206.82	432-5500	2.66
Number of people living in home	20	4.1	1.52	2-8	1.11
SES	17	-0.26	1.46	-2.36-4.62	1.46
Parent ACES (possible range 0-10)	20	5.15	2.91	1-10	1.64

Variable name	*N*	Percent Endorsed
Parent Ethnicity	20	
European American/White	15	75%
More than one race/ethnicity	5	25%
Child Ethnicity	20	
European American/White	11	55%
More than one race/ethnicity	9	45%
Child Gender	20	
Male	11	55%
Female	9	45%
Child grade in school	20	
Not yet in school	3	15%
Preschool/Head start	8	40%
Kindergarten	4	20%
First grade	1	5%
Second Grade	4	20%
Parent Marital Status	20	
Single/Separated	13	65%
Married	5	25%
Partnered/Living together	2	10%
Parent Employment Status	20	
Full time stable employment	4	20%
Full time temporary/seasonal employment	1	5%
Part time stable employment	4	20%
Part time temporary or seasonal	1	5%
Unemployed	10	50%

Notes. SES= socioeconomic status, estimated by using the averages of standardized scores of income and maternal education. ACES= Adverse Childhood Experiences.

Missing Data

In this study of 20 parent-child dyads, two dyads are missing parenting behavior (DPICS codes) data at the mid-treatment (i.e., post-CDI time point). Families included in the study were those who completed at least one coaching session, and of the 20, three did not complete CDI treatment sessions. Of the n = 3 families who did not complete CDI, two did not attend the mid-treatment assessment. All other dyads completed the CDI phase of treatment. Participants' sessions ranged in number from 5-12 coaching sessions for CDI (M = 8.8, SD = 2.4 sessions). Since treatment is such that, if a family misses a week of therapy, they return for the next consecutive coaching session the next time they come in, there is not missing data at time points in parenting behaviors, except for when there were issues with video recording sessions (two sessions total) and thus can be considered missing at random. Missing data analysis were conducted to assess for bias that results from missing data, including using bivariate correlations and chi-squared tests to test for differences between treatment completers versus treatment discontinuers. Family treatment attrition was not systematically related to SES, child age, parent age, child gender, ethnicity, or baseline parenting behaviors.

Differences in Pre-Treatment and Mid-Treatment Parenting Skills

To address the first research question, paired *t*-tests were used to compare mother's pre-treatment and mid-treatment parenting skills. Table 2 presents means and standard deviations for total do, total don't, behavior descriptions, reflections, labelled praises, and proportions of total do and total don't skills over total speaking turns at the baseline and mid-treatment assessments, as well as the paired *t*-test results. As shown in Table 2, significant differences in average skill use from baseline to mid-treatment were

seen for all observed parenting skills, in the hypothesized directions. Parents were observed to use a greater number of do skills at the mid-treatment assessment relative to the baseline assessment, on both the frequency count, $t(17) = 4.09$, $p < .001$, and a higher proportion of do skills proportion of do skill behaviors observed relative to all parenting behaviors observed, $t(17) = 4.51$, $p < .001$.

Table 2

Baseline and Mid-treatment DPICS-IV Parenting Skills Means, Standard Deviations and Paired Sample t-tests

Variable Name	Baseline (n = 20)		Mid-Treatment (n = 18)		t-test (df = 17)
	Range	*M(sd)*	Range	*M(sd)*	
Total Do Skills					
Frequency Count	0-16	3.30 (3.47)	0-33	10.61(8.42)	4.09***
Proportion Score	0-0.21	0.06 (0.05)	0-.56	0.22 (0.15)	4.51***
Individual Skills					
Reflections	0-11	2.33 (2.68)	0-15	5.61 (4.25)	3.62**
Behavior Descriptions	0-4	0.65 (1.14)	0-10	2.78 (3.41)	2.67*
Labelled Praises	0-3	0.35 (0.76)	0-14	2.22 (3.30)	2.59*
Total Don't Skills					
Frequency Count	3-45	21.00 (11.07)	0-21	8.56 (5.83)	-5.78***
Proportion Score	.22-.61	0.40 (0.11)	0-.27	0.17 (0.13)	-9.18***

Notes. Do skill frequency= sum of reflections, behavior descriptions and labelled praises. Do skill proportion score= (reflections + behavior descriptions + labelled praises)/ total utterances. Higher scores indicate a higher frequency of targeted PRIDE skill parent behaviors relative to all talk. Don't skill frequency = sum of questions, commands and negative talk. Don't skill proportion score= (questions + commands + negative talk)/total utterances). Higher scores indicate a higher proportion of undesired parenting behaviors relative to all talk. *** $p < .001$. ** $p < .01$. *$p < .05$.

At the mid-treatment assessment, parents were also observed to use greater frequencies of each of the do skills relative to baseline, including a greater number of reflections, $t(17) = 3.62$, $p < .01$, behavior descriptions, $t(17) = 2.67$, $p < .05$, and labelled praises, $t(17) = 2.59$, $p < .05$. Parents were observed to use fewer don't skill on the frequency count variable, $t(17) = -5.78$, $p < .001$, and a lower proportion of don't skills, $t(17) = -9.18$, $p < .001$ at mid-treatment as compared to the baseline assessment. See Table 2 for more details on mean parenting behavior scores at baseline and mid-treatment.

Table 3 presents bivariate correlations between the baseline parenting skill variables and demographic variables to determine appropriate covariates to control for in the subsequent growth models. Baseline parenting behaviors were not related to employment status, parent age, marital status, and child age, thus, those variables were not included in the models. Several baseline parenting behaviors were related to parent SES (a composite of standardized income and maternal years of education values), including total do skills frequency count, do skill proportion score (do skill frequency/total utterances), behavior descriptions, and reflections($r = .57$, $r = .47$, $r = .52$, $r = .59$, respectively, all significant at $p > .05$). Child gender was significantly associated with baseline total don't skill frequency count ($F = 4.73$, $p > .05$), such that mothers interacting with boys used significantly more don't skills ($M = 25.45$, $SD = 9.26$) compared to mothers with girls ($M = 15.56$, $SD = 11.11$). Thus, child age and SES were included as covariates in all subsequent analyses.

Table 3

Bivariate Correlations of CDI Skills and Demographic Variables

Variable	1	2	3	4	5	6	7	8	9
1. Do Skills Frequency Count	--								
2. Do Skills Proportion Score	.95**	--							
3. Behavior Descriptions	.70**	.58**	--						
4. Labelled Praise	.56**	.56**	.24	--					
5. Reflections	.93**	.91**	.48*	.36	--				
6. Don't Skills Frequency Count	.24	.05	.46*	-.09	.17	--			
7. Don`t Skills Proportion Score	-.10	-.17	.01	-.45*	.01	.69**	--		
8. Child Age	-.31	-.29	-.38	-.01	-.28	-.20	-.04	--	
9. SES	.57*	.47*	.52*	.07	.59*	.14	.12	-.36	--
10. Parent Age	-.13	-.24	.06	-.23	-.14	.16	.22	.18	.28

Notes. All variables were collected at the baseline assessment. CDI= Child Directed Interaction. LP= Labelled praise, BD= Behavior Description, RF= Reflection, CO= command, NT= negative talk, QU= question. ***p* >0.01, *p>0.05, two-tailed significance.

Repeated measures analysis of variance (RM-ANOVA) analyses were used to test pre- and post-CDI differences in mother's parenting skills use while controlling for child gender and parent SES, which were significantly related to baseline parenting behaviors (see Table 2). When controlling for significant baseline covariates, no significant differences in baseline and mid-treatment parenting skills were found for total do skill frequency count or proportion score, behavior descriptions, labelled praises, or total don't frequency count or proportion score (see Table 4). Child gender and SES were also not significantly related to the change in parenting behaviors at mid-treatment. It should be noted that total do skill frequency count did show a trend toward significance, $F(1,12) = 4.54$, $p = .06$, in which parent do skill frequency was greater at mid-treatment ($M = 10.61$) compared to baseline ($M = 3.30$), whereas don't skill frequency change when controlling for child gender and parent SES did not reach significance. When individual do skill frequencies were examined, it appeared that change in reflections remained significant when controlling for child gender and SES, such that parent reflections were significantly greater at mid-treatment ($M = 5.61$) than baseline ($M = 2.33$), $F(1,12) = 6.22$, $p < .05$.

Table 4

Pre-, Post-CDI Parenting Skills Repeated Measures Analysis of Variance Table (n = 15)

Effect	*MS*	*df*	*F*	*P*
Time (Total Do Frequency Count)	118.96	1	4.54	.06
Time * Child Gender	38.09	1	1.15	.25
Time* SES	.36	1	0.01	.91
Error	26.24	12		
Time (Total Do Proportion Score)	0.007	1	.48	.50
Time* Child Gender	.001	1	.10	.75
Time*SES	.002	1	.13	.72
Error	.015	12		
Time (Behavior Descriptions)	4.91	1	.82	.38
Time*Child Gender	.83	1	.14	.72
Time*SES	.08	1	.01	.91
Error	6.02	12		
Time (Reflections)	60.04	1	6.22	.03
Time* Child Gender	28.20	1	2.99	.11
Time*SES	.06	1	.01	.94
Error	9.65	12		
Time (Labelled Praises)	.89	1	1.34	.27
Time* Child Gender	.01	1	.02	.90
Time*SES	.40	1	.60	.45
Error	.66	12		
Time (Total Don't Frequency Count)	104.02	1	2.22	.16
Time *Child Gender	.21	1	.01	.94
Time * SES	34.15	1	.73	.41
Error	46.96	12		
Time (Total Don't Proportion score)	.011	1	1.81	.20
Time*Child Gender	.009	1	1.46	.25
Time* SES	.0004	1	.01	.94
Error	.006	12		

Notes. MS = Means Squared.

Multilevel Growth Modelling of Parenting Skills During CDI Through Mid-Treatment Assessment

In order to assess the adequacy of using multilevel models, key assumptions of hierarchical linear models were examined, including assessing the homogeneity of

residual variance at level 1 and level 2. This was done by examining scatterplots of residuals and level 1 and level 2 continuous predictors (histograms were used for categorical predictors), as well as by examining Q-Q/P-P plots of residuals. Level 1 variables examined included time (by session) and level 2 variables included SES, child gender, and average homework completion. Multivariate normality and independence were assessed using Mahalanobis distance and examining bivariate scatterplots of residuals from level-1 and each level 2 random effect. Errors at level 1 and level 2 were also found to be independent across levels 1 and 2. For each of the growth models of parenting behaviors, a model building technique was employed in which each slope parameter was added to the model, starting with the linear slopes parameter and using hypothesis testing to test goodness of fit between the fixed linear slopes versus random linear slopes model. Next, quadratic slope parameters were added to the unconditional models, and again, hypothesis testing determined whether the fixed or random quadratic slopes parameter best fit the data. If the quadratic slopes parameter was significant, cubic growth parameters were added to the model. Although hypothesis testing was utilized for model comparisons in each step of the model building process, for the ease of reporting, only the final significant chi-squared test was reported for each unconditional model.

