EFFECTS OF THE FAMILY CHECK-UP INTERVENTION ON REDUCING GROWTH IN CONDUCT PROBLEMS IN TODDLERHOOD THORUGH SCHOOL AGE: MODERATORS AND MODERATED MEDIATION

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Child conduct problems (CP), characterized by oppositionality, disruptiveness, aggression, and rule-breaking behavior, present a significant public health issue, as they are the most common reason children are referred for mental health services (Lavigne et al., 1996). Parenting interventions for child CP have been found to be efficacious, with meta-analyses demonstrating small to moderate effects (e.g., Lundahl et al., 2006; Reyno & McGrath 2006). The Family Check-Up (FCU), a preventive intervention combining aspects of motivational interviewing with parent training, is one intervention found to significantly reduce child CP. As not all children improve following parenting interventions (Webster-Stratton, 1990; Webster-Stratton & Hammond, 1997), exploring moderators is an important way to identify subgroups who may respond differentially (Gardner et al., 2009). Baseline level of child CP is one important potential moderator, as young children with elevated CP are at risk for long-term persistence (Campbell, Shaw, & Gilliom, 2000). The current study examined baseline CP as a moderator of effectiveness of the FCU utilizing latent growth curves of parenting and child behavior, group-based trajectory models, and parallel-process moderated mediation models to explore parenting and maternal depression as mediators. Participants included 731 mother-child dyads recruited at child age 2 and followed to child age 9.5, half assigned to the FCU. The study involved structured annual in-home assessments and measures of maternal depression, observed parenting, and child CP from

different informants. Intervention families were given the opportunity for annual check-ups and additional sessions as desired. The FCU was effective in reducing growth in CP across child ages 2 to 9.5. Engagement in feedback sessions led to greater benefits in a few outcomes. Findings on baseline CP as a moderator varied, with some models demonstrating greater benefit for those with higher baseline problems and others demonstrating non-significant differences. Assignment to the FCU was not associated with group-based trajectory membership, although baseline CP distinguished trajectory group membership. Finally, moderated mediation models were partially supported, with differential effects for those with high baseline CP only found for some of the hypothesized pathways. Results highlight the importance of examining subgroups to elucidate the potential for differential responsiveness to intervention.

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1.0 INTRODUCTION

A wealth of longitudinal research on the emergence of conduct problems has shown that young children who demonstrate elevated levels of disruptive behavior in early childhood are at risk for persisting in problematic behavior across development (Campbell, 2002), including serious antisocial behavior (Moffitt & Caspi, 2001) and abuse of substances (Dishion, Capaldi, & Yoerger, 1999). The term conduct problems (CP) encompasses problematic behaviors such as oppositionality, disruptiveness, aggression, and rule-breaking behavior (American Psychiatric Association, 2000) and differs from the broader term of externalizing problems, which is also inclusive of inattention and hyperactivity (Hinshaw, 1987). CP are the most common reason for referring children for mental health treatment (J. B. Reid, 1993) and are particularly common in young children, with estimates of between 5-13% of preschoolers showing moderate to severe CP (Lavigne et al., 1996). As research has suggested behavior is more malleable in early childhood than in later childhood or adolescence (Dishion & Patterson, 1992), investigating ways in which to intervene early has received much attention.

Among early risks implicated in the development of CP, parenting is a particularly salient factor because parents serve as the most important socializing agents for young children (Maccoby, 1992) and parenting has been posited to play a mediating role in the link between various other risk factors (e.g., socioeconomic status) and child behavior outcomes (Gardner,

Shaw, Dishion, Burton, & Supplee, 2007; Patterson, Reid, & Dishion, 1992). Numerous aspects of parenting have been linked to the emergence of CP, particularly in early childhood, including positive dimensions such as warmth (Pettit, Bates, & Dodge, 1997) and negative dimensions such as rejection (Trentacosta & Shaw, 2008); therefore, it is not surprising that many widely implemented early interventions for CP target aspects of parenting (Lundahl, Risser, & Lovejoy, 2006; Reyno & McGrath, 2006).

One such parenting intervention which is the focus of the current research is the Family Check-Up (FCU), a preventive intervention that combines aspects of motivational interviewing with parent training for at-risk youth. The early childhood version of the FCU has demonstrated significant effects in reducing growth in child CP, with effect sizes from .57 (teacher reports at age 7.5) to .85 (parent report from ages 2 to 5) for families who attended annually repeated feedbacks for follow-ups (Dishion, Brennan, McEachern, Shaw, Wilson, & Weaver, 2014). At a broader level, meta-analyses of parenting interventions for child CP have shown small to moderate effects (Lundahl et al., 2006; Piquero, Farrington, Welsh, Tremblay, & Jennings, 2009). While these results are favorable overall, parenting interventions are not effective for all parents and children. Studies have found that a sizeable group (e.g., one-fifth to one-third of children) fail to show improvement (Webster-Stratton, 1990; Webster-Stratton & Hammond, 1997). Therefore, the investigation into moderators of effectiveness is a critical issue for the field both to inform ways to refine interventions and to advance theory. Moderator analyses can help identify subgroups to elucidate whether developmental processes differ for members of different groups or those at different levels of risk (Gardner et al., 2009; Hinshaw, 2002a). Importantly, moderator analyses in intervention studies involve comparing outcomes between intervention

and control groups to clarify if behavior in the control group might further deteriorate without intervention.

Several empirical studies (e.g., Gardner et al., 2009; M. J. Reid, Webster-Stratton, & Baydar, 2004) and a limited number of reviews (e.g., Lundahl et al., 2006) have investigated whether factors across sociodemographic, child, and family domains operate as moderators and are associated with differential effectiveness. It is important to explore the potential for differential effectiveness by risk status because children who demonstrate CP are a heterogeneous group (Gardner et al., 2009), and families with multiple risks are more likely to have children whose CP escalate (Moffitt & Caspi, 2001). A recent review of studies that explored moderators of parenting intervention effects in the domains of sociodemographic risks (e.g., low income, parental education), family process risks (e.g., maternal depression, family conflict), and baseline levels of child CP found that although moderation was inconsistently demonstrated in sociodemographic and family process risk domains, one relatively consistent finding was that children with higher baseline CP tended to demonstrate greater benefits from intervention (Shelleby & Shaw, 2014). This is consistent with what has been reported in some meta-analyses (e.g., Lundahl et al., 2006) suggesting greater improvements for children with higher CP at baseline.

Understanding how individuals with high initial levels of child CP respond to interventions is very important because child CP is directly targeted in parenting interventions. Further, children with elevated CP at young ages are at risk for long-term persistence of CP (e.g., Campbell, Shaw, & Gilliom, 2000), and thus they may be the most important targets for interventions to prevent long-term costs. Therefore, it is essential to understand whether interventions are effective for children and parents who may be in most need of services and who

are at risk for multiple types of future problem behavior (Shaw & Gross, 2008). One relevant framework to explain the pattern of greater effects for those at higher baseline risk in domains that are directly targeted by parenting interventions is the theory of behavioral change that postulates that the degree of motivation for change (i.e., as indicated by parent's perceived difficulty in managing child behavior) is positively related to the level of change likely to occur (Miller & Rollnick, 2002). Indeed, researchers have theorized that one of the central components of motivation in parenting interventions for child CP is the parent's desire for child behavioral change (Nock & Kazdin, 2005). It may be the case that only when a child's CP is at an intolerable level, creating significant struggles between parents and children, that a parent's motivation for engagement in a parenting intervention increases. Therefore, parents of children with highly problematic behavior and who may themselves demonstrate more problematic parenting may have relatively higher motivation for engaging in and benefiting from intervention. Thus far, no research on the FCU has directly examined baseline child CP as a moderator of effectiveness.

In addition to understanding moderators of direct intervention effects, it is also important to examine how moderating variables may influence mediational pathways. Especially for interventions such as the FCU that have been demonstrated to operate on child CP by modifying proximal family risk factors, it is important to explore whether moderators influence these mediating pathways. Moderated mediation is one type of methodology that can be employed to assess whether mediating mechanisms are differentially influenced by risk variables. Previous research has shown two mediational mechanisms through which the FCU reduced growth in child CP: through improving positive parenting (Dishion et al., 2008) and through improving maternal depression (Shaw, Connell, Dishion, Wilson, & Gardner, 2009). Baseline level of child

CP could moderate links between the FCU and changes in parenting/depression and/or changes in CP. As parents of more highly problematic children may be more motivated to change, such mediational pathways could be stronger for those with higher baseline CP.

The current study seeks to advance our understanding of how initial level of child CP may influence the effectiveness of the FCU in an ethnically diverse cohort of 731 low-income children followed from early to middle childhood when children are ages 2 to 9.5. From the perspective of variable-centered growth models of parenting and CP across time, higher baseline child CP is expected to be associated with greater intervention benefit because CP is a direct target of the FCU and because families may be more motivated to change in this domain. From a person-centered framework examining trajectories of behavior over time, it is expected that children in the FCU with elevated CP at baseline will be disproportionately represented in a high desistant group compared to children with initially high CP in the control group, who are expected to be disproportionately represented in a high persistent group. As noted above, there is a need for additional research to examine how moderators may influence mediational pathways to better understand how mechanisms implicated in interventions may differ for those at higher versus lower baseline risk. To address this need, the current study will also employ a moderated mediation analytic framework to explore whether mechanisms through which the FCU has been found to reduce child CP (e.g., through improving parenting and reducing maternal depression; Dishion et al., 2008; Shaw et al., 2009) are moderated by baseline CP, with the mediated effects expected to be stronger for those with higher baseline CP.

1.1 LITERATURE REVIEW

1.1.1 Associations between Parenting and CP

From a developmental psychopathology framework, CP are theorized to be multiply determined through proximal and distal factors, including child factors (e.g., biology, temperament), family factors (e.g., parenting, parental psychopathology), and other contextual factors (e.g., SES, neighborhood, peer groups) (e.g., Cicchetti & Rogosch, 1996; Hinshaw, 2002b), many of which become increasingly important as children move from the preschool to school-age period (e.g., neighborhood, peers). Among these influences, parenting has been described as, "the most well researched and most important risk factor for early-onset conduct problems" (Webster-Stratton, Reid, & Hammond, 2004, p. 105). Two of the most influential theories that implicate parenting as an important factor in the development of CP are attachment theory (Erickson, Sroufe, & Egeland, 1985) and social learning theory (J. B. Reid, Patterson, & Snyder, 2002). Insensitive and unresponsive caregiving has been associated with insecure attachments characterized by children's ignoring, angry resistance, and/or avoidance of contact with parents after separation (Ainsworth, 1979). Insensitive parenting, or the failure to contingently respond to children's needs, is thought to prompt children to engage in increasingly disruptive behavior as a way to increase parental responsiveness (Greenberg, Speltz, & DeKlyen, 1993). Indeed, insecure attachments have been associated with CP (Erickson et al., 1985; Shaw & Vondra, 1995).

Similarly, social learning theorists hypothesize that parents model and reinforce negative behavior through coercive cycles in which children learn to avoid parental requests/criticisms by escalating their negative behavior (Patterson et al., 1992). In response, parents may act aversively, inconsistently follow through, or withdraw in an attempt to end the child's behavior (Patterson, 1986). Therefore, parents' and children's negative behavior is mutually reinforced, and they engage in increasingly negative behavior in an attempt to make the other withdraw.

Following from attachment and social learning models, extensive research has examined specific types of positive and negative parenting as they relate to the emergence and persistence of CP. Among negative domains, ineffective/inconsistent discipline (Snyder, Cramer, Afrank, & Patterson, 2005), low strictness (Feehan, McGee, Stanton, & Silva, 1991), and parental rejection (Shaw et al., 1998) have been linked to CP. Long term effects have also been found, with rejection during toddlerhood (Trentacosta & Shaw, 2008) and low strictness/inconsistent discipline in middle childhood (Feehan et al., 1991) associated with CP in adolescence. In the positive domains, warmth (Deater-Deckard, Ivy, & Petrill, 2006), positive reinforcement (Garland, Hawley, Brookman-Frazee, & Hurlburt, 2008), proactive structuring (Gardner, Sonuga Barke, & Sayal, 1999; Pettit et al., 1997), and involvement (Dishion et al., 2008; Shaw, Dishion, Supplee, Gardner, & Arnds, 2006) have been found to protect against CP in early childhood. Longitudinal links have also been found, with proactive parenting characterized by support, clear instruction, and limit setting in the preschool period found to protect against CP at school-age (Denham et al., 2000). This literature helped to inform the development of interventions focused on parenting as a mechanism for change in CP, to which we now turn.

1.1.2 Parenting Interventions that Seek to Reduce or Prevent CP

Before the 1960s, interventions for child CP largely involved individual child therapy. As a result of the increasing recognition of the ways in which parenting influences CP and the emerging belief that parents could act as "agents of children's behavior change" (p. 568) rather than only therapists serving this role (Kaminski, Valle, Filene, & Boyle, 2008), there has been a shift toward focusing on modifying parenting to decrease problematic child behavior (Graziano & Diament, 1992; Kaminski et al., 2008). Some of the most prominent parenting interventions have their origins in behaviorism and are designed to shift social contingencies so that parents positively reinforce child prosocial behavior and ignore or punish aversive and disruptive behavior (Serketich & Dumas, 1996). Early parenting interventions began as treatments for referred children in clinical settings, but more recently, attention has been placed on early prevention (Shaw, 2006). Historically, research on CP focused on children of at least school-age, but results from studies of toddlers and preschoolers demonstrating continuity in CP for some from very early ages (Campbell et al., 2000), along with the recognition that prevention may be more successful than later intervention (Campbell et al., 2000; Kazdin, 1993), led to a focus on early development and preventive efforts.