Model 1a: Unconditional Total Do Skill Frequency Count. Results of the unconditional growth model indicated that the best fitting model included linear, quadratic, and cubic growth with a significant random effect for the quadratic slope (see model 1a, Table 5). The intra-class correlation (ICC) suggested 17% percent of variance was at level 2 once growth patterns at level 1 were controlled for, indicating that growth

modeling was an appropriate analytic tool to examine growth trajectories of parent skills (Lee, 2000).

Results of the unconditional model (Table 5) indicated the average growth trajectory for the parent total do skill frequency count from the baseline assessment, through CDI sessions to the mid-treatment assessment, was linear, quadratic, and cubic. Hypothesis testing showed that the fixed linear slopes model fit the data significantly better than random linear slopes model, and the random quadratic slopes model fit the data significantly better than the fixed linear slopes, fixed quadratic slopes model (χ^2 (2) = 33.88, $p < .001$). The fixed cubic slopes model fit the data significantly better than the random cubic, fixed linear, random quadratic model. Thus, the final best fitting model for total do skill frequency count was the fixed linear slopes, random quadratic slopes, and fixed cubic slopes model. Figure 1 shows that total do skill frequency count showed linear increases, quadratic deceleration, and then another cubic deceleration in skills (as noted by the colored slope lines). The positive linear growth term (β = 1.47, $p < .001$) indicated that parents gained 1.47 skills on average in between each session. The quadratic effect was also significant (β = -0.38, $p < .001$), and based on examination of the data, (see Figure 1), there was negative quadratic change, indicating a slight deceleration in skill acquisition over time. The cubic growth term was significant (β = -0.21, $p < .05$) and indicated another deceleration in skill acquisition. Significant random effects were found for the quadratic slope parameter. The significant random effect for the quadratic slope indicated that there was variance between mothers in the sample, in terms of their rates of deceleration of total do skill acquisition near the middle to end of CDI sessions (as measured via frequency count) throughout CDI treatment ($r_{2j} = 0.04$).

Model 1b: Conditional. The results of the conditional model are presented in Table 5, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the linear slope (β = 1.35, $p < .001$), quadratic slope, (β = -.35, $p < .001$), and cubic slope parameters (β = -0.02, $p < .05$). Additionally, child gender was a significant predictor of mean level of parenting skills (β = -3.54, $t(36) = -2.26$, $p < .05$), such that mothers with boys had a fewer total do skill frequency count than mothers with girls in the middle of treatment.

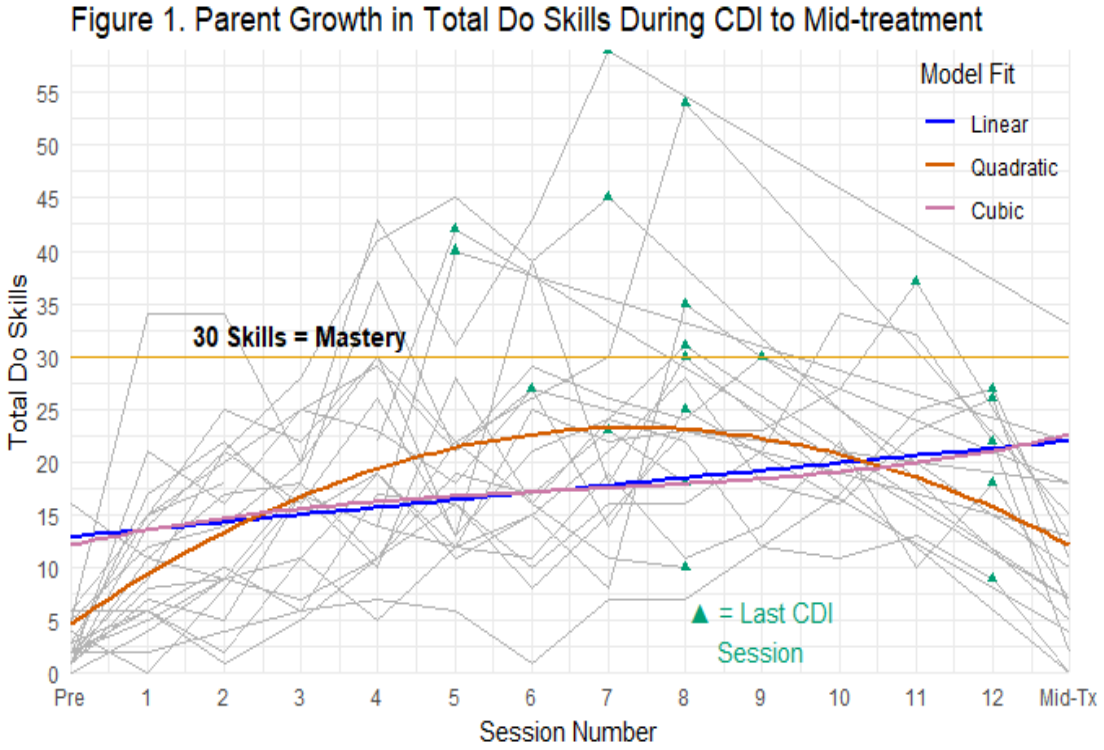

Figure 1. Parent growth in total do skills from baseline to mid-treatment, where the point in the graph notates the last session of child directed interaction before the mid-treatment assessment. Mid-tx = mid-treatment. Lines are approximations of the model fit rather than best-fit lines to the actual data.

Table 5
Multilevel Growth Models of Total Do and Don't Skill Frequency Count from Baseline Through Mid-Treatment

	Model 1 Unconditional Do Frequency[b]	Model 1b Conditional	Model 2 Unconditional Don't Frequency[bc]	Model 2b Conditional
	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)
Intercept (Mid-Tx)	24.91 (2.21)***	29.12 (3.34)***	6.29 (0.79)***	9.05 (2.28)***
Linear	1.47 (0.35)***	1.35 (0.32)***	0.10 (0.23)	-0.01 (0.24)
Quadratic	-0.38 (0.05)***	-0.36 (0.06)***	0.17 (0.04)***	0.15 (0.05)**
Cubic	-0.21(0.01)*	-0.02 (0.01)*	-0.02 (0.01)**	-0.02 (0.01)**
SES	-	0.46 (0.57)	-	0.16 (0.47)
Child Gender	-	-3.62 (1.57)*	-	-1.56 (1.32)
Log likelihood	-725.73	-607.14	-649.73	-560.16
AIC	1467.5	1234.3	1321.5	1146.3
BIC	1494.2	1266.3	1358.3	1188.0

Notes. Notation of [a] indicates a random effect on the linear slope, a notation of [b] indicates a random effect on the quadratic slope, a notation of [c] indicates a random effect on the cubic slope. Mid-Tx = Mid-treatment. SES = socioeconomic status. * $p <$ .05.** $p <$.01. *** $p <$ .001.

Model 2a: Unconditional parent total don't skill frequency count CDI through mid-treatment. Results of the unconditional model showed the best fitting model included quadratic and cubic growth with significant random effects for the quadratic and cubic slopes. The ICC suggests 10% of variance is at level 2 (i.e., varies among people) once growth patterns at level 1 (i.e., varying within the person) are controlled for. Hypothesis testing showed that the fixed linear slopes model fit the data significantly better than random linear slopes, and the random quadratic slopes model fit the data significantly better than the fixed linear, fixed quadratic slopes model (χ^2 (2) = 22.95, $p < .001$). The fixed linear, random quadratic, random cubic slopes model fit the data significantly better than the fixed cubic slopes model (χ^2 (3) = 9.04, $p < .05$). Figure 2 shows that don't skill frequency counts showed quadratic increases before cubic deceleration (as noted by the colored slope lines). Although when looking at figure 2,

there appears to be a decrease in don't skills between the baseline and first CDI session, in the final growth model, these initial declines did not reach the level of significance. There was a positive quadratic growth term ($\beta = 0.17$, $p < .001$), which indicated an increase in don't skills over time. Based on examination of the data (see Figure 2), the increase in don't skill frequency count appeared to take place over the first several sessions. The negative cubic slope parameter was significant, indicating deceleration in use of don't skills over time ($\beta = -0.02$, $p < .01$). The significant random effects for the quadratic and cubic slopes indicated that there was variance between mothers in the rates of initial growth of total don't skill frequency ($r_{2j} = 0.03$), and variance between mothers in rates of deceleration in don't skill frequency count throughout CDI treatment to mid-treatment ($r_{3j} < 0.01$).

Model 2b: Conditional. The results of the conditional model are presented in Table 5, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the quadratic slope ($\beta = 0.15$, $p < .01$) and cubic slope parameters ($\beta = -0.02$, $p < .01$). On average, parent don't skill frequency count trajectories showed significant increases in the negative parenting behaviors, before showing declines in don't skill frequency throughout CDI to mid-treatment.

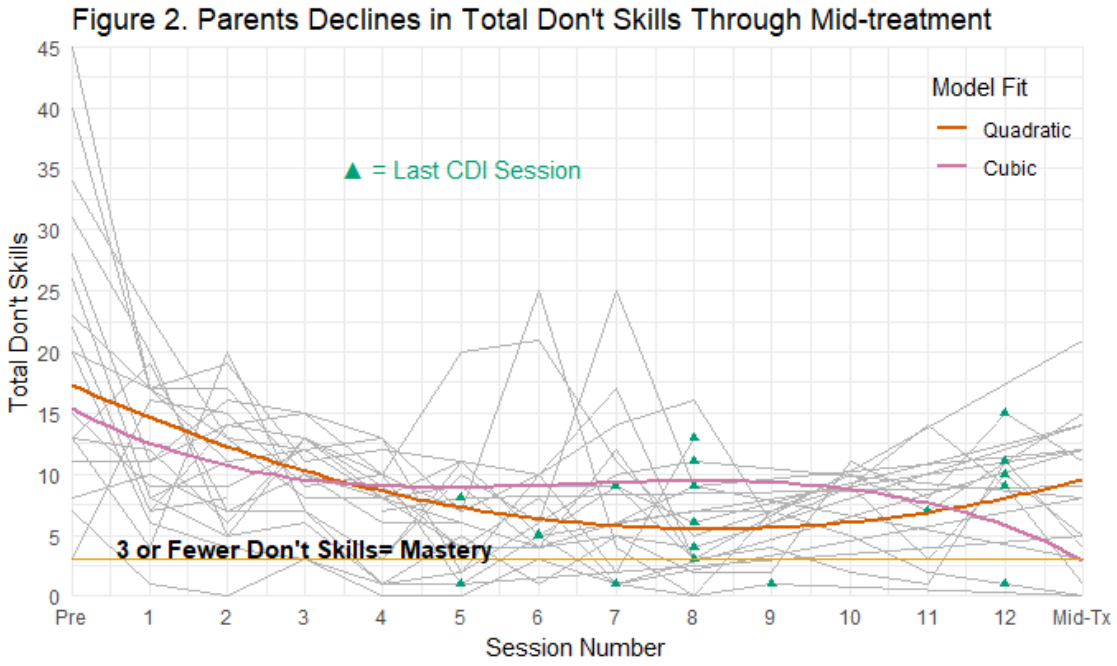

Figure 2. Parent declines in total don't skill frequency count from baseline to mid-treatment, where the point in the graph notates the last session of child directed interaction before the mid-treatment assessment. Lines are approximations of the model fit rather than best-fit lines to the actual data.