The Family Check-Up (FCU), the intervention of interest for the current research, is a brief preventive intervention based on motivational interviewing techniques that has been implemented with children from the toddler period through adolescence (Dishion, Nelson, & Kavanagh, 2003; Dishion et al., 2008; Gill, Hyde, Shaw, Dishion, & Wilson, 2008). The FCU model differs from traditional clinical models and practice in three important ways: 1) it utilizes a health maintenance model, 2) it derives much of its power from a comprehensive assessment,

and 3) it emphasizes motivating change (Dishion & Stormshak, 2007). The FCU is ecological in its emphasis on improving children's adjustment across settings by motivating positive parenting practices and involvement in those settings. Moreover, the comprehensive assessment allows tailoring and adaptation, in that the intervention is fit to the family's circumstances and their desires for more, less, or different forms of intervention. The core of the intervention addresses family management issues, including a collective set of parenting skills within three broad domains: positive behavior support, monitoring and limit setting, and relationship quality. These domains that have been empirically established as critical to the development of problem behavior in childhood and adolescence (Patterson et al., 1992). The Everyday Parenting curriculum is used (Dishion, Stormshak, & Kavanagh, 2011), based on a well-established social learning parent management training intervention which has shown positive effects on both parenting practices and child behavior (e.g., Dishion & Andrews, 1995; Forgatch & Patterson, 2010). Although the FCU has been found to be effective in several domains, including improving parenting, reducing maternal depression, and reducing child problem behavior (Dishion et al., 2008; Shaw et al., 2009), consistent with outcomes studies of other parenting interventions, it is less effective for some children and families (e.g., Gardner et al., 2009). Thus, studying moderators of intervention effects associated with the FCU has the potential to advance our understanding of who benefits from the FCU and who could potentially benefit more.

1.1.3 Differential Effects: Exploring Moderators of Effectiveness

Moderator analyses can help identify subgroups to elucidate whether developmental processes differ for members of different groups or those at different levels of risk (Gardner et al., 2009;

Hinshaw, 2002a; Kraemer, Wilson, Fairburn, & Agras, 2002). Importantly, moderator analyses in intervention studies involve comparing outcomes between intervention and control groups to clarify if behavior in the control group might further deteriorate without intervention. Baron and Kenny (1986) define a moderator as, "a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" (p. 1174). In statistical terms, moderation involves an interaction in which the moderating variable (e.g., SES) interacts with a predictor (e.g., intervention group status) and impacts the level of the outcome (e.g., child behavior) (Holmbeck, 1997). Moderation can also be explored in a structural equation modeling (SEM) framework through multi-group modeling, which involves testing whether the same model fits the data in a comparable manner among different subgroups (Jonsson, 1998).

It is important to clarify the distinction between moderators and predictors. In intervention research, moderators are variables that specify for whom or under what conditions interventions are more or less effective (Baron & Kenny, 1986; Kraemer et al., 2002). Predictors, on the other hand, can be defined as variables associated with an intervention outcome but not differentially associated with response based on group assignment. The important difference between predictors and moderators is illustrated by the following example. Suppose researchers were interested in the influence of maternal depression on parenting intervention response. Looking at this association in the intervention group *only* would elucidate if depression served as a predictor by influencing the level of improvement in parenting among those treated. However, without comparing these results with a control group, it is unclear what would happen without intervention. If maternal depression predicts poor outcomes in the intervention group, it may predict even poorer outcomes in the control group and thus the intervention could actually be

protecting against a greater decline in parenting associated with depression. Testing whether there is an interaction between intervention status and depression and how this influences outcomes is therefore a more informative way to understand the influences of a risk variable. A significant interaction could indicate greater benefits in parenting for depressed mothers compared to how they would fare in the control group and to the benefits gained by non-depressed mothers in the intervention group. Alternatively, a significant interaction could indicate reduced effectiveness for depressed compared to nondepressed mothers if they showed less benefit. Both findings are important for learning who benefits and how to refine interventions to increase effectiveness.

One further point is that a nonsignificant interaction would indicate that effectiveness did not vary based on level of maternal depression. In this case, depression may still be a predictor if there were main effects of depression on parenting regardless of group assignment (e.g., in both the intervention and control groups those who were depressed had worse parenting outcomes compared to the nondepressed mothers). Testing an interaction and finding a nonsignificant moderating effect but significant predictor effect provides greater information than a predictor finding in a study involving only a treatment group. Only by including and comparing results with a control group is it possible to specify that maternal depression was not *differentially* associated with outcomes between intervention and control groups.

1.1.3.1 Moderation research with the FCU.

In previous research on the FCU, Gardner et al. (2009) explored several demographic and family process risk variables as potential moderators of effectiveness in relation to child CP across ages 2, 3, and 4. The authors found that children of partnered parents and children of parents with

lower educational attainment demonstrated greater benefit than children of single parents and children whose parents had greater education, respectively. Other risk variables explored in this study – partner relationship quality, parenting daily hassles, maternal depression, substance use problems, teen parent status, and cumulative risk – were not found to moderate intervention effectiveness. In addition, somewhat similar to the research questions for the current study, Dishion et al. (2008) alluded to analyses that were not formally presented in their publication involving a growth mixture analysis in which two groups (one with high problem behavior and one with low problem behavior, both of which were relatively stable across time) were identified. Intervention effects were then examined within each group. This initial analysis suggested that the effect of intervention was strongest in the high-problems group, meaning there was a larger difference between treatment and control conditions in that group. However, this analysis was restricted to child CP outcomes through age 4 and did not formally test an interaction effect. Neither moderation analyses involving the formal assessment of treatment by initial level of CP interactions nor multi-group structural equation models comparing effects across groups of children – such as those with high versus low baseline CP – have been carried out for the FCU intervention, and further, no analyses on moderators have been carried out on outcomes beyond age 4 or using teacher reports of CP. Further, no studies have employed group-based trajectory modeling (Nagin, 1999) to examine if developmental trajectories of CP differ based on intervention status and children's initial level of CP. In addition, no studies have utilized a moderated mediation approach to explore differential effects that moderators may have on mechanisms of change found in previous studies on the FCU. The current study provides an opportunity to further research on the FCU in these important ways.

1.1.3.2 Baseline child problem behavior.

Baseline child problem behavior is commonly explored to account for differential effectiveness in parenting interventions targeting child CP. Studies of early starting pathways of CP have demonstrated the predictive utility of levels of CP, such as high aggression, for some at an early age (Campbell et al., 2000). In particular, basic research has shown that children with the most elevated rates of CP at young ages are at greater risk for long-term persistence and exacerbation of CP (Aguilar, Sroufe, Egeland, & Carlson, 2000; Campbell et al., 2000; Shaw & Gross, 2008). Children with the highest levels of CP may be the most important targets for intervention to prevent long-term costs. As noted by Hautmann et al. (2010), there are two opposing hypotheses for how baseline severity could influence intervention effectiveness. Given the potential for stability of CP, those higher at baseline might be more difficult to treat and resistant to change. Conversely, children with higher baseline levels of CP have the greatest room for progress and may demonstrate greater change. In line with this latter hypothesis, the theory of behavioral change postulates that the degree of motivation for change (i.e., as indicated by parent's difficulty in managing child behavior) is positively related to the level of change likely to occur (Miller & Rollnick, 2002). An under-appreciated aspect of parenting interventions is that the parent must engage and work to change their own and their child's behavior. Thus, a parent's engagement and more importantly, her/his motivation to change, are critical for success. Researchers have theorized that one of the central components of motivation in parenting interventions for child CP is the parent's desire for child behavioral change (Nock & Kazdin, 2005). In the context of initial level of child CP, parents might be less motivated to change or to engage in an intervention if a child's behavior is at a level that is "tolerable," even if it is elevated compared to standardized norms (norms that the parent may not be aware of);

accordingly only when behavior is perceived by a parent to be unmanageable would motivation increase to a great degree.

Although only a limited number of studies on effectiveness of parenting interventions have employed formal tests of moderation (Brestan & Eyberg, 1998; Conduct Problems Prevention Research Group (CPPRG), 2002; Lavigne et al., 2008), a recent review of existing studies (Shelleby & Shaw, 2014) found that in samples in which not all children were clinically elevated on initial levels of CP, the more problematic a child's behavior was rated at baseline, the greater change in problem behavior occurred (Chamberlain et al., 2008; M. J. Reid et al., 2004; Shaw et al., 2006; Tein, Sandler, MacKinnon, & Wolchik, 2004). By contrast, in samples in which all children were clinically elevated, initial levels of problem behavior did not moderate outcomes, with all children benefitting to a similar extent (Gardner, Hutchings, Bywater, & Whitaker, 2010; Lavigne et al., 2008). Therefore, it appears that the likelihood of finding significant moderation is tied to characteristics of the sample, namely the overall level of child CP at baseline. Beyond a certain threshold there may be a critical point at which the association between higher risk and greater intervention benefit is no longer apparent. A similar pattern has been demonstrated in multicomponent interventions that included parenting as one element of intervention (in addition to other components such as child training, teacher training). Several studies found greater benefits for those at higher baseline risk (August, Realmuto, Hektner, & Bloomquist, 2001; CPPRG, 2007; CPPRG, 2010; CPPRG, 2011; J. B. Reid, Eddy, Fetrow, & Stoolmiller, 1999; Wolchik et al., 2002; Wolchik et al., 2000), while other studies found non-significant effects such that the interventions were equally effective regardless of baseline level of problem behavior, including some studies in which all children were clinically elevated on initial measures of CP in line with parenting-only intervention results (Brotman et al., 2011;

CPPRG, 2002; CPPRG, 2004; Eddy, Reid, Stoolmiller, & Fetrow, 2003; Walker et al., 2009). As children involved in the current study were required to have parent-reported ratings of CP above the normative mean at screening but were not required to be in the clinical range, children in the FCU group with higher initial levels of CP might more closely resemble samples of nonclinical populations, in which children with relatively higher levels of CP, because of their parents' presumably higher motivation for change, would be expected to show greater improvements in CP relative to those with lower initial levels of CP.

1.1.3.3 Engagement in an intervention.

As increased motivation to change is likely associated with level of participation in an intervention, it is important to explore whether level of engagement is associated with intervention effectiveness. For preventive interventions such as the FCU that are offered to families seen in health service settings who are not seeking treatment, engagement in the primary components of the intervention and in follow-up sessions is critical for evaluation of the intervention model (Dishion et al., 2014). Exploring engagement in the FCU can help to elucidate whether "high engagers" are attaining greater benefit than families who are less engaged. Such findings could also inform efforts to increase engagement, which might be beneficial in increasing change in certain families who may not respond as well. One relevant study conducted by Nock and Kazdin (2005) found that a brief motivational enhancement to PMT resulted in greater motivation for intervention, greater attendance, and greater adherence. Although they measured participation variables rather than outcomes, it seems likely that participation enhancements could also lead to greater effectiveness on major outcomes of interests. Studies examining factors such as engagement, attendance, and drop-out are greatly

important, as the first step to a successful treatment would arguably be attending it. One prior FCU study found that effect sizes on parent-reported oppositional behavior across ages 2-5 increased as a function of engagement, as indexed by the number of annual feedback sessions attended by parents (Dishion et al., 2014). The current study seeks to add to this research by examining whether differences in levels of engagement in the annual feedback sessions is linked with effectiveness in both parenting and child behavioral outcomes in the school-age period.

1.1.3.4 Moderated mediation.

The FCU has been demonstrated to operate on child CP by modifying proximal family risk factors (Dishion et al., 2008; Shaw et al., 2009). Therefore, in addition to examining moderators of direct intervention effects on child CP and parenting, it is important to explore whether moderators influence these mediating pathways. Moderated mediation is one type of methodology that can be employed to assess whether mediating mechanisms are differentially influenced by risk variables. Moderated mediation analysis, also referred to as conditional indirect effects analysis (Preacher, Rucker, & Hayes, 2007), can elucidate if a mediated effect is larger or only apparent within a subgroup, or if the size of the mediated effect changes as the level of the moderator changes. A limited number of studies on parenting intervention effects have demonstrated significant moderation of mediational mechanisms, such that the mediation effects were stronger for those at higher baseline risk. For example, Chamberlain et al. (2008) found that the indirect effect of parenting intervention on child CP through increases in parental positive reinforcement was stronger for children with higher baseline CP. Similarly, Zhou, Sandler, Millsap, Wolchik, and Dawson-McClure (2008) found that for higher risk children (with the risk measure including CP, parental conflict, negative life events, maternal distress,

reduced father contact, and financial hardship), the mediational effects of a multicomponent intervention (that included parenting) on child outcomes (e.g., externalizing problems, internalizing problems, mental disorder symptoms) were mediated through changes in parent-child relationship quality. In contrast, for the low risk group, neither the direct effect of intervention on child outcomes nor the mediational effects were significant. In a similar yet slightly distinct analysis of mediated moderation involving the same sample as the Zhou et al. (2008) study, Tein et al. (2004) found that for children with high baseline CP, the intervention effect on CP was partially mediated through improved parenting, namely effective discipline. However, for children with lower baseline CP, there were no direct or mediational effects on CP. The moderated mediation analytic approach applied to the FCU intervention could help to elucidate if mediational pathways are contingent on moderating variables and which paths specifically are moderated in models including multiple pathways.