Multilevel Models Examining CDI Sessions Only, Excluding Mid-Treatment Assessment

In order to make analyses most comparable to other process studies of PCIT (Hakman et al., 2009; Legato, 2015) and to better clarify the growth within treatment, rather than after in a non-treatment time-point, total do and don't skills models, as well as the other specific do skills models were run using only CDI session data, with the last data point being the last treatment session without the mid-treatment assessment data points. For the next models, I assessed models that differed in functional form (i.e., linear, quadratic, and cubic). Time was centered in the middle of the treatment (i.e., -6, -

5, -4 to 6) to ensure the slope terms were uncorrelated; therefore, the intercept represented parent skills at session 7 of CDI.

Model 3a: Unconditional total do skill frequency count through CDI. The best fitting model was a model that included linear and cubic growth with significant random effects for the linear slope. The ICC suggests 18.6% of variance is at level 2 once growth patterns at level 1 are controlled for. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed linear slopes model (χ^2 (2) = 40.56, $p < .001$), and the fixed quadratic slopes model fit the data significantly better than the random linear, random quadratic slopes model. The random linear, fixed quadratic, fixed cubic slopes model fit the data significantly better than the random cubic slopes model.

Results of the unconditional model (Table 6) indicate that the average growth trajectory for the total do skill frequency count from baseline through CDI, was linear and cubic. Figure 3 is a graphical representation of the data and shows that parents achieved linear and then cubic increases in skills (as noted by the colored slope lines).The positive linear growth term (β = 1.73, $p < .001$) indicated that parents gained 1.73 skills on average in between each session. The quadratic effect was not significant (β = -0.05). The cubic growth term was significant (β = 0.33, $p < .05$), and indicated an acceleration in do skills after the initial linear growth. Significant random effects were found for the linear slope parameter. The significant random effect for the linear slope indicated that participants had variability in how quickly they learned do skills (r_{1j} = 1.49). This total do skill frequency count model that excludes the mid-treatment assessment (i.e., CDI sessions-based only: model 3a) is functionally different than the model that includes the

mid-treatment data (i.e., CDI sessions + Mid-treatment assessment: model 1a). In both models, there are initial linear increases in total do skill frequencies, but in the CDI session-only model, the quadratic deceleration in skills over time in model 1a is no longer significant, and there is instead a cubic acceleration in do skills later in sessions. Random effects were seen on the linear slope parameter for model 3a, perhaps suggesting that when modeling growth in parents' PRIDE skills across CDI sessions only, the linear slopes parameter was more precise and individual differences in growth could emerge.

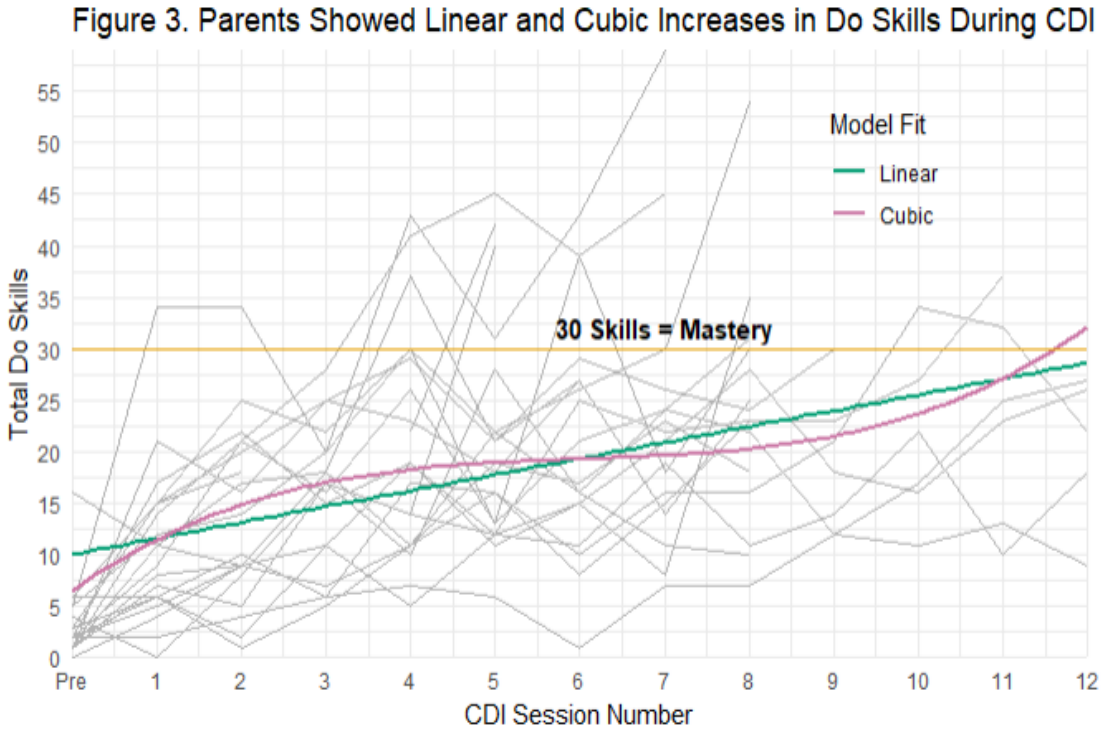

Figure 3. Parent increases in total do skill frequency count during Child Directed Interaction. Lines are approximations of the model fit rather than best-fit lines to the actual data.

Model 3b: Conditional. The results of the conditional model are presented in Table 6, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the linear

slope (β = 1.33, $p < .01$), insignificant quadratic slope (β =-0.07), and cubic slope parameters (β = 0.04, $p < .01$). On average, parent do skill frequency trajectories showed significant increases throughout CDI to mid-treatment, with another significant acceleration in skills after the initial growth.

Table 6
Multilevel Growth Models of Total Do Skill Frequency Count and Proportion Score from Baseline Through CDI

	Model 3 Unconditional Do Frequency[a]	Model 3b Conditional	Model 8 Unconditional Do Proportion[ab]	Model 8b Conditional
	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)
Intercept (Mid-Tx)	23.39 (2.27)***	26.33 (4.14)***	0.41 (0.03)***	0.497 (0.065)***
Linear	1.73 (0.48)***	1.33 (0.45)**	0.02 (0.01)*	0.015(0.0062)*
Quadratic	-0.05 (0.05)	-0.07 (0.05)	-0.004 (0.001)**	-0.0043(.002)**
Cubic	0.33 (0.01)*	0.04 (0.01)**	0.0004 (0.0002)*	0.0004(0.0002) +
SES	-	0.48 (0.75)	-	0.0014 (0.0119)
Child Gender	-	-2.92 (2.30)	-	-0.0604(0.0360)
Log likelihood	-653.62	-550.42	147.68	136.12
AIC	1323.2	1120.8	-273.37	-246.25
BIC	1349.3	1152.0	-237.53	-205.71

Notes. Notation of [a] indicates a random effect on the linear slope, a notation of [b] indicates a random effect on the quadratic slope. * $p < .05$. ** $p < .01$. *** $p < .001$.

Model 4a: Unconditional total do skill proportion score through CDI. In order to take into account the possible variations in how much parents speak, models of total do skill proportion scores also were examined over the course of CDI. Thus, in addition to examining frequency counts of total do skills such as in models 1 and 3, the total do skills proportion (e.g., the sum of the do skills divided by the total speaking turns) were examined. Time was centered in the middle of the treatment (i.e., -6, -5, -4 to 6) to ensure the slope terms were uncorrelated; therefore, the intercept represented parent skills at session 7 of CDI.

The best fitting model for total do skill proportion score (i.e., total do skills/total speaking turns) included linear growth, quadratic deceleration and cubic growth with significant random effects for the linear and quadratic slopes. The ICC suggests 18.19% of variance is at level 2 once growth patterns at level 1 are controlled for. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed linear slopes model (χ^2 (2) = 26.88, $p < .001$), and the random quadratic slopes model fit the data significantly better than the random linear, fixed quadratic slopes model (χ^2 (3) = 11.15, $p < .05$). The random linear, random quadratic, fixed cubic slopes model fit the data significantly better than the random cubic slopes model. As seen in Figure 4, Parents showed linear increases, then quadratic decreases, and then cubic increases in the total do skills proportion score (i.e., the sum of reflections, behavior descriptions, and labelled praises, divided by the number of total utterances), as noted by the colored slope lines.

Results of the unconditional model (Table 6) indicate that the average growth trajectory for the parent total do skill proportion scores from baseline through CDI was linear, quadratic and cubic. The positive linear growth term ($\beta = 0.02$, $p < .001$) indicated that parents gained do skills in relation to total speaking turns on average in between each session, then there were quadratic decelerations in the do skill proportion scores ($\beta = -0.004$, $p > .01$). The cubic growth term was significant ($\beta = 0.0004$, $p < .05$) and indicated an acceleration in do skills after the initial linear growth. Significant random effects were found for the linear slope and quadratic slope parameters. The significant random effect for the linear slope indicated that participants had variability in how quickly they learned total do skills, and how much they showed deceleration in do skills. The do skill

proportion score growth trajectory was similar to the do skill frequency count growth trajectory (model 3), such that there were significant linear increases and cubic increases in total do skills. In the proportion scores variable, there was significant deceleration in total do proportion as well.

Model 4b: Conditional. The results of the conditional model are presented in Table 8, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the linear slope ($\beta = 0.0145$, $p < .01$), and quadratic slope parameters ($\beta = -0.0043$, $p > .001$). The cubic slope parameter no longer met significance, but was nearly significant ($\beta = 0.0004$, $p < .10$). On average, parent do skill proportion score trajectories showed significant increases throughout CDI, with significant deceleration after initial growth.

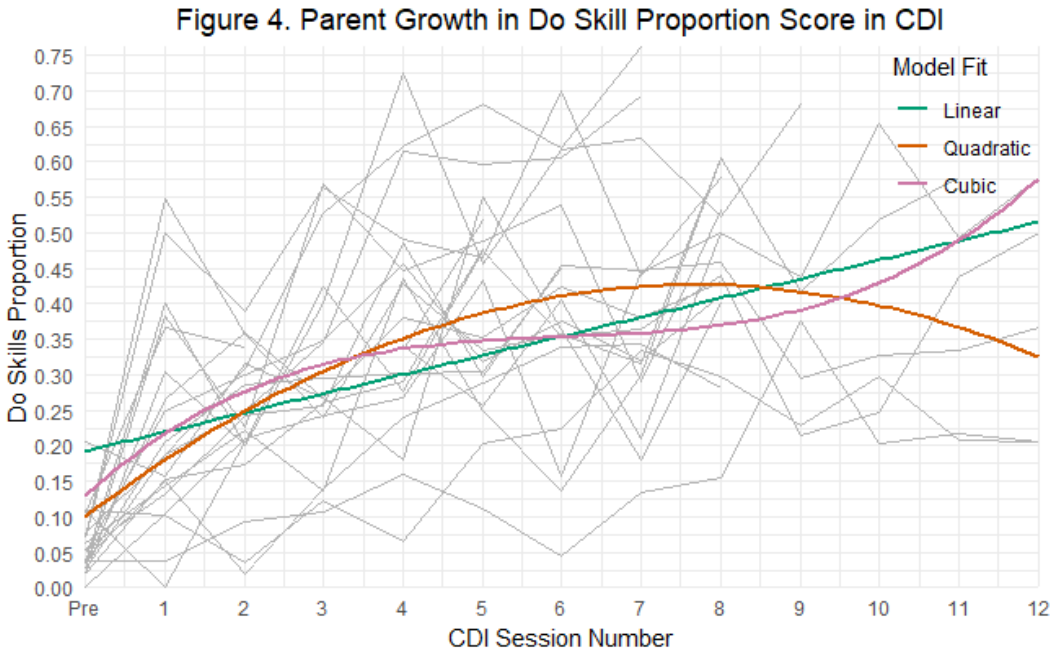

Figure 4. Parent growth in do skill proportion scores in CDI. Lines are approximations of the model fit rather than accurate best-fit lines.

Multilevel Models of Each Do Skill Frequency Count Through CDI Treatment

Model 5a: Unconditional parent reflection frequency. When examining reflection frequency count individually, the best fitting model was linear growth model with significant liner random effects (see model 5a, Table 7). The ICC suggests 15% percent of variance is at level 2 once growth patterns at level 1 are controlled for.

Results of the unconditional model (Table 7) indicated that the average growth trajectory for reflection frequency from baseline through CDI was linear. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed linear slopes model (χ^2 (2) = 12.58, $p < .01$). See Figure 5 for a visualization of the reflection frequency count data, with the approximation of the linear slope line. The positive linear growth term ($\beta = 0.73$, $p < .001$) indicated that parents employed 0.73 more Reflections on average in each subsequent CDI session. Significant random effects were found for the linear slope parameter, which indicated that participants varied significantly in terms of how quickly they increased in use of reflections in response to their child's verbalizations ($r_{1j} = 0.19$).

Model 5b: Conditional. The results of the conditional model are presented in Table 7, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the linear slope ($\beta = 0.64$, $p < .001$) parameter. On average, parents showed significant increases in reflection frequency.

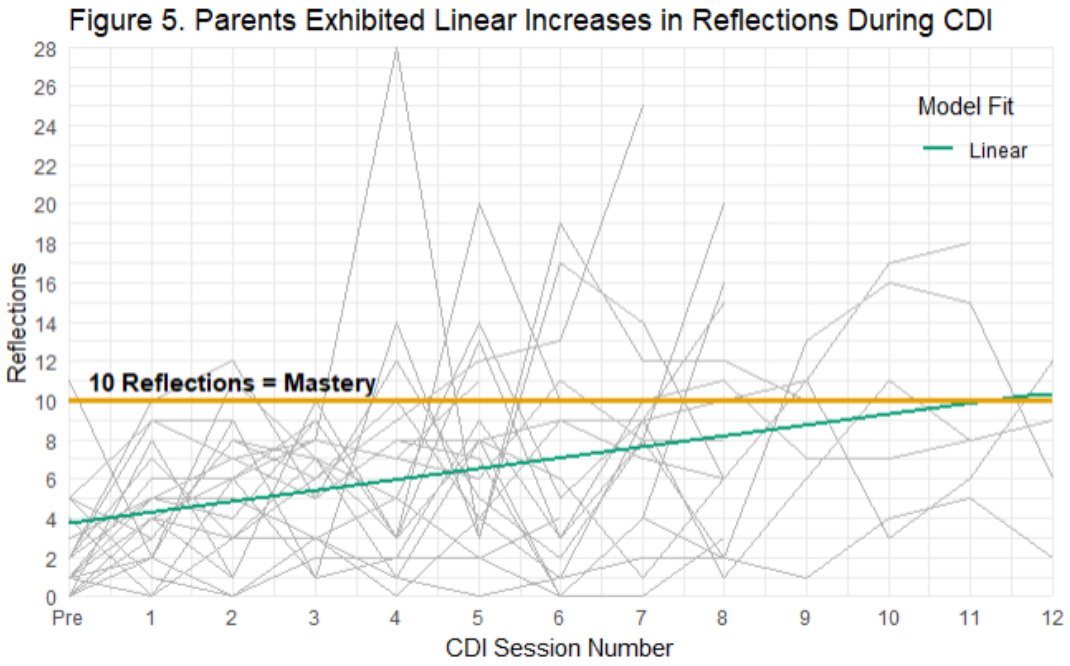

Figure 5. Parents exhibited linear increases in reflection frequencies during CDI. The linear slope line approximates the model fit rather than a best-fit line to the actual data.

Model 6a: Unconditional parent behavior description frequency count. The best fitting model was a linear growth model with significant liner random effects (see model 6a, Table 7). The ICC suggests 16% percent of variance is at level 2 once growth patterns at level 1 are controlled for.

Results of the unconditional model (Table 7) indicated that the average growth trajectory for behavior description frequency count from baseline through CDI was linear. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed linear slopes model (χ^2 (2) = 17.48, $p < .001$). Figure 6 shows the approximation of the best fitting linear slope line along with the graphical representation of the frequency count of behavior descriptions. The positive linear growth term ($\beta = 1.04$, $p < .001$) indicated that parents gained 1.04 behavior descriptions on average in between each session. Significant random effects were found for the linear

Table 7

Multilevel Growth Models of Frequency Counts of PRIDE Skills from Baseline Through CDI

	Model 5a Unconditional Total RF[a]	Model 5b Conditional	Model 6a Unconditional BD[a]	Model 6b Conditional	Model 7a Unconditional LP[a]	Model 7b Conditional
	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)
Intercept (Mid-Tx)	7.69 (0.78)***	9.19 (1.71)***	7.99 (0.99)***	9.97 (1.90)***	7.38 (0.80)***	6.47 (1.65)***
Linear	0.73 (0.14)***	0.64 (0.14)***	1.04 (0.15)***	1.00 (0.17)***	0.40 (0.19)*	0.28 (0.18)
Quadratic	-	-	-	-	-0.04 (0.02)	-0.04 (0.02)
Cubic	-	-	-	-	0.01 (0.01)*	0.01(0.01)*
SES	-	0.25 (0.32)	-	-0.00 (0.35)	-	-0.00 (0.31)
Child Gender	-	-1.34(1.00)	-	-1.62 (1.06)	-	0.23 (0.94)
Log likelihood	-550.10	-469.6	-547.93	-470.41	-498.40	-426.55
AIC	1112.2	955.19	1107.9	956.82	1012.8	873.1
BIC	1131.8	980.14	1127.4	981.76	1038.9	904.28

Notes. Notation of [a] indicates a random effect on the linear slope, a notation of [b] indicates a random effect on the quadratic slope. * $p < .05$. ** $p < .01$ *** $p < .001$.

slope parameter, which indicated that participants had variability in how quickly they learned behavior descriptions (r_{1j} = 0.31).

Model 6b: Conditional. The results of the conditional model are presented in Table 7, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the linear slope (β = 1.00, p < .001) parameter. On average, parents showed significant increases in frequency of behavior descriptions throughout CDI.

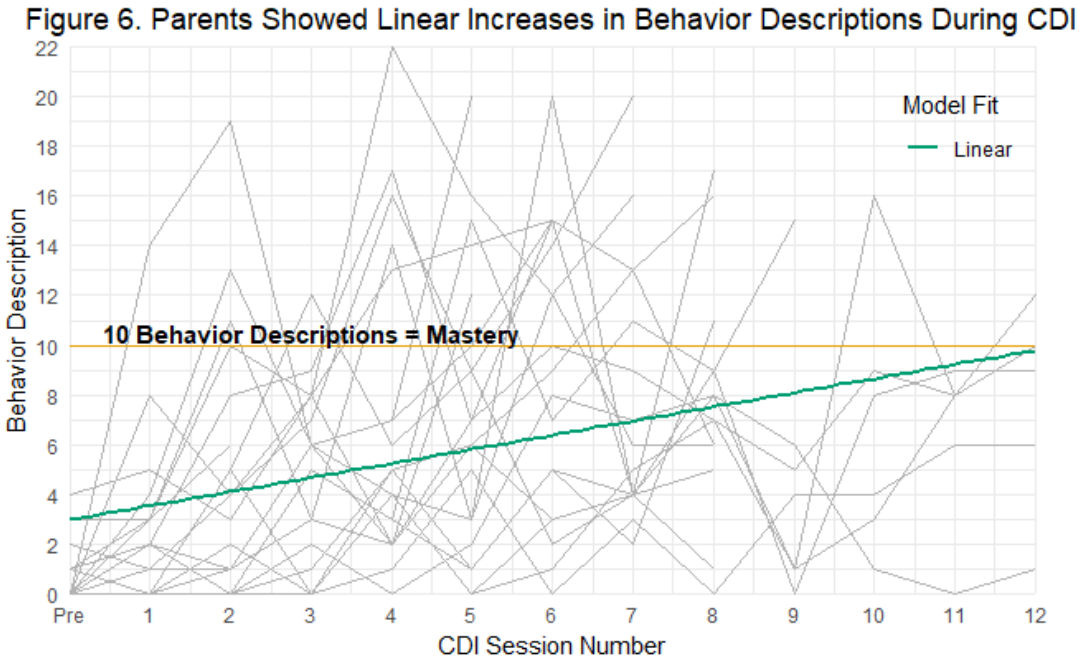

Figure 6. Parents exhibited linear increases in behavior description frequency count during Child Directed Interaction. The linear slope line approximates the model fit rather than a best-fit line to the actual data.