The two family-based mediating pathways through which the FCU has reduced child CP are by improving positive parenting (Dishion et al., 2008) and improving maternal depression (Shaw et al., 2009). Dishion et al. (2008) demonstrated that the FCU was effective in increasing primary caregivers' level of positive behavior support (PBS), which is a cluster of positive parenting techniques found to decrease the likelihood of coercive escalations (Patterson, 1982; Snyder, Edwards, McGraw, Kilgore, & Holten, 1993). Because parents of children with higher initial levels of CP may be more motivated to change, these parents may be more engaged and may demonstrate greater gains in positive parenting.

Similarly, maternal depression has consistently been shown to be associated with child CP (Goodman & Gotlib, 1999; Gross, Shaw, & Moilanen, 2008). Depressed mothers have been found to demonstrate higher negativity, coercion, punitive discipline, inconsistency, and

criticism and to be less responsive and affectionate toward children than non-depressed mothers (Goodman & Gotlib, 1999; Lovejoy, Graczyk, O'Hare, & Neuman, 2000), leading some interventionists to realize that by reducing parental depression through parenting interventions, both parenting and child behavioral outcomes may be influenced. Although improving parenting is a primary focus of the FCU, the breadth of the initial assessment and follow-up intervention covers an array of factors that have been empirically linked to child problem behavior. Broadly, these include parental economic and employment issues, neighborhood risk, parent conflict and relationship quality, and, importantly, maternal depression. Shaw et al. (2009) demonstrated that improvements in maternal depression brought about by the FCU mediated the association between the intervention and reductions in child CP even after accounting for changes in positive parenting. Importantly, the FCU might therefore improve maternal depression by providing parents with the knowledge that there is someone in the community advocating and providing support for them, watching out for them, and interested in how they and their children are doing. Further, as research has shown bidirectional effects between maternal depression and CP during early childhood (Gross et al., 2008), parents with elevated depressive symptoms who have children with high initial levels of CP may see their engagement in a parenting intervention as a way to learn better management strategies for their children's behavior to improve family functioning. Therefore, the indirect effect through which the FCU is linked with lower maternal depression and subsequent reductions in CP potentially could be stronger for families in which children are higher on initial levels of CP.

1.2 STATEMENT OF PURPOSE

Research examining moderators of intervention effectiveness is critical to provide a better understanding about for whom and under what conditions interventions may be most or least effective. Although parenting interventions for child CP have demonstrated robust effects in improving parenting and reducing CP, such interventions are not effective for all children and families. Further research is needed to examine how those who may be at the most elevated risk at baseline, such as children with the most elevated rates of CP, respond to parenting interventions. In addition, it is important to explore whether the level of engagement in interventions is related to the benefits gained. As increased motivation to change is likely associated with level of participation in an intervention, it is important to explore whether level of engagement is associated with intervention effectiveness. Further, existing research examining how moderators may influence mediational mechanisms that operate in the context of parenting interventions is relatively limited. Additional research employing a moderated mediation analytic approach would advance our understanding of how important risk variables of interest may differentially influence mediating pathways involved in parenting interventions for child CP to provide a more holistic picture of the ways in which risk factors influence intervention effectiveness.

The current research will examine how baseline levels of child CP may moderate the effectiveness of the FCU intervention on reducing problematic parenting across child ages 2

through 5 and on reducing the persistence of child CP across child ages 2 through 9.5 in a sample of 731 at-risk families. In addition, the current study will examine whether mediational pathways through which the FCU has been shown to reduce child CP – through improved parenting and improved maternal depression – are moderated by baseline child CP. Analyses will include examination of moderation of parenting and CP outcomes at each individual time point and growth curve modeling to explore growth in maternal depression as a mediator, growth in parenting as a mediator and as an outcome, and growth in child CP as an outcome in moderation and moderated mediation models. Further, group-based trajectory modeling of CP will be utilized to explore how intervention status and baseline CP may be related to child CP across time. The study will also examine whether the level of engagement in the FCU is associated with the intervention's effectiveness on reducing problematic parenting across child ages 2 through 5 and on reducing the persistence of child CP across child ages 2 through 9.5. This longitudinal and experimental study employs a combination of observational and questionnaire measures from multiple informants, including primary caregivers, teachers, and youth. The following hypotheses will be explored:

Hypothesis 1a: Baseline CP will significantly moderate the effectiveness of the FCU on changes in parenting (positive/neutral behavior) and growth in CP across time. It is hypothesized that parents of children with higher baseline CP will show greater improvements in parenting (positive/neutral behavior) from the FCU from child ages 2 through 5. Further, it is hypothesized that children with higher baseline CP will show greater reductions in CP from the FCU from ages 2 through 9.5 than those with lower levels of baseline CP.

Hypothesis 1b: Group-based trajectories of behavior modeled on the full sample will differ based on intervention status and baseline CP. It is hypothesized that the developmental

trajectories of child CP from ages 2 to 9.5 will differ based on children's baseline levels of CP and intervention status, with children in the FCU group with elevated CP at baseline expected to be disproportionately represented in the high desistant group compared to initially high CP children in the control group, who are expected to be disproportionately represented in the high persistent group from early to middle childhood.

Hypothesis 2: Level of engagement in the FCU will be significantly associated with the effectiveness of the FCU on the outcomes of parenting (positive/neutral behavior) and CP across time. It is hypothesized that parents who are more engaged in the intervention, as indexed by the number of annual feedback sessions attended, will show greater improvements in positive/neutral behavior from child ages 2 through 5 than those parents in the intervention group attending fewer feedback sessions. Further, it is hypothesized that children of parents who are more engaged in the FCU will show greater reductions in CP from the FCU from ages 2 through 9.5.

Hypothesis 3: Baseline CP will significantly moderate the mediational pathway through which the FCU is associated with improvements in parenting (positive/neutral behavior) which, in turn, are associated with improvements in CP. It is hypothesized that higher baseline CP will be associated with stronger associations between FCU and improvements in parenting (positive/neutral behavior) from child ages 2 through 5 and between improvements in parenting (positive/neutral behavior) and reduced growth in CP from ages 2 through 9.5.

Hypothesis 4: Baseline CP will significantly moderate the mediational pathway through which the FCU is associated with reductions in maternal depression which, in turn, are associated with improvements in CP. It is hypothesized that higher baseline CP will be associated with stronger associations between FCU and improvements in maternal depression

from child ages 2 through 5 and between improvements in maternal depression and reduced growth in CP from ages 2 through 9.5.

2.0 METHOD

2.1 PARTICIPANTS

Participants in this study are part of the Early Steps Multisite Study (ESM), a large and ongoing multisite study that was designed to examine the effectiveness of a tailored, family-based intervention for children identified as at risk for CP on the basis of child, family, and sociodemographic factors (Dishion et al., 2008). Participants included 731 primary caregiver-child dyads recruited from Women, Infants, and Children (WIC) Nutritional Supplement Centers between 2002 and 2003. Because the vast majority of primary caregivers were mothers (e.g., > 90% across all ages), the terms "mothers" and "maternal" will be used throughout when referring to primary caregivers. Families with children age 2 years 0 months to 2 years 11 months were asked to participate and screened to ensure that they met risk criteria defined as one standard deviation or more above normative averages on at least two of the following three domains: (a) child behavior (conduct problems, high conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status), and (c) socio-demographic risk (low educational achievement and low family income using WIC criteria). Participants were from urban (37% from Pittsburgh, PA), rural (26% from Charlottesville, VA), and suburban (37% from Eugene, OR) locations and reports of primary caregivers' ethnicity was as follows: 28% African American (AA), 50% European American

(EA), 13% biracial, and 9% other groups. Thirteen percent self-reported as Hispanic American. Over two-thirds of families had an annual income of less than $20,000 at the time of recruitment (in 2002-3). Fifty-eight percent of primary caregivers had a live-in partner. Further baseline descriptive information is provided in Table 1.

2.2 PROCEDURES

Observational and parent report data were collected at home visits when the target child was 2, 3, 4, 5, 7.5, 8.5, and 9.5 years old. In addition, teacher reports of child behavior were collected at child ages 7.5, 8.5, and 9.5. Parents (i.e., primary caregivers who were mostly mothers and, if available, alternative caregivers such as fathers or grandmothers) who agreed to participate in the study and went through informed consent procedures were scheduled for annual home visits. Assessment visits were identical for control and intervention group participants and involved structured and unstructured play activities for the target child with mothers and alternative caregivers and siblings. Each assessment began by introducing children to an assortment of age-appropriate toys and having them play for 15 min while the mothers completed questionnaires. After the free play (15 min), each mother and child participated in a cleanup task (5 min), followed by a delay of gratification task (5 min), four teaching tasks (3 min each), a second free play (4 min), a second cleanup task (4 min), the presentation of two inhibition inducing toys (2 min each), and a meal preparation and lunch task (20 min). Home-visit and observation protocols that were comparable in terms of content, structure, and length, occurred at all ages with slight variations to make tasks developmentally appropriate. Primary caregivers received $100 for

participating in the age 2 home assessment, $120 for the age 3 assessment, $140 for the age 4 assessment, $160 for the age 5 assessment, $180 for the age 7.5 assessment, $90 for the briefer age 8.5 assessment, and $200 for the age 9.5 assessment. Participant children received $15 for the age 7.5 assessment, $15 for the age 8.5 assessment, and $35 for the age 9.5 assessment.

Of the 731 families who initially participated, 659 (90%) participated at the age 3 follow up, 629 (86%) participated at the age 4 follow-up, 621 (85%) participated at the age 5 follow-up, 566 (77%) participated at the age 7.5 follow-up, 565 (77%) participated at the age 8.5 follow-up, and 587 (80%) participated at the age 9.5 follow-up. At ages 3, 4, 5, and 7.5, selective attrition analyses revealed no significant differences related to intervention group; project site; children's race, ethnicity, or gender; levels of maternal depression; or parent-reported children's behavior problems. However, at age 8.5, the following selective attrition effects were identified: families in the intervention group were less likely to participate than families in the control group ($p <$ .05); families with lower age 2 ratings of maternal depression were less likely to participate ($p <$ .05); families with higher age 2 ratings of children's externalizing problem behavior were less likely to participate ($p < .05$); and there were significant differences based on site, with families from Eugene more likely to be retained than families from Charlottesville ($p < .05$) and Pittsburgh (at a trend level; $p < .10$). There continued to be no significant differences at age 8.5 related to children's race, ethnicity, or gender. In addition, at the age 9.5 assessment, only the following selective attrition effect remained, reflecting the 'come and go' behavior of participating families: families with higher age 2 ratings of children's internalizing and externalizing problem behavior were less likely to participate ($p < .05$). Teacher data were available for only 314 participants at age 7.5 and 380 participants at age 8.5, primarily due to

difficulties in obtaining cooperation at two of the largest school systems in Pittsburgh (age 7.5 only) and Charlottesville, which significantly reduced retention of school data at those sites.

2.2.1 Intervention Protocol: The Family Check-Up (FCU)

The FCU is a brief intervention based on motivational interviewing techniques and modeled after the Drinker's Check-Up (Miller & Rollnick, 2002). Following developmentally-based assessments for intervention and control families, intervention families were scheduled to meet with a parent consultant for an initial contact meeting and a feedback session, and follow-up treatment sessions typically focused on parenting. To optimize internal validity by preventing differential dropout rates in the intervention and control groups, age 2 assessments were completed before random assignment results were known to either the research staff or the family. Intervention families received a $25 gift certificate for completing the FCU and feedback.

After the home assessment, the second visit called the "get to know you" meeting consisted of the parent consultant meeting with the caregiver(s) and discussing their concerns with a focus on current family issues that were most critical to their child's and family's functioning. For the third meeting, the feedback session, parent consultants utilized motivational interviewing to summarize the results of the assessment and highlight areas of strength and areas in need of attention. Objectives of the feedback involve assessing the caregiver's willingness to change problematic parenting practices, identifying ways to support parenting strengths, and providing services appropriate to the family's needs. Parents also have the option to participate

in follow-up sessions focused on parenting practices and contextual issues (e.g., co-parenting, child care resources, or housing).

2.2.2 Measures

2.2.2.1 Demographics questionnaire.

During each annual home assessment, a demographics questionnaire was administered to mothers, including questions about family structure, parental education and income, parental criminal history, and areas of familial stress. Several demographic variables will be used as covariates for the current research to control for their effects, including age 2 family income, race/ethnicity, gender, and project site. Annual income was assessed by having mothers indicate on a scale from 1 to 13 the range in which their income fell. For example, 1 = $4,999 or less, 2 = $5,000 to $9,000, 3 = $10,000 to $14,999, and so forth. The income measure derived for the current study was created by taking the midpoint value of each range to create an individual value for annual income for each family at age 2.

2.2.2.2 Childhood behavior problems.

Several different measures of child CP will be utilized for analyses. First, the Child Behavior Checklist (CBCL) for ages 1.5 - 5 (Achenbach & Rescorla, 2000) and ages 6 -18 (Achenbach & Rescorla, 2001) is a questionnaire that assesses behavior problems in children, which was administered to mothers at each home assessment. Data from the age 2, 3, 4, 5, 7.5, 8.5, and 9.5 assessments will be used to explore growth in CP as an outcome. To generate a factor of conduct problem behavior that was both developmentally meaningful and clinically

relevant, individual items from the CBCL were chosen that mapped onto DSM-IV criteria for Oppositional Defiant Disorder and aggressive items from Conduct Disorder. Only the 8 items that were continuously present on both versions of the CBCL across ages were included. This will serve as the primary outcome measure of CP for the current analyses. Composite variables were computed by summing the values for these items at each assessment, and alpha values were between .71 and .84 at all ages. The following items are included in the composite: cruel to animals, destroys own things, destroys others' things, gets in many fights, physically attacks people, is defiant, is disobedient, and has temper tantrums. Because the broad-band externalizing scale of the CBCL has been used in previous analyses with this sample (e.g., Dishion et al., 2008; Gardner et al., 2009), this measure was also explored for selected analyses at individual assessment points but not for growth models, as the broad-band externalizing scale items change from the early childhood to later childhood versions of the CBCL. It should be noted that there is some overlap in the broad-band externalizing factor and the oppositional/aggressive factor, but both were explored to allow for examination of growth over time in the same construct (oppositional/aggressive behavior) and consistency with previous studies (broad-band externalizing scale).