Model 7a: Unconditional parent labelled praise frequency count. The best fitting model for labelled praise frequency count was a linear and cubic growth model with significant random effects for the linear slopes. The ICC suggests 17% percent of variance is at level 2 once growth patterns at level 1 are controlled for. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed

linear slopes model (χ^2 (2) = 27.27, $p < .001$), and the fixed quadratic slopes model fit the data significantly better than the random linear, random quadratic slopes model. The random linear, fixed quadratic, fixed cubic slopes model fit the data significantly better than the random cubic slopes model.

Results of the unconditional model (Table 7) indicate that the average growth trajectory for parent labelled praise frequency count from baseline through CDI, was linear and cubic. There was a positive linear growth term (β = 0.40, $p < .05$), which indicated an increase in labelled praises skill frequency over time. Based on visual examination of the data (see Figure 7), the increase labelled praises appeared to take place from baseline over the first several sessions, before flattening out. The positive cubic slope parameter was significant, indicating another acceleration in use of labelled praise frequency skills over time (β = 0.01, $p < .05$). The significant random effects for the linear slopes indicated that there was variability between mothers in the initial rate of learning labelled praises (r_{1j} = 0.20).

Model 7b: Conditional. The results of the conditional model are presented in Table 7, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were no longer consistent for the linear slope parameter, but was consistent for the cubic slope parameter (β = -0.01, $p < .05$). See Figure 7 for graphical representation of the approximations of growth trajectory. On average, parents showed later acceleration in labelled praises.

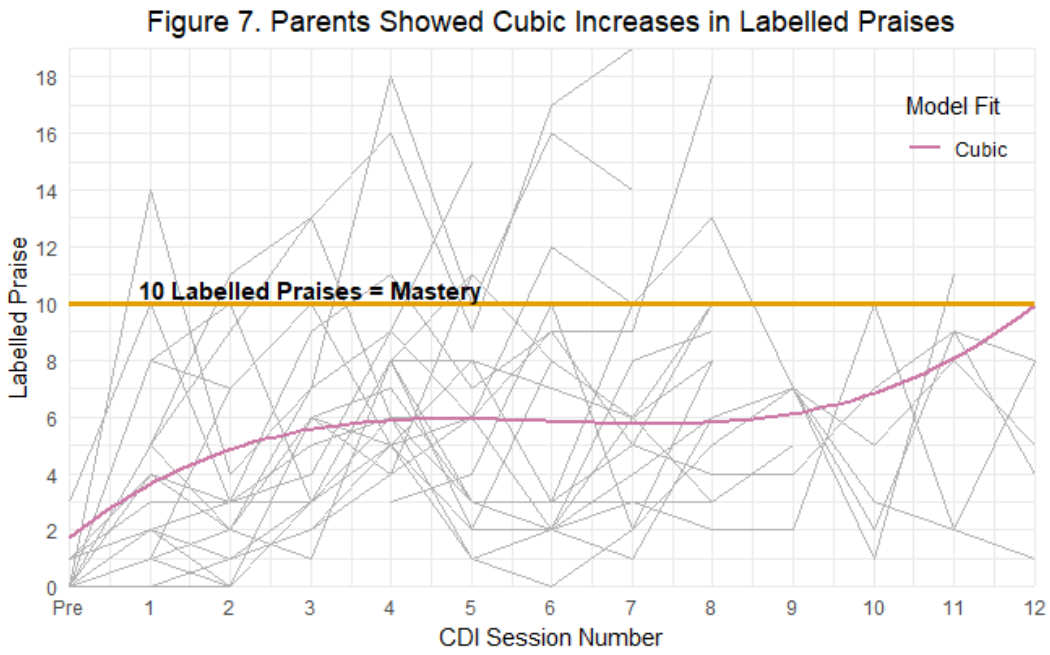

Figure 7. Parents exhibited cubic increases in labelled praises frequency count during Child Directed Interaction. The cubic slope line approximates the model fit rather than a best-fit line to the actual data.

Multilevel Models of Total Don't Skill Frequency Count and Proportion Score Through CDI Treatment Sessions

Model 8a: Unconditional parent total don't skill frequency. When examining the don't skill frequency count, the best fitting model included quadratic and cubic growth with significant random effects for the linear and quadratic slopes. The ICC suggests 9.58% percent of variance is at level 2 once growth patterns at level 1 are controlled for. Hypothesis testing showed that the random linear slopes model fit the data significantly better than fixed linear slopes model (χ^2 (2) = 11.53, $p < .01$), and the random quadratic slopes model fit the data significantly better than the random linear, fixed quadratic slopes model (χ^2 (3) = 19.76, $p < .001$). The random linear, random quadratic, fixed cubic slopes model fit the data significantly better than the random cubic slopes model.

Results of the unconditional model (Table 8) indicate that the average growth trajectory for the parent total don't skills from baseline through CDI, was quadratic and cubic. There was a positive quadratic growth term ($\beta = 0.19$, $p < .01$), which indicated an increase in don't skill frequency count over time. Based on examination of the data in Figure 8, the increase in don't skills appeared to take place over the first several sessions, and although there appeared to be initial declines in total don't frequency from the baseline session to the first CDI session, those declines did not reach statistical significance. The negative cubic slope parameter was significant, indicating steeper deceleration in use of don't skills over time ($\beta = -0.03$, $p < .01$). The significant random effects for the linear and quadratic slopes indicated there was variability between mothers in the initial increases in don't skill frequency count. This model which excluded the mid-treatment assessment was consistent with the model that examined total don't skill frequency count through CDI to the mid-treatment session (model 2), such that both models showed quadratic increases in don't skills before cubic deceleration. The difference in the two models was that in this model (model 8a) there were significant random effects seen for the linear and quadratic slopes, whereas in model 2, random effects were significant for the quadratic and cubic growth terms.

Model 8b: Conditional. The results of the conditional model are presented in Table 6, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the quadratic slope ($\beta = 0.18$, $p < .05$) and cubic slope parameters ($\beta = -0.02$, $p < .05$). On average, parent don't skill frequency count trajectories showed significant increases in

the negative parenting behaviors, before showing declines in don't skills throughout CDI sessions.

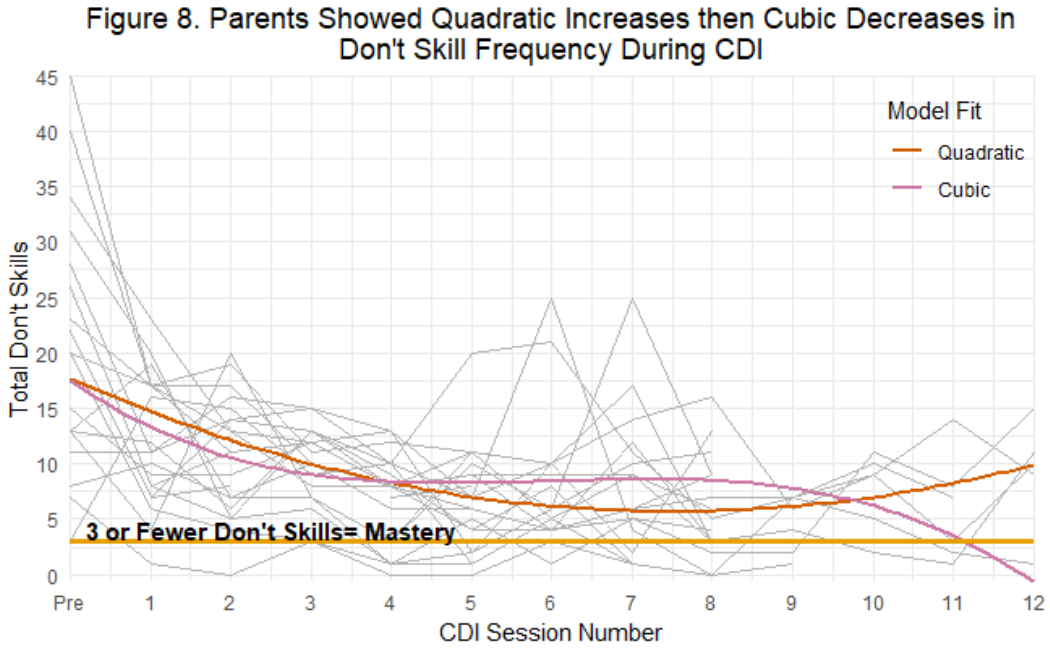

Figure 8. Parents showed quadratic increases then cubic decreases in don't skills during CDI. Colored slope lines are approximations of the model fit rather than best-fit lines to the actual data.

Model 9a: Unconditional parent total don't proportion score. Like the do skill proportionate scores, in order to account for the possible variations in how much parents speak, models of total don't skill proportion scores were examined over the course of CDI. The best fitting model for total do skill proportion score (i.e., total do skills/total speaking turns) included quadratic growth and cubic deceleration with significant random effects for the quadratic slopes. The ICC suggests 6.71% of variance is at level 2 once growth patterns at level 1 are controlled for. Hypothesis testing showed that the fixed linear slopes model fit the data significantly better than random linear slopes model, and the random quadratic slopes model fit the data significantly better than

the fixed linear, fixed quadratic slopes model (χ^2 (2) = 7.12, $p < .05$). The fixed linear, random quadratic, fixed cubic slopes model fit the data significantly better than the random cubic slopes model.

Table 8
Multilevel growth models of Total Don't Skill Frequency Count and Proportion Score from Baseline Through CDI

	Model 8 Unconditional Don't Frequency[ab]	Model 8b Conditional	Model 9 Unconditional Don't Proportion[b]	Model 9b Conditional
	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)
Intercept (Mid-Tx)	6.43 (0.81)***	7.82 (2.53)**	0.1266 (0.0168)***	0.1397 (0.04935)*
Linear	0.03 (0.25)	-0.13 (0.28)	-0.0021 (0.00444)	-0.00441 (0.004836)
Quadratic	0.19 (0.06)**	0.18 (0.06)*	0.00251 (0.00082)**	0.002426 (0.000877)*
Cubic	-0.03 (0.01)**	-0.02 (0.01)*	-0.0065 (0.00017)***	-0.00057 (0.000187)**
SES	-	0.23 (0.50)	-	0.00356 (0.009150)
Child Gender	-	-0.72 (1.51)	-	-0.00396 (0.02945)
Log likelihood	-594.73	-518.27	183.95	156.8
AIC	1211.5	1062.5	-351.91	-293.6
BIC	1247.3	1103.1	-325.85	-262.42

Notes. Notation of [a] indicates a random effect on the linear slope, a notation of [b] indicates a random effect on the quadratic slope. * $p < .05$. ** $p < .01$. *** $p < .001$. $^{+}p < .10$.

Results of the unconditional model (Table 8) indicate that the average growth trajectory for the parent total don't skill proportion from baseline through CDI, was quadratic and cubic. There was a positive quadratic growth term ($\beta = 0.00251$, $p < .01$), which indicated an increase in don't proportion over time. Based on examination of the

data (see Figure 9), the increase in don't skills appeared to take place from over the first several sessions. The negative cubic slope parameter was significant, indicating steeper deceleration in use of Don't proportion over time (β = -0.0065, $p < .001$). As shown in Figure 9, parents showed quadratic increases, and then cubic decreases in the proportion of "don't skills (i.e., the sum of questions, commands, and negative talk, divided by the number of total utterances), as noted by the colored slope lines. The significant random effects for the quadratic slopes indicated there was variability as to how parents showed increases in the increase in don't proportion.

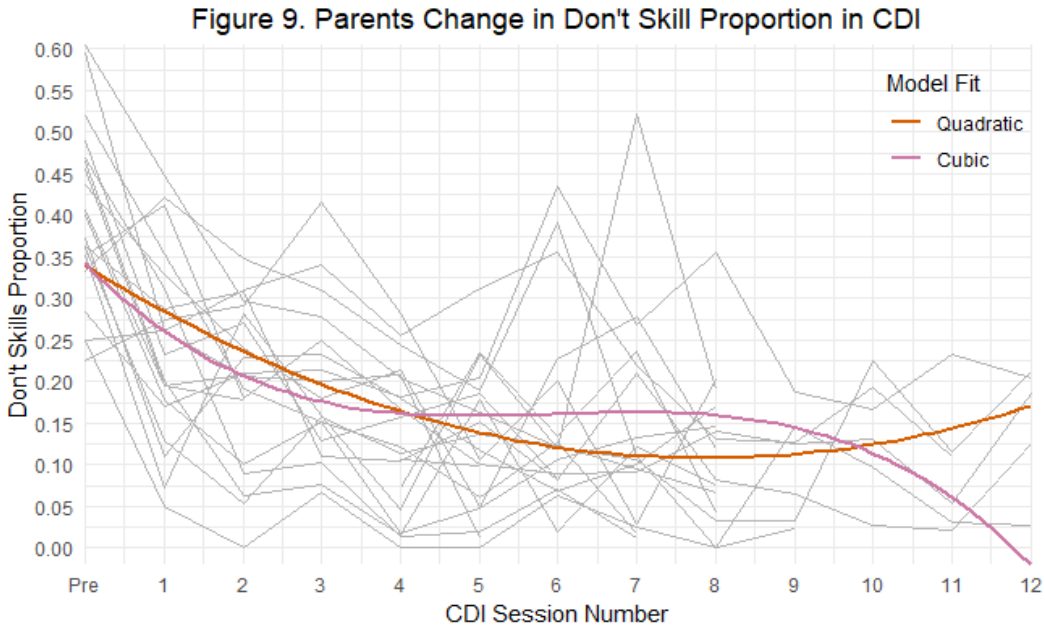

Figure 9. Parent change in don't skill proportion during CDI. Lines are approximations of the model fit rather than accurate best-fit lines.

Model 9b: Conditional. The results of the conditional model are presented in Table 8, in which SES and child gender were included as covariates of the intercept. When controlling for SES and child gender, model results were consistent for the quadratic slope (β = 0.002426, $p < .05$) and cubic slope parameters (β = -0.000572, $p < .01$). On average, parent use of don't proportions trajectories showed significant increases

in the negative parenting behaviors in relation to total speech, before showing declines throughout CDI sessions.

Impact of Self-Reported Homework Completion on Skill Use

When adding parents' average weekly homework completion (level 2) into RM-ANOVAS comparing baseline and mid-treatment skill use (research question 4a), there was no significantly greater increases in do skills nor were there significant decreases in don't skills. Further, pre-and post- skill change no longer reached the level of significance for total do or don't skills when average homework was added along with the other covariates (See Table 9).

Table 9
Pre-, Post- CDI PRIDE Skills Repeated Measures Analysis of Variance with Homework (n = 15)

Effect	*MS*	*df*	*F*	*p*
Time (Total Do)	90.59	1	3.17	.10
Time * Child Gender	38.29	1	1.34	.27
Time* SES	0.24	1	0.01	.93
Time* Homework	0.38	1	0.01	.91
Error	28.58	11		
Time (Total Don't)	113.74	1	2.27	.16
Time * Child Gender	0.46	1	0.01	.93
Time* SES	40.98	1	0.82	.38
Time* Homework	14.58	1	0.29	.60
Error	49.90	11		

Notes. Average homework calculated by averaging weekly homework completion ratio.

Given that there was significant growth in models of total do and don't skills for parents during CDI, similar models were run exploring the moderating effect of average homework completion on growth across sessions. Average homework (the mean of the total number of days of completed homework over total number of days between session) was added to the growth models. See Table 10 for complete results.

When adding average homework completion in the conditional model of total do skill frequency through CDI, model results were consistent for the cubic parameter (β = 0.08, $p < .05$) while controlling for SES and child gender; however, linear and quadratic terms no longer met the level of significance (β = 1.06, $p > .10$ and β = 0.13, $p > .10$, respectively). Thus, parents showed significant cubic increases in total do skill frequency during CDI. There was not a significant main effect of average homework and growth in skills over time, and there were not significant interaction effects between average homework completion and the linear, or cubic growth. A near significant interaction effect between the quadratic slope parameter and average homework completion was observed (β = -0.22, $p <. 10$). Interpretation of this interaction indicates that parents who reported greater average weekly homework completion showed a near significant deceleration in quadratic growth total do skills across CDI sessions.

For the total don't skill frequency growth model, when adding the average homework completion into the conditional model, model results were consistent for the cubic growth parameter (β = -0.05, $p < .05$), such that parents showed decreases in total don't skill frequencies during CDI. Additionally, a significant main effect was observed for the linear growth parameter (β = 1.29, $p <. 05$), such that initially there were linear increases in total don't skills, before the cubic declines. A significant interaction was also observed between average homework reported and the linear slope parameter (β = -1.60, $p <. 05$). Interpretation of this interaction indicates that parents who reported completing more homework on average, were observed to show decreases in don't skills during CDI, as hypothesized. Thus, a higher average level of homework was associated with greater decreases in the negative parenting skills.

Table 10

Multilevel growth models of Total Do and Don't Skills with Homework Completion from Baseline through CDI

	Model 3 Unconditional Do Frequency[a]		Model 3b Conditional		Model 4 Unconditional Don't Frequency[ab]		Model 4b Conditional	
	B (*SE*)		B (*SE*)		B (*SE*)		B (*SE*)	
Intercept (Mid-Tx)	23.39	(2.27)***	28.6	(6.56)***	6.43	(0.81)***	10.35	(3.24)**
Linear	1.73	(0.48)***	1.06	(1.10)	0.03	(0.25)	1.29	(0.05)*
Quadratic	-0.05	(0.05)	0.13	(0.12)	0.19	(0.06)**	0.51	(0.18)
Cubic	0.33	(0.01)*	0.08	(0.03)*	-0.03	(0.01)**	-0.05	(0.03)*
SES		-	0.37	(0.73)		-	0.06	(0.50)
Child Gender		-	-3.14	(2.23)		-	-0.46	(1.49)
Homework		-	-4.72	(11.53)		-	-6.48	(4.41)
Linear*HW			0.63	(2.28)			-2.89	(1.27)*
Quadratic*HW			-0.35	(-0.21)$^{+}$			0.14	(0.37)
Cubic*HW			-0.07	(0.06)			0.08	(0.05)$^{+}$
Log likelihood	-653.62				-594.73			
AIC	1323.2				1211.5			
BIC	1349.3				1247.3			

Notes. Notation of [a] indicates a random effect on the linear slope, a notation of [b] indicates a random effect on the quadratic slope. HW= homework. $^{+}$ $p < .10$. * $p < .05$. **$p < .01$. *** $p < .001$.

CHAPTER IV

DISCUSSION

The goal of this study was to better understand patterns of growth in parenting skills throughout the CDI phase of treatment, and to discover how parent homework completion impacted the improvement of observed parenting skills. In this preliminary study of families with child welfare involvement, as hypothesized, there were significant increases in total do skills across treatment, and decreases in total don't skills. Discussion of the specific change patterns found in this study will follow. It is important to note that even in the first phase, PCIT effectively changed parenting behaviors observed in session.

Understanding change trajectories in PCIT is an important step in clarifying pathways through which PCIT leads to positive changes in functioning for CM families. PCIT is an evidence-based practice for families with abuse and neglect histories (California Evidence-Based Clearing House [http://www.cebc4cw.org]); Chaffin et al., 2007; Chaffin et al., 2011). Originally designed as a treatment for children with oppositional behavior problems, more information on how and when changes occur with CM families is necessary to determine mechanisms for change and to best tailor intervention to reduce child abuse and neglect recidivism. Moreover, process-oriented studies are important in order to understand information about how, why, and with whom interventions are effective to better choose and implement cost- and time-effective interventions.

In this study, I looked at growth patterns in parents' observed skill use across CDI. Participants were the first 20 mother-child dyads randomized to the PCIT group in a larger RCT of PCIT for families involved in child welfare, or at risk for child welfare

involvement. Findings are comparable to previous process research on PCIT for physically abusive families (Hakman et al., 2009), and indicate CM parents show substantial change even within the first phase of PCIT, across both do and don't skills.

In looking at observed parenting changes from baseline to post-CDI/mid-treatment, parents were observed to change in total do skill, total don't skills, and proportions of do and don't skills, all in the expected direction. Parents showed increases in do skill frequencies including reflections, behavior descriptions, labelled praises, and the proportion of do skills to all verbal utterances as observed in the mid-treatment assessment, in comparison to baseline. Additionally, parents showed decreases in both total don't skills and the don't skill proportion at mid-treatment compared to pre-treatment observations. Although these results support study hypotheses that parents who receive PCIT displayed greater do skills and fewer don't skills from baseline to mid-treatment assessments, results diminished when controlling for variables associated with pretreatment skills, specifically, SES and child gender. Once the covariates were included into the pre-, post- analysis, only reflections continued to meet the level of significant change at mid-treatment as compared to pre-treatment. The total do skill frequency count was trending toward significance when SES and child gender were controlled for. These results make looking more specifically into the change processes with more sophisticated statistical techniques integral in order to understand nuances within parent's skill use, and to optimize power when using a small sample of 20 families. Growth modeling was thus indicated to better understand treatment change, and to enhance statistical power by including multiple data points per participant.