Second, another established measure of child CP was also administered to mothers at ages 2, 3, 4, 5, and 8.5 (unavailable at ages 7.5 and 9.5), the 36-item, Eyberg Child Behavior Inventory (ECBI, Robinson, Eyberg, & Ross, 1980). Data from the ECBI at age 2 will serve as the primary measure of initial level of child CP and data from ages 2, 3, 4, 5, and 8.5 will be used to explore CP as an outcome. The ECBI includes two factors: an Intensity factor and a Problem factor. The Intensity factor measures the caregiver-report of the strength of the problem behavior using a seven-point scale where 1 indicates *Never* and 7 indicates *Always*. The Problem factor

consists of dichotomous ratings of whether or not each behavior is a problem for the caregiver. Both scales will be explored in the current study. Sample items include, "refuses to obey until threatened with punishment" and "gets angry when doesn't get his/her own way." Alphas ranged from .86 to .94. This measure was only utilized for selected analyses because it was not collected at the ages 7.5 or 9.5 assessments; therefore, growth in this construct was not explored.

Third, teacher reports from the Teacher Report Form (TRF) (Achenbach, 1991) were collected at child ages 7.5, 8.5, and 9.5. A composite similar to that created for parent-reported CBCL data was created for teacher-reported CP by using items that mapped onto DSM-IV criteria for Oppositional Defiant Disorder and Conduct Disorder to provide an additional measure of child CP outcomes from a different informant. The TRF does not include the item "cruel to animals" but does include the item "cruelty, bullying, or meanness to others," which is consistent with DSM-IV diagnostic criteria for Conduct Disorder. The other 7 items from the parent report also appear in the teacher report, so composites were created with these 8 items. Growth in teacher reports of CP across ages 7.5, 8.5, and 9.5 in addition to composites of scores across ages will be examined as an additional outcome variable. Because teacher reports are measured much later during the course of the study, the age 5 measures of parent-reported CP will serve as the "baseline CP" moderator for analyses involving teacher reported CP to examine relations between the level of CP at school entry (age 5) and teacher reports of changes in CP across time (ages 7.5, 8.5, and 9.5). Although not strictly a baseline measure, parents of children with high CP at school entry may demonstrate similarly high motivation to change as those with high CP at age 2, as problem behavior at school could act as a stressor especially if teachers are informing parents of children's problems in the school setting.

Fourth, the last measure of CP is child-reported delinquency, which is assessed at age 9.5 using the Self-report of Delinquency Questionnaire (SRD, Elliott, Huizinga, & Ageton, 1985). The SRD is a questionnaire that assesses the frequency with which an individual has engaged in aggressive and delinquent behavior, alcohol and drug use, and related offenses during the prior year, with a 27-item version for younger children used in the current study at age 9.5 that excludes age-inappropriate behavior (e.g., intravenous drug use, sexual assault). Using a 3-point rating scale (1 = never, 2 = once/twice, 3 = more often), youths rate the extent to which they engaged in different types of antisocial activities (e.g., stealing, throwing rocks at people, getting into fights). A summary score was created by summing all items, which had an alpha of 0.81. Again, because the SRD was only utilized for selected analyses and was only administered to children at the age 9.5 assessment, growth in this construct was not explored.

2.2.2.3 Maternal positive/neutral behavior.

Observed maternal positive and neutral behavior will serve as the current study's primary measure of parenting behavior as a mediator and outcome of intervention effectiveness. Positive and neutral behavior was measured at the ages 2, 3, 4, and 5 home assessments and was derived from 50 minutes of observational data, including coding of all tasks that occurred at the home assessment at each age, using state-space grid methods. The regions of both maternal positive behavior and neutral behavior were summed and include the following behavioral and affective indicators: positive verbal or positive structure, positive physical, positive affect or validation, neutral affect, and verbal engagement from the mother. The duration proportion of time the parent spent in the positive and neutral regions (across all tasks) was calculated and summed to

derive a measure of positive/neutral behavior. Percent agreement was between 93% and 94% and kappas were between .90 and .93 at all ages.

2.2.2.4 Maternal depression.

The CES-D (Radloff, 1977) is a well-established and widely used 20-item measure of depressive symptomatology that was administered to mothers at each annual home assessment. Data from the ages 2, 3, 4, and 5 assessments will be used in analyses. Mothers report how frequently they have experienced a list of depressive symptoms during the past week on a scale ranging from 0 (less than a day) to 3 (5–7 days). Sample items include, "I felt depressed" and "I was bothered by things that usually don't bother me." Items are summed to create an overall depressive symptoms score, with scores of 16 indicating significant depressive symptoms. Alphas across ages 2 through 5 ranged from .74 to .77.

2.3 DATA ANALYTIC PLAN

The primary goal of the proposed research was to examine how baseline levels of child CP may moderate the effectiveness of the FCU intervention on improving parenting and reducing the persistence of child CP, to explore whether the level of engagement in the FCU is associated with the intervention's effectiveness on improving parenting and reducing the persistence of child CP, and to examine whether mediational pathways through which the FCU has been shown to reduce child CP – through improved parenting and improved maternal depression – are moderated by baseline child CP. Analyses exploring baseline CP as a moderator focused on

differences in intervention effectiveness for those at high and low initial levels of CP on the outcomes of CP and parenting at each individual time point and growth in child CP and parenting behaviors across time, utilizing an intent-to-treat design. Semi-parametric group based trajectory modeling also was utilized to explore whether children with high initial CP in the intervention would be more likely to demonstrate a high desistant pattern of behavior compared to children with high initial CP in the control group, who were expected to be more likely to demonstrate a high persistent pattern of behavior. Analyses exploring whether greater engagement in the FCU is associated with intervention effectiveness were focused on identifying differences in intervention effectiveness for those with higher versus lower engagement in the FCU on the outcomes of CP and parenting at each individual time point. Moderated mediation analyses were focused on whether baseline CP was related to the mediational mechanisms involving improved parenting and improved maternal depression on growth in CP over time. A more detailed description of the analytic strategies that were used to test each hypothesis follows within the results section.

3.0 RESULTS

3.1 PRELIMINARY ANALYSES

As a preliminary analytic step to examine the specific time points at which significant differences in positive/neutral behavior and CP were demonstrated for those in the FCU versus control group, independent samples t-tests were conducted comparing (1) mean levels of positive/neutral behavior between the FCU and control group at each age (i.e., at age 2 to establish that randomization worked and at ages 3, 4, and 5 to examine post-intervention differences) and (2) mean levels of CP between the FCU and control group at each age (i.e., at age 2 to establish that randomization worked and at ages 3, 4, 5, 7.5, 8.5, and 9.5 to examine post-intervention differences). Further, a mean score of positive/neutral behavior across ages 3 to 5 was computed and an additional independent samples t-test was computed to examine FCU versus control group differences in mean scores of positive/neutral behavior from 3 to 5. Similarly, a mean score of CP across ages 3 to 9.5 was computed and an additional independent samples t-test was computed to examine FCU versus control group differences in mean scores of CP across child ages 3 to 9.5. A total of 42 tests were run. Results are shown in Table 2.

3.1.1 Maternal Positive/Neutral Behavior.

Results of independent samples t-tests exploring intervention and control groups' levels of maternal positive/neutral behavior across time demonstrated significant differences at age 3 ($p < .01$) and for the mean of maternal positive/neutral behavior across ages 3, 4, and 5 ($p < .05$), with higher mean positive/neutral behavior in the intervention group compared to the control group. By contrast, the groups did not differ at pre-intervention at age 2 ($p = .56$), at age 4 ($p = .20$) or at age 5 ($p = .12$).

3.1.2 Conduct Problems.

As previously noted, several measures of CP were explored to allow for examination of growth over time in the same construct (oppositional/aggressive behavior) and to provide consistency with outcomes measured in previous studies (externalizing scale). Results on the various measures of CP are reported below.

Oppositional/aggressive behavior: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated a nonsignificant trend-level difference in parent-reported oppositional/aggressive behavior at age 4 ($p = .08$) with lower mean oppositional/aggressive behavior in the intervention group compared to the control group. Differences at all other ages and for mean behavior across ages 3 to 9.5 were not significant.

Externalizing syndrome: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated a significant difference in parent-reported externalizing behavior at age 4 ($p < .05$) with lower mean externalizing behavior in the

intervention group compared to the control group. Differences at all other ages and for mean behavior across ages 3 to 9.5 were not significant.

Eyberg intensity factor: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated a significant difference in the Eyberg intensity factor at age 4 (p <.01) and nonsignificant trend level differences at age 3 (p = .09) and for the mean of intensity scores across ages 3 to 8.5 (p = .10), with lower mean intensity scores in the intervention group compared to the control group. Differences at all other ages were not significant.

Eyberg problem factor: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated a significant difference in the Eyberg problem factor at age 4 (p < .05) with lower mean problem scores in the intervention group compared to the control group. Differences at all other ages and for mean behavior across ages 3 to 8.5 were not significant.

TRF Oppositional/aggressive behavior: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated nonsignificant differences in the teacher-reported oppositional/aggressive behavior factor at every age and for mean behavior across ages 7.5 to 9.5.

TRF Externalizing syndrome: Results of independent samples t-tests exploring intervention and control groups' levels of CP across time demonstrated a trend level difference in teacher-reported externalizing behavior at age 9 (p = .10) with lower mean externalizing in the intervention compared to the control group. Differences at all other ages and for mean behavior across ages 7.5 to 9.5 were not significant.

SRD: Results of an independent samples t-test exploring intervention and control groups' levels of CP on the SRD at age 9.5 demonstrated a nonsignificant difference.

To summarize, there was a significant group difference in maternal positive/neutral behavior at age 3 and for the mean across ages 3, 4, and 5, such that those in the intervention had a higher mean score. The most consistent difference in child CP was found at age 4, with significant differences across three outcomes measures (the externalizing broad-band scale, the ECBI problem scale, and the ECBI intensity scale) and a trend level difference in one outcome measure (oppositional/aggressive behavior), such that there were lower mean scores of CP in the intervention compared to control group across these measures. The only other differences were trends in the ECBI intensity scale at age 3 and for the mean across ages 3 to 8.5 and the teacher-reported externalizing scale at age 9.5.

3.1.3 Hypothesis 1a: Hierarchical multiple regression models

To test the hypothesis that higher baseline CP will significantly moderate the effectiveness of the FCU on parenting and CP outcomes, hierarchical multiple regression analyses were computed as a first step to determine the specific time points at which baseline CP may moderate intervention effectiveness. In Step 1, covariates including child gender, race/ethnicity, project site, and income were entered. In step 2, baseline CP was entered first, followed by intervention status. In Step 3, the interaction term (baseline CP by intervention status) was entered. Initial level of CP was explored both dichotomously and continuously. For the dichotomous CP variable analysis, one group was defined as high on baseline CP (e.g., scoring at or above the established clinical cutpoint of 132 on the Eyberg intensity factor (Colvin, Eyberg, & Adams, 1999) and the other

group was defined as low on baseline CP (e.g., scoring below 132). The interaction term was created by multiplying the dichotomous baseline CP variable by intervention group status. For the continuous CP variable analysis, an interaction term was generated by multiplying intervention group status by the continuous measure of initial level of CP. Significant interactions were probed using software based on procedures outlined by Aiken and West (1991), Dawson (2013) and Dawson and Richter (2006).

For mother positive/neutral behavior outcomes, six regression analyses were computed (i.e., three for the dichotomous CP variable analysis and three for the continuous CP variable analysis) to examine the effects of the FCU, baseline CP, and the interaction term between the FCU and baseline CP on the outcomes of positive/neutral behavior at age 3, 4, and 5. Results are shown in Table 3. There was a significant interaction between dichotomously scored baseline CP (ECBI intensity above 132) and intervention status on maternal positive/neutral behavior at age 3 (B = -0.133, $p < .05$), depicted in Figure 1. Contrary to the hypothesis, intervention group differences were evident for parents of children with low baseline CP but not for parents of children with high baseline CP. Specifically, mothers of children with low (versus high) baseline CP in the intervention group demonstrated higher positive/neutral behavior at age 3 as compared to parents of children with low baseline CP in the control group. Mothers of children with high baseline CP did not differ in their level of positive/neutral behavior.

For CP outcomes, two regression analyses were computed for each outcome at each age (i.e., one dichotomous and one continuous analysis for each outcome, with a total of 68 regression analyses across all CP outcomes) to examine the effects of the FCU, baseline CP, and the interaction term between the FCU and baseline CP on the outcomes of CP at age 3, 4, 5, 7.5, 8.5, and 9.5. Results are shown in Table 4. For parent-reported child oppositional/aggressive

behavior, there were no significant interactions between intervention status and baseline CP (either dichotomously or continuously scored) on oppositional/aggressive behavior at age 3, 4, 5, 7.5, 8.5, or 9.5. For parent-reported child externalizing behavior, there was one significant interaction: for externalizing at age 9.5, continuously scored baseline CP interacted with intervention status to significantly predict externalizing at age 9.5 (B = -0.118, $p < .05$), depicted in Figure 2. Consistent with hypotheses, among children with higher (continuously scored) baseline CP, children in the intervention group had parents who reported lower externalizing at age 9.5. Among those with lower baseline CP, parents reported similar externalizing at age 9.5 across both intervention and control groups.