The current study replicated and extended Hakman and colleagues research (2009), and is one of three studies to go beyond pre/post designs to look at observed skill use throughout treatment.

The first two multilevel growth models examined do and don't skills from baseline to mid-treatment, encompassing up to 12 CDI sessions, and the mid-treatment assessment. Results were somewhat consistent with the study hypotheses for research questions 2 and 3, that linear growth in skills would emerge, but there were also some results inconsistent with hypotheses.

For total do skills, mothers' skills showed linear increases, then quadratic decreases, and finally cubic increases across CDI sessions. Although we cannot determine the specific time that the growth trajectory changed, visual inspection of the data appeared to take a linear course over the first 4-5 sessions, and then perhaps showed some decreases after that, with another spike in skills around session 8. Future studies should employ piecewise growth modeling to test where the change is occurring across the sessions. For don't skills through to mid-treatment, parents on average showed growth in don't skills, which was inconsistent with hypotheses, before showing cubic decreases. Visual inspection of the graphs indicated that the quadratic change occurred somewhere between the 2nd and 5th session, and cubic decreases appear to take place after that. Although the don't skill models appeared to show initial declines in the expected direction between the baseline assessment and the first session, those changes did not reach the level of statistical significance. Results were somewhat consistent with other process research on skills, but were inconsistent based on the sessions modeled in other similar studies. That said, it is important to note that in the sample of N = 20 participating families, the number

of CDI sessions that each family completed varied widely. Almost one-half completed the CDI phase of treatment in 5-8 sessions, and over a third of families completed 9-12 sessions and not all families attained mastery of the CDI skills before transitioning to PDI. Hence it is plausible that the quadratic and cubic patterns observed in do and don't skills changes over time were produced by different subgroups of families in the sample. Early session versus full CDI course trajectories of change may be quantitatively different when examined in these separate subgroups of participating families.

In order to better match other process studies that examined targeted parenting skills over the course of PCIT (Hakman, et al., 2009; Legato, 2015), the rest of the models included baseline through CDI sessions, with the exclusion of the mid-treatment assessment. Legato looked at early sessions of CDI, without mid-treatment and found linear increases in do skills and linear decreases in don't skills. Hakman and colleagues (2009) included a subset of both CDI and PDI sessions in their growth models, such that their model included coding parent-child interactive sequences at baseline, CDI sessions one through five, and then interactions during PDI or CDI coding within the PDI phase of treatment. Therefore, there was not a similar "mid-treatment" assessment point in either of the two closest related studies of change in PCIT. The mid-treatment is substantially different from the other CDI sessions, and is also not a true "post-treatment assessment," as there is one more phase for parents to solidify their skills. Thus, in order to best characterize change within CDI, and to make data comparable to other process studies, the models were re-run without the mid-treatment timepoint.

Change Trajectories for Parents in CDI: Do Skill Frequencies and Proportions

Change in total do skill frequency was modelled from baseline through CDI sessions and results indicated significant linear increases in total do skills, and then another significant acceleration in parent do skills through the cubic parameter. These results remained consistent once covariates of gender and SES were controlled for. These findings were partially consistent with the hypothesis, in which I expected to see linear growth in parenting skills during CDI, similar to Legato's unpublished dissertation (2015). Through visual inspection of the data, it is unclear where to estimate the linear versus cubic change takes place. It appears that parents may have increased targeted skills in the first 5 sessions, and then there may be another acceleration around session 6 or 7. Follow-up studies including piecewise growth modeling will help clarify the timing of the change. Similar to Legato (2015), linear increases were observed, though it was unclear whether Legato tested for nonlinear slope parameters. Legato also used a non-CM community-based sample. It is possible that non-CM parents change at different rates and through different trajectories than CM parents.

Although Hakman et al. (2009) operationalized parenting skills differently in their study, results in this study were somewhat consistent with their findings that parenting interactions change within the CDI portion of PCIT. Based on their growth modeling, they found linear and quadratic growth, and determined that growth occurred mostly in the first three sessions by testing a piecewise growth modeling technique. Hakman et al. operationalized parenting skills in terms of a parent's response to child's behavior. "Positive" interactions were defined as parent responding to appropriate child behaviors with behavior descriptions, information descriptions [i.e., describing information rather

than the child's behavior], labelled praises, [direct commands within PDI sessions] or reflections. Hakman determined that there were early, steep changes in positive parenting interactions, and then there was not significant change in the next six sessions. Contrary to Hakman's findings, it appears through visual inspection and the significance of the cubic growth parameter, that change continues to occur after the first three sessions in this subsample of parents involved in the child welfare system. There may be several important reasons for this discrepancy in findings. First, Hakman qualified positive parenting within parenting interactions, rather than simply looking at do skills toward mastery, independent of preceding child behaviors, as was done in the current study. Thus, it is possible that although skills continue to develop and increase over the course of CDI, interactions may qualitatively change before that time, such as parents learning to respond discriminately depending on the child's behavior before they reach mastery level in skills. Another possible explanation for the differences in skill increases is that Hakman and colleagues looked at parenting not just in the CDI portion of treatment, but also across PDI sessions, in which parents are also learning to provide effective commands with consistent discipline. When providing discipline and limits to children in the next PDI sessions, children may have acted out more, as it was not the task for parents to simply follow the child's lead. Thus, parents may have showed less change in the proportion of positive behaviors since they have more skills to focus on. Thus, this may not have provided an equivalent set of skills to map throughout PCIT. When simply looking at mastery skills over a greater number of sessions, cubic growth could emerge.

Proportions of parenting skills were perhaps the closest models in design to Hakman et al.'s (2009) models of parenting interactions, which was also a proportion.

Results indicated that when taking the ratio of positive parenting skills to overall parent utterances, results were consistent for linear increases early on, then quadratic deceleration in do skill proportion, and finally another significant increase in do skills. However, when controlling for SES and child gender, the cubic increases did not quite reach significance. These results indicated that parents showed some deceleration in their growth, possibly near the middle of treatment Again, the specific time frame of the changes cannot be determined, and future analyses should clarify the timing of growth patterns and whether there are particular subgroups of families accounting for change patterns given the variable length of treatment depending on how quickly families met mastery, and whether families were allowed 8 or 12 sessions of CDI.

Growth in Each Individual Do Skill Frequency

Unlike other published process studies of its kind, research question 3 of the current study examined changes across CDI in each do skill, including reflections, behavior descriptions, and labelled praises. For reflections and behavior descriptions, parents increased in skills in a linear pattern, suggesting growth was relatively stable across CDI sessions. On the other hand, without controlling for SES and child gender, linear and cubic increases emerged for labelled praises. When controlling for the two covariates, only cubic growth in skills emerged as significant specific to parents' labelled praises. Visual inspection of the data showed increases occurring possibly later in sessions, possibly between session 4 and 7, although the exact time frame for the change patterns cannot be determined statistically thorough current study. This finding indicates that coaching skills differentially may be important, as there are different growth patterns depending on the skill. Although we cannot determine whether differences exist *between*

skills, we do see that behavior descriptions and reflections have linear growth patterns, whereas labelled praise when looked at individually shows a different pattern/shape of growth. This could potentially indicate that labelled praises are complicated, or represent a more difficult skill to learn, and may take more coaching and practice to acquire. In PCIT, the coaching is assessment-driven, in that therapists' tailor coaching after the 5 minutes of coded observation of parenting skills. Thus, although looking at how observed parenting skills is important, skills should be looked at in the context of what skill was targeted and coached in the previous session. If coaches did indeed notice labelled praises were slower to develop, it is likely they chose to coach labelled praises in session. If labelled praises persist to show later development or slower skill acquisition over time that could potentially make tailoring to focus on labelled praises even more important. In the current study of 20 families, coaching focus was not included. This preliminary look into the specific growth in parenting skills sets up future research to explore some fascinating questions about skill development. Follow-up studies with a greater number of participants should clarify the relationship between coaching focus and skill development in parents.

Changes in Parents' Don't Skills During CDI: Frequencies and Proportions

When looking at changes in parent don't skills, results were somewhat inconsistent with my hypothesis as well as previous studies (Hakman et al., 2009; Legato, 2015). Parents showed significant quadratic increases in the targeted skills to avoid during the CDI observation, before then decreasing their don't skills in the expected direction. A drop in don't skills between the baseline assessment and first treatment session seemed to happen upon visual examination of the data, but did not reach the level

of significance. This change was unlike Legato's findings of linear decreases in don't skills and Hakman's early, steep decreases in negative parenting interactions. Through visual inspection of the data, it appears that parents may have some increases in don't skills, possibly in the first several sessions, and then possible decreases around sessions 4-9 for some parents. This model was difficult to visualize; however, which makes follow-up research on when the change is occurring even more valuable. Again, although Legato found linear decreases in don't skills, it is unclear whether she also explored non-linear slopes, and thus she may have found that a quadratic or cubic model fit the data better than the linear model. Also, it is possible that her community sample of participants differed in their declines in don't skills. Hakman et al., on the other hand, found early linear and quadratic declines, again using piecewise modeling to separate and model change in the first three sessions and then change in the next six sessions. Interactions were deemed as "negative" if appropriate child behavior was followed by parent questions, commands (indirect commands in PDI), or negative talks. Again, there are several reasons in which Hakman's findings and those in the current study may differ. It is possible that the way Hakman and colleagues measured the changing interactions were qualitatively different than measuring don't skills independent of child behavior, and thus those changes emerged earlier in sessions. However, another interpretation may be related to the fact that Hakman modelled fewer CDI sessions, and substantially PDI sessions were included within the same model, which could lead to less precise findings about the growth in CDI mastery skills.

Proportions of total don't skills were modeled to consider the ratio of don't skills toward mastery relative to other parenting behaviors observed. The proportion of don't

skills relative to total utterances showed quadratic increases before cubic decreases. Looking at proportions rather than solely at frequencies is important, because otherwise it might be possible that changes could be partially related to being coached to talk more frequently during CDI, and thus not relate necessarily to changes in the interaction patterns. The proportions of do and don't skills show that parents are indeed showing increases and decreases as hypothesized during CDI. Again, it is not possible to statistically determine when the increases and decreases in don't skills proportions occurred, but patterns appeared to take place across more sessions visually than the comparable study (Hakman et al., 2009). Modeling a greater number of sessions and looking only specifically at CDI sessions rather than a combination of each could lend itself to getting a more accurate, clear picture of the patterns of change during CDI. Additionally, examining CDI specifically can elucidate whether there are certain subgroups that show different change patterns once more data is gathered. In this study, there were variable lengths of treatment that families completed depending on meeting mastery and/or session limits. Thus, as different families completed CDI at different rates, the later sessions modelled (sessions 8-12) represented a smaller subgroup of families, which could have impacted the change trajectories patterns, and perhaps some quadratic and cubic growth trends that emerged. Despite this confounding factor, all models showed changes in parenting skills in expected and hypothesized directions, supporting that child welfare-involved parents can indeed show changes during just the first phase of treatment in their parenting skills.