For parent-reported Eyberg intensity outcomes, there were no significant interactions between intervention status and baseline CP (either dichotomously or continuously scored) on intensity scores age 3, 4, 5, 7.5 or 8.5. For parent-reported Eyberg problem outcomes, there were three significant interactions. For intensity at age 4, both continuously scored baseline CP and dichotomously scored baseline CP interacted with intervention status to significantly predict problem scores at age 4 (B = 0.121, $p < .05$ for continuous; B = 0.192, $p < .05$ for dichotomous), depicted in Figures 3 and 4, respectively. Contrary to the hypothesis, intervention group differences were evident for children with low baseline CP but not children with high baseline CP. Specifically, those with lower baseline CP (continuously scored) in the intervention group had lower age 4 problem scores compared to those in the control group and children with higher baseline CP, depicted in Figure 3. Similarly, those with lower baseline CP (dichotomously scored) in the intervention group showed lower age 4 problem scores compared to those in the control group and children with higher baseline CP, depicted in Figure 4. In addition, those with lower baseline CP (dichotomously scored) in the intervention group showed

lower age 5 problem scores compared to those in the control group and children with higher baseline CP (Figure 5).

For teacher-reported outcomes and child self-reports of CP, there were no significant interactions between intervention status and baseline CP (either dichotomously or continuously scored) or between intervention status and age 5 CP (either dichotomously or continuously scored) on either oppositional/aggressive behavior or externalizing behavior at ages 7.5, 8.5, or 9.5 or child self-report of delinquency at age 9.5.

To summarize, the effect of baseline CP as a moderator of intervention effects on CP outcomes was inconsistent, with some results in line with the hypothesis that children with higher baseline CP in the intervention group would have lower CP at outcomes (e.g., age 9.5 broad-band externalizing factor) and some results contrary to hypotheses (e.g., analyses on the ECBI problem scale), such that intervention group differences were evident for children with low baseline CP but not children with high baseline CP.

Additionally, a second set of hierarchical multiple regression equations were computed to examine whether the level of CP at the previous time point interacts with intervention status to predict parenting and CP outcomes at the subsequent time point, again using both a dichotomous and continuous measure of CP. These analyses are no longer purely experimental because the CP variable of interest is measured after the baseline assessment, and the intervention occurred prior to these measurements of CP. However, these results may be informative in considering how the FCU may be associated with improvements on CP and parenting at each successive assessment point. In Step 1, covariates including child gender, race/ethnicity, project site, and income were entered. In step 2, the previous timepoint level of CP was entered first followed by intervention status. In Step 3, the interaction term (previous timepoint level of CP by intervention status) was

entered. For maternal positive/neutral behavior outcomes, four regression analyses were computed (i.e., two for the dichotomous CP variable analysis and two for the continuous CP variable analysis) to examine the effect of the FCU, the previous assessment of CP, and the interaction term on outcomes of positive/neutral behavior at ages 4 and 5. In these analyses, shown in Table 5, there were no significant interactions between intervention status and previous timepoint level of CP (either dichotomously or continuously scored) on maternal positive/neutral behavior at any age.

For CP outcomes, two regression analyses were computed for each outcome at each age (i.e., one dichotomous and one continuous analysis for each outcome, with a total of 38 regression analyses across all CP outcomes) to examine the effect of the FCU, the previous assessment of CP, and the interaction term between the FCU and the previous assessment of CP on outcomes of child CP at age 4, 5, 7.5, 8.5, and 9.5. Results from these models, shown in Table 6, demonstrated only two significant interactions. For parent-reported externalizing, age 5 ECBI intensity (scored continuously) interacted with intervention status to predict age 8.5 externalizing (Figure 6), such that those with lower age 5 CP in the control group had lower externalizing scores than those in the intervention group. For teacher-reported externalizing at age 9.5 (Figure 7), those with higher age 8.5 CP in the intervention group demonstrated lower age 9.5 externalizing behavior as compared to children with high age 8.5 CP in the control group.

3.1.4 Hypothesis 1a: Structural equation models

To examine baseline CP as a moderator of growth in outcomes over time, structural equation modeling (SEM) was utilized using maximum likelihood estimation with robust standard errors

(MLR) in Mplus 5.21 (Muthén & Muthén, 1998-2009). MLR is robust to nonnormality and adjusts for missing data by estimating parameters of all available data for the estimation of a specific parameter (Muthén & Muthén, 1998-2009). In the SEM models, initial level of CP was tested as a moderator of the path between (1) intervention group status and changes in parenting from child ages 2 through 5 in models examining parenting (maternal positive/neutral behavior) as an outcome, and (2) intervention group status and growth in CP from child ages 2 through 9.5 in models examining CP as an outcome. Latent growth curve modeling (Muthén & Muthén, 1998-2009) was employed to examine growth in positive/neutral behavior and children's CP, using separate growth curve models for maternal positive/neutral behavior across ages 2, 3, 4, and 5 and child CP as reported by mothers from ages 2, 3, 4, 5, 7.5, 8.5, and 9.5 and as reported by teachers from ages 7.5, 8.5, and 9.5. The overall model fit of each model was assessed using several fit indices such as Chi-square goodness of fit index, RMSEA, and CFI. Because the oppositional/aggressive behavior factor is the only measure of CP available at all time points across ages 2-9.5, growth models primarily focused on this variable, although growth in teacher reports from ages 7.5, 8.5, and 9.5 was also examined. Unstandardized results are reported.

As a first step, an unconditional growth curve model for oppositional/aggressive behavior across ages 2-9 was computed. The best fitting model included an intercept term set at the initial timepoint (age 2), a linear growth term, and a quadratic growth term. The unconditional model demonstrated significant means and variances for the intercept, linear slope, and quadratic slope, and the fit indices were as follows: χ^2 (df =19) = 92.066, p = .00; CFI = 0.957; TLI = 0.953; $RMSEA$ = .073; $SRMR$ = .048. Consistent with prior research on growth in overt CP (Shaw et al., 2003), the overall pattern suggests a significant decrease in oppositional/aggressive behavior over time, with the rate of growth flattening out (leveling off) over the later years (with visual

inspection suggesting this occurs after age 7.5). As quadratic and linear factors are to some extent confounded because the quadratic is dependent on the linear factor because of scaling (i.e., squaring), pathways to the quadratic term should be interpreted with some caution, and we will focus on effects involving the linear growth term. Next, the full model including covariates and intervention status was computed on the full sample. This model provided good fit: χ^2 (*df* =51) = 135.665, *p* = .00; *CFI* = 0.961; *TLI* = 0.940; *RMSEA* = .048; *SRMR* = .027. In this model (depicted in Figure 8), there was a significant association between intervention group and the linear slope, such that those in the intervention group demonstrated greater decreases in CP over time (B = -0.204, $p < .05$). There was also a significant positive association between intervention group and the quadratic slope (B = 0.024, $p < .05$), although this should be interpreted with caution, as the quadratic is dependent on the linear slope because of scaling.

Initial level of CP as a moderator of the path between intervention and growth was explored both continuously and dichotomously. For the continuous CP variable analysis, an interaction term was created by multiplying baseline ECBI intensity scores by intervention group status. The model including this interaction term provided good fit to the data χ^2 (*df* =59) = 138.931, *p* = .00; *CFI* = 0.965; *TLI* = 0.946; *RMSEA* = .043; *SRMR* = .024. In this model, the interaction term was not significantly associated with the slope of oppositional/aggressive behavior (B = -0.005, *p* = 0.168).

For the dichotomous CP variable analysis, models were tested in a multi-group design, with one group defined as high on baseline CP (e.g., scoring at or above the established clinical cutpoint of 132 on the Eyberg intensity factor (Colvin et al., 1999) and the other group defined as low on baseline CP (e.g., scoring below 132). Multi-group models were computed in two ways. For the more conservative approach, first all parameters were constrained to equality across

groups, as this represents the most parsimonious model. Next, paths were individually freed to vary across groups and chi-square difference tests were conducted to determine whether the paths should be considered invariant across groups or whether they significantly differ and thus should be freed. These results are presented first. A less conservative approach, which is commonly used, establishes strong invariance (e.g., same factor loadings constrained across the groups and intercepts of observed variables constrained to equality) but then allows all other parameters to be freely estimated across groups. The path(s) of most interest are then examined one at a time to determine if they should be constrained to equality across groups or if they significantly differ and thus should be free to vary across groups. The Satorra-Bentler scaled chi square difference test (Satorra, 2000) was used to examine differences. This test is appropriate when MLR estimation is utilized to account for non-normality, as it divides the normal chi-square statistic by a scaling correction factor to account for non-normality (Muthén & Muthén, 1998-2009).

Child oppositional/aggressive behavior: Results from the first multi-group model (more conservative) provided good fit to the data: χ^2 (*df* =130) = 225.680, *p* = .00; *CFI* = 0.947; *TLI* = 0.938; *RMSEA* = .045; *SRMR* = .042 (see Figure 9). Based on preliminary tests examining differences between residual variance of the indicators (i.e., measures of oppositional/aggressive behavior at each age) for the growth model, suggesting they differed across groups, these parameters were allowed to vary freely across groups. The series of Satorra-Bentler chi square difference tests indicated that the following parameters significantly differed between the two groups. The mean of the intercept differed, such that as would be expected, the mean intercept was significantly higher in the high group (B = 6.234) compared to low group (B = 4.084). The mean of the slope differed, such that the mean rate of change in the high group (B = -0.568) was

higher than the mean rate of change in the low group (B = -0.524). The variance of the both the intercept and the slope differed, such that there was greater variance for the high (intercept B = 3.701; slope B = 0.499) compared to the low group (intercept B = 2.285; slope B = 0.439). Contrary to hypotheses, the association between intervention status and growth in oppositional/aggressive behavior did not differ between the two groups, and this association was only significant at a trend level (B = -0.175, p = .061), in contrast to the full-group model in which it was significant.

In the second multi-group model (less conservative), the results differed. This model provided adequate fit to the data: χ^2 (df =102) = 194.841, p = .00; *CFI* = 0.949; *TLI* = 0.923; *RMSEA* = .050; *SRMR* = .035 (see Figure 10). With the exception of constraining the factor loadings and intercepts of observed variables across the two groups, all other parameters were allowed to vary freely. Parameters of interest (e.g., association between intervention and linear slope and intervention and quadratic slope) were then tested individually to determine whether they significantly differed across groups. In this model, the association between intervention and the linear slope significantly differed (p = .05), such that the intervention was associated with decreasing growth in oppositional/aggressive behavior for the high group only (B = -0.424, p = .012), whereas this association was not significant in the low group (B = -0.050, p = .642). Similarly, there was a trend level difference (p = .07) between the groups for the association between the intervention and quadratic slope, such that the intervention was significantly associated with the quadratic term for the high group (B = 0.048, p = .018), whereas this association was not significant in the low group (B = 0.005, p = .692).

To summarize, both the model involving the continuously scored baseline CP by intervention group interaction and the more conservative multi-group model did not support the

hypothesis that baseline CP would moderate the FCU intervention effect on growth in CP; however, findings from the less conservative multi-group model were in line with this hypothesis, such that the effect of the intervention on growth in CP was only significant for the high group.

Growth in teacher-reported oppositional/aggressive behavior was also investigated. The unconditional model demonstrated a significant mean and variance for the intercept, but nonsignificant mean and variance for the linear slope, suggesting that these values do not significantly differ from zero. This indicates that there is little development over time on average and that individuals grow at a similar rate. To enhance the model's interpretability, the unique variance of this indicator was set to zero. The fit indices were as follows: χ^2 (df =3) = 0.536, p = .91; *CFI* = 1.000; *TLI* = 1.022; *RMSEA* = .000; *SRMR* = .017. It is often recommended not to pursue further analyses in models in which there is no variability in the slope factor mean or variance with which to predict with intervention status or other covariates of interest. However, with the addition of covariates, there is higher power to detect slope variability (Muthén & Muthén, 1998-2009). Therefore, follow-up analyses were conducted for the purposes of the current study. The full model including covariates and intervention status was computed on the full sample. This model (depicted in Figure 11) provided adequate fit to the data: χ^2 (df =11) = 7.526, p = .76; *CFI* = 1.000; *TLI* = 1.029; *RMSEA* = .000; *SRMR* = .013. In this model, intervention group status was not significantly associated with growth in teacher-reported oppositional/aggressive behavior.

For the continuous CP variable analysis, an interaction term was created by multiplying baseline ECBI intensity scores by intervention group status. The model including this interaction term provided good fit to the data χ^2 (df =11) = 7.161, p = .79; *CFI* = 1.000; *TLI* = 1.041;

RMSEA = .000; *SRMR* = .010. In this model, the interaction term was not significantly associated with the slope of oppositional/aggressive behavior (B = 0.000, p = 0.979). Similarly, the model investigating an interaction term created by multiplying age 5 ECBI intensity scores by intervention group status provided good fit to the data χ^2 (df =11) = 7.722, p = .74; *CFI* = 1.000; *TLI* = 1.035; *RMSEA* = .000; *SRMR* = .010. In this model, the interaction term was not significantly associated with the slope of oppositional/aggressive behavior (B = -0.005, p = 0.393).

For the more conservative multi-group model, there was only one significant difference between the two groups, such that the association between Hispanic race/ethnicity and the slope differed (being positive in the high group and negative in the low group) but was not significant for either group. For the less conservative model, none of the examined pathways significantly differed.

Growth model for observed maternal positive/neutral behavior: As a first step, an unconditional growth curve model for maternal positive/neutral behavior across ages 2-5 was computed. The best fitting model included an intercept term set at the initial timepoint (age 2) and a linear growth term. The unconditional model demonstrated significant means for the intercept and linear slope and significant variance for the intercept but not for the slope, suggesting that individuals have a similar growth rate. The model had relatively poor fit, and the fit indices were as follows: χ^2 (df =5) = 173.268, p = .00; *CFI* = 0.688; *TLI* = 0.625; *RMSEA* = .215; *SRMR* = .085. The overall pattern suggests a significant increase in maternal positive/neutral behavior over child ages 2 to 5. Next, the full model including covariates and intervention status was computed on the full sample. This model (depicted in Figure 12) provided relatively weak fit to the data: χ^2 (df =21) = 208.967, p = .00; *CFI* = 0.741; *TLI* =

0.532; *RMSEA* = .111; *SRMR* = .039. In this model, intervention was not significantly associated with growth in maternal positive/neutral behavior (B = 0.058, p = 0.146), although the pattern was in the expected direction.

Next, a model was computed to investigate the continuous measure of baseline level of CP as a moderator of the path between intervention and growth maternal positive/neutral behavior. For this model, an interaction term was created by multiplying baseline ECBI intensity scores by intervention group status. This model provided relatively weak fit to the data: χ^2 (*df* =25) = 216.753, p = .00; *CFI* = 0.740; *TLI* = 0.522; *RMSEA* = .102; *SRMR* = .035. In this model, the interaction between baseline level of CP and intervention status on the slope of maternal positive/neutral behavior was not significant (B = 0.000, p = 0.890).

Next, a multi-group model was computed to investigate baseline level of CP dichotomously, with one group defined as high (scoring greater than or equal to 132 on the ECBI intensity factor) and the other group defined as low on baseline CP (e.g., scoring below 132). Again based on preliminary tests examining differences between residual variance of the indicators (i.e., measures of maternal positive/neutral behavior at each age) for the growth model, suggesting they differed across groups, these parameters were allowed to freely vary between the groups. Results from the first multi-group model (more conservative) provided weak fit to the data: χ^2 (*df* =62) = 262.900, p = .00; *CFI* = 0.729; *TLI* = 0.668; *RMSEA* = .094; *SRMR* = .053 (see Figure 13). The series of Satorra-Bentler chi square difference tests indicated that the only parameter that significantly differed between the two groups was the association between intervention status and the intercept of positive/neutral behavior. While this association was not significant in either group, there was a positive association between intervention and the intercept in the low group (B = 0.159, p = .147) and a negative association for the high group (B

= -0.070, p = .549), which led to the positive Satorra-Bentler chi square difference test. The pathway from intervention to the slope of maternal positive/neutral behavior did not vary across the groups and was not significant (B = 0.055, p = .163).

The less conservative multi-group model was computed next. With the exception of constraining the factor loadings and intercepts of observed variables across the two groups, all other parameters were allowed to vary freely. Parameters of interest (e.g., association between intervention and linear slope) were then tested individually to determine whether they significantly differed across groups. This model (see Figure 14) provided weak fit to the data: χ^2 (df =43) = 240.783, p = .00; *CFI* = 0.734; *TLI* = 0.529; *RMSEA* = .112; *SRMR* = .047. This pathway did not significantly differ between groups and was not significant (B = 0.061, p = 0.129).

To summarize, contrary to hypotheses, none of the models involving growth of maternal positive/neutral behavior found significant moderation of intervention effects by baseline level of child CP.

3.1.5 Hypothesis 1b: Group-based trajectories of behavior

Semi-parametric group-based modeling (Nagin, 1999) was employed to test the hypothesis that children in the FCU group with more elevated CP at baseline would be disproportionately represented in a high desistant group compared to initially high CP children in the control group, who were expected to be disproportionately represented in a high persistent group. This technique is designed to identify clusters of individuals who share common pathways (Nagin, 1999). Using finite mixtures of suitably defined probability distributions, the group-based

approach for modeling developmental trajectories is intended to provide a flexible and easily applied method for identifying distinctive clusters of individual trajectories within the population and for profiling the characteristics of individuals within these clusters. The group-based approach utilizes a multinomial modeling strategy that has the strength of being able to identify trajectories of individuals on selected outcomes over time. The models were estimated with a specialized Mplus-based procedure in which within-group variance was constrained to zero. In selecting the optimal trajectory group model, the Bayesian information criteria (BIC) in combination with theoretical rationale was used to identify the best fit in both number and shape of groups. Following the recommendation of Kass and Raftery (1995), the model selection was guided by the objective of maximizing the BIC score. The model generates posterior probabilities of group membership, which estimates each individual's probability of belonging to each of the trajectory groups. Individuals are assigned to the group with the largest posterior probability estimate. Indicators of good fit to a model include maximized BIC scores, high within group posterior probabilities, and close fit between predicted and actual group proportions.

Trajectories of child oppositional/aggressive behavior were modeled from ages 3 to 9.5 in one set of analyses (to have no overlapping time points between baseline measure of CP and the trajectory timing) and subsequently ages 2 to 9.5 in a second set of analyses (to compare whether including baseline assessment in the trajectories influenced the results). Various models were examined to determine the most appropriate way to characterize the groups and the best number of groups.

For the trajectories modeled from ages 3 to 9.5 (total *N* of 706, see Figure 15), a five-group model with both linear and quadratic growth terms was selected, as this model was the

best balance between maximized BIC scores and theoretical rationale, as can be seen in Table 7a. Although BIC scores kept improving with the addition of groups, group sizes became increasingly small with the addition of more groups. The average posterior probability for each group was also calculated. Posterior probabilities measure a specific individual's likelihood of belonging to each of the trajectory groups (Nagin, 2005). The average posterior probabilities for all groups fell above the recommended threshold for assignment of 0.70 (Nagin, 2005), with values above 0.80 for all groups in both the four and five group solutions. The range in the current sample was 0.83 (high decreasing) to 0.90 (high increasing) in the five group model. Group 1, termed "high decreasing" consisted of 13% (n = 87) of the sample and showed small decreasing quadratic growth (at a trend level). Children in this group started out with very high levels of CP followed by a quadratic downturn. Group 2, which we term "moderate stable," consisted of 7% of the sample (n = 51), and demonstrated nonsignificant linear and quadratic growth. Children in this group demonstrated a consistently moderate level of CP. Group 3, which we term "high increasing," consisted of 5% of the sample (n = 37), and demonstrated positive linear growth (at a trend level). Children in this group began with the highest level of CP and increased over time. Group 4, which we term "moderate decreasing," consisted of 37% of the sample (n = 262) and demonstrated negative linear growth. Children in this group demonstrated a moderate level of CP (similar to Group 2) but declined in CP over time. Group 5, which we term "low decreasing," consisted of 38% (n = 269) of the sample and demonstrated significant negative linear growth and significant positive quadratic growth. Children in this group started with the lowest levels of CP and decreased over time, a decrease that leveled off with a quadratic upturn. Next, the model was re-estimated with intervention group status and baseline level of CP (dichotomously scored) added as predictors. Trajectories and the predictors of trajectory group

membership were jointly estimated, providing multinomial logit model results in which all groups were compared to Group 4 (moderate decreasing). Results are reported in Table 7b. When examining group specific effects, intervention status did not significantly differentiate membership in Group 4 versus any other group, nor did it differentiate membership in any other groups versus the others. For baseline CP, not surprisingly having high baseline CP was associated with higher likelihood of membership in Group 1 (high decreasing) and Group 3 (high increasing) compared to Group 4 (moderate decreasing), whereas having high baseline CP was associated with lower likelihood of membership in Group 5 (low decreasing) compared to Group 4 (moderate decreasing). There was not a significant difference in likelihood of membership in Group 2 (moderate stable) compared to group 4 (moderate decreasing) based on baseline CP.

For the trajectories modeled from ages 2 to 9.5 (N = 731, see Figure 16), again a five-group model with both linear and quadratic growth terms was selected, as this model was the best balance between maximized BIC scores and theoretical rationale, as can be seen in Table 8a. Group 1, termed "high stable," included 13% of the sample (n = 95) and showed a high and stable trajectory of oppositional/aggressive behavior. Group 2, termed "high decreasing," included 23% of the sample (n = 167) and showed initially high levels of oppositional/aggressive behavior followed by negative linear growth and positive quadratic growth (at a trend level). Group 3, termed "highest stable," included 6% of the sample (n = 40) and showed the highest initial levels of oppositional/aggressive behavior that remained stable. Group 4, termed "low decreasing," included 41% of the sample (n = 298) and showed initially low levels oppositional/aggressive behavior followed by negative linear growth and positive quadratic growth. Group 5, termed "moderate decreasing," included 18% of the sample (n = 131) and

showed initially moderate levels of oppositional/aggressive behavior followed by negative linear growth (at a trend level). Again, the average posterior probabilities for all groups fell above the recommended threshold for assignment of 0.70 (Nagin, 2005). The range in the current sample was 0.78 (high decreasing) to 0.91 (highest stable). Next, the model was re-estimated with intervention group status and baseline level of CP (dichotomously scored) added as predictors. Trajectories and the predictors of trajectory group membership were jointly estimated, providing multinomial logit model results in which all groups were compared to Group 5 (moderate decreasing). Results are reported in Table 8b. When examining group specific effects, intervention status did not significantly differentiate membership in Group 5 versus any other group, nor did it differentiate membership in any other groups versus the others. For baseline CP, not surprisingly having high baseline CP was associated with higher likelihood of membership in Group 1 (high stable), Group 2 (high decreasing), and Group 3 (highest stable) compared to Group 5 (moderate decreasing), whereas having higher baseline CP was associated with lower likelihood of membership in Group 4 (low decreasing) compared to Group 5 (moderate decreasing).

In summary, across both sets of analyses examining group-based trajectory models of CP from ages 3 to 9.5 and the separate models examining CP from ages 2 to 9.5, baseline level of CP was associated with trajectory group membership, but intervention group status was not associated with group membership.

3.1.6 Hypothesis 2: Engagement in the intervention and intervention effectiveness

To examine whether intervention effectiveness was related to engagement in the intervention's feedback (FB) sessions, analyses of variance (ANOVAs) were conducted to compare post-intervention outcomes on maternal positive/neutral behavior and child oppositional/aggressive behavior for the following three groups: the control group, individuals assigned to the intervention who engaged in FCU feedback (FB) sessions, and individuals assigned to the intervention who did not engage in FCU FB sessions. For analyses involving positive/neutral behavior as an outcome, three ANOVAs were computed to examine the effect of engagement in the FCU on the outcome of positive/neutral behavior at ages 3, 4, and 5. For analyses involving CP as an outcome, six ANOVAs were computed to examine the effect of engagement in the FCU on the outcomes of CP at ages 3, 4, 5, 7.5, 8.5, and 9.5. As an additional analysis, engagement was defined as intervention families who had feedbacks after at least 3 of the assessments at ages 2, 3, 4, and 5 compared to those assigned the intervention who did not engage in at least 3 feedbacks and those in the control group. Three additional ANOVAs were computed to examine the effect of consistent engagement across at least 3 of the feedbacks as it related to the outcomes of CP at ages 7.5, 8.5, and 9.5. Results are displayed in Table 9. Using post hoc Tukey tests, specific group differences were examined. For maternal positive/neutral behavior at age 3, those who were assigned to the intervention group and participated in the FB session after the age 2 assessment had higher mean positive/neutral behavior compared to those in the control group ($p < .01$). At age 4, there was a trend level overall difference ($p = .072$), with those who were assigned to the intervention group and participated in the FB session after the age 3 assessment demonstrating higher mean positive/neutral behavior compared to those in

the control group (p = .110). There were no significant differences between groups based on having had a FB after the age 4 assessment for maternal positive/neutral behavior at age 5. For child oppositional/aggressive behavior, there were no significant differences between those assigned to the intervention who had a FB, those assigned to the intervention who did not have a FB, and those in the control group at any age. In addition, there were no differences between those assigned to intervention who had at least 3 FBs across ages 2-5, those assigned to intervention with fewer than 3 FBs across ages 2-5, and those in the control group on oppositional/aggressive outcomes at ages 7.5, 8.5, or 9.5.

3.1.7 Hypothesis 3: Moderated mediation through maternal positive/neutral behavior

To examine whether the growth in maternal positive/neutral behavior across ages 2 to 5 mediated the effect of the intervention on oppositional/aggressive behavior across ages 2 through 9 and whether such an effect might be stronger (or only significant) for families in which children demonstrate higher levels of baseline CP, a moderated mediation analytic technique was employed in an SEM framework. First a single group parallel process growth model was computed examining potential effects of the intervention to growth in maternal positive/neutral behavior across child ages 2 through 5 to growth in child oppositional/aggressive behavior across child ages 2 through 9.5. This model, depicted in Figure 17, provided adequate fit to the data: χ^2 (df =95) = 392.225, p = .00; CFI = 0.899; TLI = 0.847; $RMSEA$ = .065; $SRMR$ = .037. In this model, there was a non-significant trend level association between the intervention and the linear slope of oppositional/aggressive behavior (B = -0.199, p = 0.086) in the expected direction, and there was a trend level association between the intervention and the quadratic slope of

oppositional/aggressive behavior (B = 0.028, p = .065). The association between intervention and the slope of maternal positive/neutral behavior was not significant (B = 0.059, p = 0.140), and the association between growth in maternal positive/neutral behavior and growth in child oppositional/aggressive behavior was not significant (B = -0.079, p = 0.938). The indirect effect from the intervention to growth in maternal positive/neutral behavior to growth in child oppositional/aggressive behavior was also not significant (B= -0.005, p = 0.938).