Exploration of the Impact of Homework on Parent Skills

When exploring the relationship between pre- and post-CDI treatment do and don't skills with homework included as a covariate, there was no significant relationship between homework and do or don't skill change over time during CDI. This was not surprising given the already null findings while controlling for SES and child gender for total do and total don't skill changes observed in post-CDI/mid-treatment assessment relative to the baseline assessment. It is likely that the sample size was not large enough to detect changes with only two time-points. Using growth modeling allowed me to look specifically at whether average homework completed impacted skill trajectories in CDI.

When adding the average amount of homework completed into the total do skills growth model, only cubic growth continued to reach the level of significance. There was a near significant interaction between average homework completed and the quadratic growth term, such that parents who reported greater average homework showed steeper quadratic declines in total do skills. This finding was surprising, but also should be interpreted with caution as it did not meet the standard level of significance of $p > .05$. That being said, there are some limitations to the homework variable in that parents self-report their homework completion, and thus may be prone to exaggerate homework use to appear more favorably, and to receive less problem-solving as to why homework was not completed (as is in the manual to do). Conversely, it is possible that those who completed more average homework may have been inadvertently practicing skills incorrectly without coaching to correct their implementation of the do skills, and then showing decreases in do skills. More research with a larger sample size is necessary in order to better understand homework patterns.

For don't skills on the other hand, average homework was related to skill use during CDI. When controlling for SES, child gender, and adding homework interactions to each growth term, significant linear increases in parent don't skills emerged before cubic decreases in the to-be-avoided skills. The interaction between the linear increases in don't skills was also moderated by the average homework completion reported, so that parents who reported a greater level of homework used fewer don't skills. This was in the expected direction of my hypothesis. Completing more homework on average therefore may be related to less increases in don't skills during treatment. Although an interaction emerged between the quadratic parameter and don't skills, many of the interactions between homework and skill use did not reach significance, contrary to my hypothesis.

Results are somewhat inconsistent with the limited literature on homework's relationship with parenting skills learned during PCIT. Homework continues to be touted as a key mechanism for change in PCIT treatment (Eyberg & Boggs, 1998), and a proxy for treatment adherence (Clarke et al., 2013), so seeing if evidence supports this assertion is necessary. Contrasting with the current results, Ros and colleagues (2016), as well as Stokes and colleagues (2016) found that greater homework was related to higher rates of do skills and fewer sessions toward mastery, respectively. Results were not consistent with greater decreases in don't skills, as found in the current study (Ros et al., 2016), but growth models were also not explored in these studies. Legato (2015) did look at whether homework was related to trajectories of change and found no significant interaction between the two.

Current findings support that homework may be related to don't skill acquisition; however, many questions remain about the special time homework completion's

relationship with change in PCIT. Although homework was not related to do skills in the current study, that is not to say that it is unrelated to child outcomes or CM recidivism. Even if only partially related to actual growth in parenting skills, there could be huge benefits to parents spending quality time with their children on a more regular basis, even if not technically practicing the PRIDE skills in the intended way. Research exploring rates of homework and later child outcomes, parent-child attachment styles, and likelihood of additional substantiated reports is necessary to determine the true importance of homework.

Strengths, Limitations, Implications, and Future Directions

Strengths, limitations, and future directions were included throughout this discussion, and will be expanded on in this section. First, there are several notable strengths of this study. Using data during each session within treatment is an ideal way to examine changes in interventions when often feasibility only allows for pre- and post-treatment time-points. Being able to look at more in-depth changes will likely elucidate important aspects of the treatment process. Second, this study utilized observational coding rather than self-report, and coding was conducted using videotaped sessions by coders who were not the family's therapist. Thus, coding was likely more objective and more accurate than using in-the-moment therapist coding.

The most obvious limitation is that there were a limited number of families in this preliminary study of an RCT for CM families. Findings may not be generalizable to other samples, and we were unable to determine whether there were significant pre-treatment predictors, or variability among treatment participators of skill acquisition with such a limited sample size. For example, there are many pre-treatment aspects that could impact

parents' pretreatment differences in skills as well as parents' aptitude to learn skills in sessions. As the RCT that this data was drawn from continues to collect more data, this research should be replicated with the full sample, and important differences in skill acquisition and later child outcomes can be explored.

Another limitation was not being able to whether the cubic growth terms that emerged in seven out of nine models of do and don't skill frequencies and proportions were due to that being the most common pattern among families (i.e., later steep inclines or declines), or whether there was a difference in family change patterns based on families completing various lengths of treatment. There was missing data in later sessions tied to (1) successful mastery and advancement to the next stage of therapy (for n= 8) at or before the 8th session, and (2) the total number of possible sessions for n= 7 families who remained in treatment due to not reaching mastery earlier and being allowed a possible 12 sessions (2 families discontinued treatment at session 8 despite being allowed a greater number of sessions and not meeting mastery). These patterns of missingness in the data could be responsible for the observed cubic pattern in skill increases or decreases, i.e., the cubic patterns could have emerged in sessions 9-12, which only 7 families completed. With the total of only 20 families included in the current study, it was not possible to examine whether there were different trajectories depending on families who met mastery earlier on as compared to those who remained in treatment without meeting mastery. Future exploration of the full CAPS study sample should analyze whether there are specific subgroups of families that vary in growth trajectories, or whether cubic patterns continue to emerge for the majority of the sample. In this study, I was hoping to explore trajectories throughout CDI to a mastery level of skills

according to the standard PCIT mastery level (Eyberg and Boggs, 1998). That was not feasible based on time-constraints within the study, as well as the increased likelihood that families would drop out if treatment became too long (Batzer et al., 2018). Often mastery was not met by families. Clinical mastery (as measured by therapists through live coding) was achieved by half of the total sample families (n = 10), and when looking at independent video DPICS coding, that number decreased further. Within non-CM populations, the average number of CDI sessions to meet mastery is 12-14 (Batzer et al., 2008), so given the cost of high attrition, shorter, more targeted treatment may be indicated for CM families, rather than extending past 12-14 sessions of CDI. Despite this limitation, there are important aspects to be drawn from looking at skills over, at maximum, 8-12 sessions. Time-limited PCIT has been proposed as possibly beneficial for CM families, and has been implemented in RCTs for physically abusive (Chaffin et al., 2004) and abusive and neglectful (Chaffin et al., 2011) families, in which treatment families did significantly increase parenting skills post-intervention despite the shorter treatment course, and had significantly less later substantiated CM reported. The Chaffin and colleagues RCTs used a 5-6 session CDI coach session protocol after the CDI teach session, and 37% of families in the PCIT condition met the full mastery criteria within those limited sessions. When extended to 8-12 sessions in the current sample, 50% of families reached the full mastery criteria. Thomas and Zimmer-Gembeck (2012) examined differences in outcomes when parents completed time-variable PCIT (i.e., continued until full mastery criteria were met) as compared to participants who completed a standardized amount of PCIT sessions (i.e., 12 coach sessions total). For the time standard PCIT group, families completed 5-8 sessions of CDI (with an average of 6

CDI coach sessions). When comparing the two groups, families who completed the standard PCIT had as good or better outcomes on child externalizing behaviors, parent internalizing symptoms and child abuse potential, and greater observed increases in positive skills and reductions in negative communication than those who had the longer form of PCIT (Thomas & Zimmer-Gembeck, 2012). The current study adds to the theoretical and empirical literature that advocates for shorter timeframes being potentially more beneficial to child welfare-involved families (Herschell & McNeil, 2005; Thomas & Zimmer-Gembeck, 2012). Follow-up studies looking at when change occurs using piecewise modeling and other sophisticated modeling techniques should explore whether there was substantial change in the last few sessions of CDI; whether 5-6 sessions is sufficient, or if there is additional benefit to increasing the standard protocol for CM families to several more sessions. This study contributes to the overall understanding of whether there is an ideal "dosage" of treatment, and future studies should expand on this idea. Along with understanding the optimal dosage, of treatment, given findings of significant parenting changes and reduced recidivism after time-limited PCIT (Chaffin et al., 2004; 2011; Thomas and Zimmer-Gembeck, 2012), it also may make sense to change what is considered "mastery level." The standard protocol of 10 of each do skill and no more than three of the don't skills may be too stringent to apply to CM families (Cotter et al., 2018). Thus, reducing the level of mastery may be more appropriate and perhaps beneficial in building parents' confidence that they can be successful within treatment and at home.

Since there were few participants who had completed CDI to be included in this subsample, and since a control group could not be included within the timeframe, a

substantial examination of treatment drop-out and/or study attrition was not feasible, nor was a comparison between the treatment group and a control group on skill acquisition. Research on PCIT for CM families indicates that attrition is a substantial issue for the population, in that attrition in CM samples was 48% on average compared to PCIT for non-CM families, which ranged from 18% to 35% (Batzer et al., 2018). In the subsample, there were only 3 families who left treatment before the mid-treatment assessment, or in CDI, who had started CDI coach sessions, but there was a higher number of families not included in analysis as they were either randomized to PCIT without starting, or dropped out before the CDI coach session. Rates of attrition could not be determined in this study, but should be explored in relation to other important parent or coach characteristics in future studies.

Conclusions

This study sought to better understand parent skills changes during the CDI phase of PCIT for child welfare-involved families. Many studies have shown that PCIT is effective within the child welfare parent population for increased positive parenting behaviors, decreasing negative parenting behaviors, or don't skills, and reducing recidivism for years after completion (Thomas & Zimmer-Gembeck, 2011; Chaffin et al., 2007; 2011). Findings indicate that even in a sample of 20 families involved in the child welfare system, we see significant increases in parenting skills across treatment, with significant improvement in each of the individual do/PRIDE skills as well as the combined do skills. This study examined a sub-sample of a larger study, thus further inquiry with the full study sample of participants is expected to clarify patterns of growth in CM parents' skills. Combined with other research examining patterns of change within

PCIT (Hakman et al., 2008; Legato, 2015), this study contributes to the knowledge base to understand how PCIT can be tailored to best meet the needs of child welfare-involved families, and therefore improve the lives of vulnerable children and families.

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