Next, a model was computed to investigate the continuous measure of baseline level of CP as a moderator of the path between intervention and growth maternal positive/neutral behavior and between intervention and growth in child oppositional/aggressive behavior. For this model, an interaction term was created by multiplying baseline ECBI intensity scores by intervention group status. This model provided adequate fit to the data: χ^2 (df =107) = 395.449, p = .00; *CFI* = 0.907; *TLI* = 0.857; *RMSEA* = .061; *SRMR* = .034. In this model, the interaction between baseline level of CP and intervention status was not significantly associated with the slope of maternal positive/neutral behavior (B = 0.000, p = 0.893) or with the linear (B = -0.005, p = 0.166) or quadratic (B = 0.000, p = 0.276) slopes of oppositional/aggressive behavior.

For the dichotomous CP variable analysis, the mediational model was tested in a multi-group design, with one group defined as high on baseline CP (e.g., scoring at or above the established clinical cutpoint of 132 on the Eyberg intensity factor (Colvin et al., 1999) and the other group defined as low on baseline CP (e.g., scoring below 132). Again, based on preliminary tests examining differences between residual variance of the indicators for the growth models, suggesting they differed across groups, these parameters were allowed to vary freely between the groups. Results from the first multi-group model (more conservative) provided adequate fit to the data: χ^2 (df =241) = 542.991, p = .00; *CFI* = 0.883; *TLI* = 0.861;

RMSEA = .059; *SRMR* = .052 (see Figure 18). The series of Satorra-Bentler chi square difference tests indicated several significant differences between the two groups. First, similar to the previous results for the multi-group latent growth curve model of oppositional/aggressive behavior that did not include positive/neutral behavior, the mean of the intercept differed, such that as would be expected, the mean intercept was significantly higher in the high group (B = 6.235) compared to low group (B = 4.083). The mean of the slope differed, such that the mean rate of change in the high group (B = -0.566) was higher than the mean rate of change in the low group (B = -0.523). The variance of both the intercept and the slope differed, such that there was greater variance for the high group (intercept B = 3.692; slope B = 0.496) compared to the low group (intercept B = 2.286; slope B= 0.439). There was also a significant difference between the high and low groups in the association between the intervention and the intercept of maternal positive/neutral behavior, although it was not significant in either group. The association across both groups between the slope of maternal positive/neutral behavior and the linear slope of oppositional/aggressive behavior was not significant (B = 0.365, p = 0.764). In addition, the association between the intervention and the linear slope of oppositional/aggressive behavior did not differ between the two groups and was only a trend level (B =-0.196, p = 0.094). The association between the intervention and the slope of mother positive/neutral behavior did not differ between the two groups and was not significant (B = 0.056, p = 0.158). Further, the indirect effect from the intervention to the linear slope of oppositional/aggressive behavior across ages 2-9 operating through maternal positive/neutral behavior from 2-5 was not significant in either group (B = 0.020, p = 0.770).

The less conservative multi-group model was computed next. With the exception of constraining the factor loadings and intercepts of observed variables across the two groups, all

other parameters were allowed to vary freely. Parameters of interest (e.g., association between intervention and linear and quadratic slopes of oppositional/aggressive behavior, between intervention status and slope of maternal positive/neutral behavior, and between the slope of maternal positive/neutral behavior and the slope of oppositional/aggressive behavior) were then tested individually to determine whether they significantly differed across groups. This model provided good fit to the data: χ^2 (*df* =195) = 494.478, *p* = .00; *CFI* = 0.884; *TLI* = 0.830; *RMSEA* = .065; *SRMR* = .046 (see Figure 19). There was a significant difference between the high and low groups in the pathway between intervention and the linear slope of oppositional/aggressive behavior. The association was not significant in either the low group (B = -0.358, *p* = 0.392) or the high group (B= -0.735 *p* = .140), but the magnitude of the association differed, leading to the significant chi square difference test. The groups did not differ in the path between the intervention and the quadratic slope of oppositional/aggressive behavior, the path between intervention and the slope of positive/neutral parenting, or the path between the slope of positive/neutral behavior and the slope of oppositional/aggressive behavior, all of which were not significant.

3.1.8 Hypothesis 4: Moderated mediation through maternal depression

To examine whether the growth in maternal depression across ages 2 to 5 mediated the effect of the intervention on oppositional/aggressive behavior across ages 2 through 9 and whether such an effect might be stronger (or only significant) for families in which children demonstrate higher levels of baseline CP, first, an unconditional growth model for maternal depression across ages 2 to 5 was computed. The best fitting model included an intercept term set at the initial

timepoint (age 2) and a linear growth term and provided good fit to the data: χ^2 (*df* =5) = 8.070, *p* = .15; *CFI* = 0.992; *TLI* = 0.991; *RMSEA* = .029; *SRMR* = .036. This model had significant means for the intercept term (B = 16.425, $p < .01$) and linear slope (B = -0.625, $p < .01$), as well as significant variances for the intercept ($p < .01$) and linear slope ($p < .05$). Next, a single group parallel process growth model was computed examining the pathway from the intervention to growth in maternal depression across child ages 2 through 5 to growth in child oppositional/aggressive behavior from child ages 2 through 9.5. This model, depicted in Figure 20, provided adequate fit to the data: χ^2 (*df* =95) = 204.998, *p* = .00; *CFI* = 0.961; *TLI* = 0.942; *RMSEA* = .040; *SRMR* = .029. In this model, there was a trend level association between the slope of maternal depression and the linear slope of oppositional aggressive behavior (B = 0.244, *p* = 0.099), such that as maternal depressive symptoms decreased, oppositional/aggressive behavior decreased. The association between the slope of maternal depression and the quadratic slope of oppositional/aggressive behavior was not significant (B= -0.027, *p* = 0.114). There were non-significant associations between intervention status and both the linear slope (B= -0.177, *p* = .126) and quadratic slope (B =0.021, *p* = .132) of oppositional aggressive behavior. The association between intervention status and the slope of maternal depression was also not significant (B = -0.125, *p* = .679). Further, the indirect effects of the intervention on both the linear slope of oppositional aggressive behavior and the quadratic slope of oppositional aggressive behavior were not significant (B = -0.030, *p* = 0.687 and B = 0.003, *p* = 0.688, respectively).

Next, a model was computed to investigate the continuous measure of baseline level of CP as a moderator of the path between intervention and growth maternal depression and between intervention and growth in child oppositional/aggressive behavior. For this model, an interaction

term was created by multiplying baseline ECBI intensity scores by intervention group status. This model provided adequate fit to the data: χ^2 (*df* =107) = 220.855, *p* = .00; *CFI* = 0.962; *TLI* = 0.942; *RMSEA* = .038; *SRMR* = .027. In this model, there was no main effect of intervention or interaction between baseline level of CP and intervention status on the slope of maternal depression or on the slope of oppositional/aggressive behavior.

Next, a multi-group model was computed to investigate baseline level of CP dichotomously, with groups defined as high (scoring greater than or equal to 132 on the ECBI intensity factor) or low (less than 132 on the ECBI intensity factor). Again based on preliminary tests examining differences between residual variance of the indicators (i.e., measures of maternal positive/neutral behavior at each age) for the growth model, suggesting they differed across groups, these parameters were allowed to vary freely between the groups. Results from the first multi-group model (more conservative) provided adequate fit to the data: χ^2 (*df* =240) = 355.826, *p* = .00; *CFI* = 0.954; *TLI* = 0.945; *RMSEA* = .036; *SRMR* = .042 (see Figure 21). The series of Satorra-Bentler chi square difference tests indicated several significant differences between the two groups. First, similar to the previous results for the multi-group latent growth curve model of oppositional/aggressive behavior that did not include maternal depression, the mean of the intercept differed, such that as would be expected, the mean intercept was significantly higher in the high group (B = 6.328) compared to low group (B = 4.041). The mean of the slope differed, such that the mean rate of change in the high group (B = -0.700) was higher than the mean rate of change in the low group (B = -0.454). In addition, the mean of the quadratic slope differed, such that it was significantly higher in the high group (B = 0.052) compared to the low group (B = 0.031). The variance of the both the intercept and the slope differed, such that there was greater variance for the high (intercept B = 3.510; slope B = 0.303)

compared to the low group (intercept B = 2.317; slope B= 0.250). Further, with regard to the growth curve for maternal depression, the mean intercept significantly differed, such that it was again higher in the high group (B = 18.425) compared to the low group (B = 14.866), and the variance of both the intercept and the slope differed, such that there was greater variance for the high group (intercept B = 53.582; slope B = 3.190) compared to the low group (intercept B = 30.563; slope B= 0.472). There was also a significant difference between the high and low groups in the association between the intervention and the slope of maternal depression: although this pathway was not significant in either group, in the low group, there was a non-significant positive association between intervention status and the slope of maternal depression (B = 0.127, p =0.682) whereas in the high group, there was a negative association that was not significant (B = -0.499, *p* =0.194). The only other significant difference between the groups was that between the intercept of maternal depression and rural (versus urban) site, such that in the low group, those mothers from rural compared to urban sites reported lower levels of maternal depression (B = -3.248, *p* = 0.001), an association that was not significant in the high group (B = -0.485, *p* = 0.722). There was a significant association across both groups between the slope of maternal depression and the linear slope of oppositional/aggressive behavior (B = 0.384, *p* = 0.001), such that as maternal depression decreased, oppositional/aggressive behavior decreased. There was also a significant association between the slope of maternal depression and the quadratic slope of oppositional/aggressive behavior, such that for the quadratic function, this association was negative (B = -0.045, *p* =0 .003). Intervention was not directly associated with the linear (B =-0.147, *p* = 0.292) or quadratic (B = 0.017, *p* = 0.321) slopes of oppositional/aggressive behavior. Furthermore, the indirect effect from the intervention to the linear slope of oppositional/aggressive behavior across ages 2-9 operating through maternal depression from 2-5

was not significant in the high group (B = -0.191, p = 0.218) or in the low group (B = 0.049, p = 0.681).

The less conservative multi-group model was computed next. All parameters were allowed to vary freely with the exception of constraining the factor loadings and intercepts of observed variables across the two groups. In addition, because the variance of the quadratic growth term for oppositional/aggressive behavior within the high group was not significantly different from zero and caused a not positive definite covariance matrix, the unique variance of this indicator was set to zero for the high group. Parameters of interest (e.g., association between intervention and linear and quadratic slopes of oppositional/aggressive behavior, between intervention status and slope of maternal depression, and between the slope of maternal depression and the slope of oppositional/aggressive behavior) were then tested individually to determine whether they significantly differed across groups. This model provided good fit to the data: χ^2 (df =196) = 323.957, p = .00; *CFI* = 0.949; *TLI* = 0.926; *RMSEA* = .042; *SRMR* = .037 (see Figure 22). There was a significant difference between the groups for the pathway between intervention and the linear slope of maternal depression: the association was not significant in the low group (B = 0.319, p = 0.415) but was significant in the high group (B= -0.747, p = .029), such that the intervention was associated decreases in maternal depression in the high group. There was also a significant difference between the groups for the pathway between the slope of maternal depression and the slope of oppositional/aggressive behavior: the association was not significant in the low group (B = 0.063, p = 0.414) but was significant in the high group (B= 0.518, p = .000), such that such that as maternal depression decreased, oppositional/aggressive behavior decreased. In addition, the indirect effect from the intervention to the linear slope of oppositional/aggressive behavior across ages 2-9 operating through maternal depression from

ages 2-5 was significant in the high group (B = -0.387, p = 0.234) but not in the low group (B = 0.020, p = 0.582). The groups did not differ in the direct path between the intervention and either the linear slope or quadratic slope of oppositional/aggressive behavior, both of which were not significant.

In summary, results of the multi-group models demonstrated that hypotheses were generally less well supported when the more conservative models were examined, whereas the less conservative model results were generally more in line with hypothesized differences of greater effects for families with children demonstrating higher baseline CP.

4.0 DISCUSSION

The first goal of the present study was to examine how baseline levels of child CP may moderate the effectiveness of the FCU intervention on reducing problematic parenting and the persistence of child CP by investigating change over time within a latent growth curve modeling framework (hypothesis 1a) and a group-based trajectory modeling framework (hypothesis 1b). Secondly, the current study sought to examine whether differences in engagement in the FCU intervention were associated with intervention effects on child behavioral and parenting outcomes (hypothesis 2), and to examine whether mediational pathways through which the FCU has been shown to reduce child CP – through improved parenting and improved maternal depression – were moderated by baseline child CP (hypotheses 3 and 4, respectively). Support was found for some, but not all, hypotheses. The intervention was associated with reduced growth in the slope of child CP from ages 2 through 9.5 across the full sample, extending findings from previous studies of intervention effects (Connell et al., 2008; Dishion et al., 2008; Dishion et al., 2014; Shaw et al., 2009). However, there was only partial and inconsistent support for the role of baseline CP as a moderator of intervention effects on CP. Only the less conservative multi-group model demonstrated moderation by baseline CP, such that the intervention was effective in reducing growth in CP in the "high" baseline group and not in the "low" baseline group. By contrast, both the more conservative multi-group model and the model testing the continuous

measure of baseline CP by intervention status interaction did not support moderation. Contrary to hypotheses, there were no direct effects of the intervention on the slope of maternal positive/neutral behavior from child ages 2 through 5 across the full sample, and baseline CP was not a significant moderator of this association. Also contrary to hypotheses, there were no differences in trajectory group membership related to intervention status. However, level of CP at baseline was linked to trajectories of CP over time suggesting that, not surprisingly, one potentially robust predictor of the shape and course of one's trajectory of CP is a child's initial level.

There was limited support for the hypothesis that level of engagement in the FCU would be associated with effectiveness of the intervention in levels of maternal positive/neutral behavior. Results demonstrated significant differences in the mean of maternal positive/neutral behavior at age 3, with the mean being higher for those who were assigned to the intervention group and participated in a feedback session after the age 2 assessment, and there was a similar trend level difference at age 4. There were no significant differences by engagement on child oppositional/aggressive behavior at any age.

Contrary to hypotheses, growth in maternal positive/neutral behavior did not mediate the path from intervention to growth in child CP, and further, this association was not moderated by baseline CP. Partially in line with hypotheses regarding the mediational role of maternal depression, the less conservative multi-group model demonstrated interesting group differences: the pathway from growth of maternal depression to growth of child oppositional/aggressive behavior was only significant for those with higher baseline CP, and there was a significant mediational effect of slope of maternal depression on the path from intervention to growth in child CP only for those with higher baseline CP. For the more conservative multi-group model

and the model including an interaction term involving a continuous measure of baseline CP, no differential effectiveness was found based on baseline CP. However, for the more conservative multi-group model, a significant association was evident across both groups between the slope of maternal depression and the linear slope of oppositional/aggressive behavior (B = 0.384, p = 0.001), such that as maternal depression decreased, oppositional/aggressive behavior decreased.

4.1 MODERATION OF DIRECT ASSOCIATIONS BETWEEN INTERVENTION AND OUTCOMES

It is promising that in the overall model, there was a significant effect of the FCU intervention on the growth of CP from age 2 out to child age 9.5. Interestingly, comparisons between mean levels of CP in the intervention and control groups in preliminary analyses demonstrated inconsistencies, as mean differences in problem behavior were only significant at some but not other ages (i.e., age 4 parent-reported externalizing, age 4 parent-reported Eyberg intensity and problem factors). Other studies examining related child outcomes in the current sample have found similar effects on the slope of behavior (e.g., child effortful control) but not individual time points (Chang et al, in press), which highlights the importance of exploring differences in change over time. These preliminary analyses demonstrated that the most robust effects appear to occur around child age 4, after families assigned to the FCU intervention have had the opportunity to participate in 2 annual FCUs.

The extent to which baseline CP significantly moderated intervention effects varied based on the outcome explored (i.e., parenting versus child CP) and how the analyses were conducted

(i.e., more versus less conservative approaches and continuous versus dichotomous baseline CP). Similar to results of previous parenting intervention studies examining moderation (Chamberlain et al., 2008; Reid et al., 2004; Shaw et al., 2006; Tein et al., 2004), the less conservative multi-group model supported moderation, such that the FCU intervention was effective for children with higher baseline levels of CP. However, this result must be tempered by the fact that moderation was not consistently supported. Differences in the results based on the type of analytic method used (e.g., comparing the less conservative multi-group framework to the more conservative multi-group model and to the continuous interaction model) suggest that any differences between high and low groups may be considered tenuous at best. Interestingly, analyses exploring individual assessment points and moderation by CP suggest that intervention effects on children's levels of parent-reported externalizing behavior at age 9.5 are significantly moderated by baseline CP, such that those with higher baseline CP demonstrated lower age 9.5 externalizing. Similarly, the interaction between intervention and level of CP at age 8.5 was significantly associated with levels of teacher-reported externalizing behavior at age 9.5, such that children with higher age 8.5 CP in the intervention group had lower age 9.5 externalizing behavior. It is difficult to speculate as to why the hypothesized patterns were most strongly supported at the last assessment, especially given the 7 year time lapse between the baseline measure and the age 9.5 outcome. However, it will be interesting for future studies to further explore outcomes out to even later ages to examine whether these differential effects may be seen as children make the transition from middle school age to early adolescence.

Findings examining moderation with the ECBI problem factor were contrary to hypotheses, in that intervention group differences were evident for children with low baseline CP but not children with high baseline CP. In contrast to the Eyberg intensity factor, the

oppositional/aggressive factor created from the CBCL, and the CBCL broad-band externalizing factor which all measure frequency or intensity of conduct problems, the Eyberg problem factor assesses how much of a problem a child's behavior is for the parent, which could explain the different pattern of associations seen for this variable. More specifically, those with lower baseline CP (both continuously and dichotomously scored) in the intervention group had lower age 4 and age 5 ECBI problem scores compared to those in the control group and children with higher baseline CP. The findings indicate the importance of not only considering the overall level or severity of child CP but also how much of a problem the behavior is viewed for the parent, which the ECBI problem scale assesses. The results for this measure suggest that parents report greater benefits in how problematic they view their child's behavior to be if they are involved in the FCU intervention and report lower baseline severity of their child's problems. Perhaps for these parents, changing their impressions of how problematic their child's behavior is may be more plausible, given that their children are not exhibiting the most intense/severe CP behaviors at baseline. Further analyses comparing parents' ratings of severity along with their ratings of how problematic their child's behavior is for them may further elucidate why there are differences when examining baseline CP as it relates to severity versus impression of problems outcomes.

As previously noted, a review of the extant literature on studies finding moderation by baseline CP found that the inclusion criteria for children within a sample matters: typically, studies involving children who are all within the clinically elevated range on baseline CP are less likely to find moderation than studies involving children who may be elevated but demonstrate more variability with regard to initial levels (Shelleby & Shaw, 2014). The current sample could be considered to fall somewhere between these two types of studies, with children required to be

above the mean on initial CP but not necessarily clinically elevated. Therefore, the modest findings with regard to baseline CP as a moderator may be related to the sample characteristics. The current sample is also novel compared to participants from other parenting intervention studies in three respects, which are related to one another: the intervention occurs annually across several years, it is relatively brief in duration compared to even other brief family-centered interventions (e.g., Incredible Years, Parent Management Training Oregon model), and children have been followed longitudinally for nearly a decade. Many of the other moderator studies involve pre/post designs of more standardized or manual-based 12- to 16-week intervention protocols. Other studies may have long term follow-up, but very few involve a design similar to that of the current study. One exception is the Fast-Track intervention, a multi-modal intervention including child, parent, and school components, that was administered for several years in which children were followed through adolescence. Although Fast Track did not begin in the toddlerhood period like the current ESM study, children were screened during kindergarten. Findings from Fast Track have shown lower symptom counts and diagnoses of certain behavioral disorders across 3rd, 6th, 9th and 12th grades, and fewer severe arrests through age 19 for children who had the highest baseline problem behavior (CPPRG, 2007, 2010, 2011). In terms of the magnitude of these moderation effects in absolute percentage points, in the highest risk group, the risk for conduct disorder was reduced by 16-21%, the risk for any externalizing disorder by 14-20%, and the risk of severe arrest by 47%. It will be interesting for further studies on the FCU intervention to examine additional outcome measures (e.g., arrest records, later diagnoses of behavioral disorders) to understand whether baseline risk is associated with these outcomes across later follow-ups, as was found for Fast Track.

In addition, another reason that the current study may have found inconsistent support for the hypothesis that stronger intervention effects would be found for families of children with higher baseline CP could be the added stressors stemming from the contexts in which some families live. The current study utilized a high-risk sample: not only were children potentially elevated on CP at baseline, but families also faced various other stressors that could have influenced the effects of the intervention. As previously described, eligibility criteria included meeting risks in at least 2 of 3 domains, defined as one standard deviation or more above normative averages on: (a) child behavior (conduct problems, high conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status), and (c) socio-demographic risk (low educational achievement and low family income using WIC criteria). Although Gardner et al. (2009) examined the influence of many contextual risks on intervention effectiveness across child ages 2, 3, and 4, further work is necessary to explore the influence of contextual risks over time. For example, in a recent follow-up of the same cohort, neighborhood deprivation moderated intervention response, such that intervention effects on teacher reports of child conduct problems at age 9.5 were stronger for those children living in moderately versus extremely deprived low-income neighborhoods (Shaw et al., 2015).

Although the FCU intervention has demonstrated effects on other measures of positive parenting in previous studies (e.g., Dishion et al., 2008; Chang et al., in press), the current analyses failed to find an effect of the FCU on *slope* of maternal positive/neutral behavior across child ages 2 to 5. However, there were differences in mean levels of positive/neutral behavior at child age 3 and for the mean across child ages 3, 4, and 5. By extending our examination of parenting out to age 5, we lessened our chances of finding significant differences due to the fact

that base rates of positive parenting decrease from the toddler period to the late preschool period across the full sample. In addition, some previous work has found that the FCU intervention tends to first improve positive behavior and subsequently lead to reductions in more negative parenting practices, such as coercion. For example, Sitnick et al. (in press) found that across child ages 2 through 5, high levels of parent-child positive engagement were associated with less parent-child coercion the following year. Although we focused on positive parenting, as interventions often find more success and openness from families if the focus is on increasing positive behaviors rather than instructing parents on what not to do (Dishion & Stormshak, 2007), it is possible that examining changes in negative parenting may be more important as children reach elementary school. Further work examining the dynamic process that occurs between positive parenting and harsh or negative parenting across time could help interventionists refine programs to more explicitly target parenting behaviors that are of critical importance to the overall change process.

With regard to the trajectory analyses, although baseline CP was associated with likelihood of group membership, intervention status was not. An important extension of these analyses would be to examine whether *within* different trajectory groups intervention status is associated with the slope of oppositional/aggressive behavior (rather than simply group membership itself), as being involved in the FCU intervention would be expected to be linked to greater decline in CP (in the declining trajectory groups) or perhaps less increase in CP (in the increasing trajectory groups) as compared to control children within these same groups. For example, Kellam et al. (2014) examined intervention effects within their trajectory classes and found effects within a persistent high class, with weaker effects in other classes. Such analyses would require estimating within class variance on the growth factors, which has disadvantages as

this approach is in contrast to the objective of reducing within-group variability (see Nagin & Odgers, 2010). Further, it would be interesting to examine differential intervention effects beyond simply an intent-to-treat design, as engagement in the intervention across time may be of importance in differentiating trajectories of CP. It could be that assignment to the intervention is not specific enough to differentiate trajectory group membership; however, identifying individuals who received adequate dosage versus those who did not could further distinguish trajectory group composition and how much change in CP is demonstrated over time.

The influence of engagement in the intervention, measured by participation in FB sessions, on parenting and child outcomes was varied. Although engagement was related to maternal positive/neutral behavior in some cases, it was not linked to changes in oppositional/aggressive behavior. Other more rigorous approaches for differentiating families who engage versus those who do could provide more nuanced ways of identifying those with meaningfully higher engagement in the FCU. For example, complier-average causal effect (CACE) modeling (e.g., Dishion et al., 2014; Jo, 2002) involves the estimation of unobserved engagement and nonengagement in the control group, which can then be compared over time with known engagement and nonengagement in the intervention condition. As previously noted, one prior study with the current sample utilized this technique and found that effect sizes on parent-reported oppositional behavior across ages 2-5 increased as a function of engagement (Dishion et al., 2014). This work could be extended to examine longer-term child CP and parenting outcomes. Future studies could also examine observed engagement "in the moment" by utilizing observational assessments of sessions between parents and their therapists, as meaningful engagement in an intervention goes beyond simply attending sessions. The combination of engagement and motivational factors, such as parents' reported desire for change

and willingness to try new techniques, could also be particularly meaningful in the context of a prevention study such as the FCU, as families are not treatment seekers but instead are recruited to participate.

While changes in different measures of parenting were found to significantly mediate the effect of the FCU intervention on child behavior at earlier time points (Shaw et al., 2009), these findings did not extend to the dual process growth model involving maternal positive/neutral behavior and changes in oppositional/aggressive behavior. As noted, the overall model demonstrated nonsignificant variance for the slope, suggesting that all individuals demonstrated similar growth over time. Therefore, there was limited variability that could be explained by the intervention (or other predictors). In addition to the aforementioned possibility of examining more negative or harsh parenting as children reach school age, other potentially salient family process factors that may be relevant at early school age, such as parent/child relationship quality, may elucidate additional avenues through which the FCU intervention could improve family functioning and in turn, reduce child CP.

Only the less conservative dual process growth model involving maternal depression as a mediator suggested that the FCU was associated with reduced maternal depression which, in turn, was associated with reduced growth in CP for children with high baseline CP. However, none of the other models found an intervention effect on growth in depression, although the more conservative multi-group model was found to demonstrate a significant slope to slope effect, such that as maternal depression decreased, child oppositional/aggressive behavior also decreased. Similar to the parenting findings from previous studies, most analyses have focused on changes in depression at individual time points (e.g., age 3 depression controlling for baseline levels in Shaw et al., 2009) rather than looking at growth over time. An alternative could be to

examine differences among mothers with and without clinically elevated depressive symptoms to see whether intervention effects in depression differ depending on level of initial risk. Gardner et al. (2009) found that maternal depression did not significantly moderate intervention effects on child CP outcomes, but it remains possible that baseline maternal depression might be related to the intervention's influence on either maternal depression and/or parenting outcomes.

4.1.1 Limitations and future directions

There are important limitations that should be noted when interpreting the results of this study. First, the participants were recruited through WIC centers and were targeted based on meeting risk criteria in family, child, and/or sociodemographic domains. Although focusing on a high risk sample is certainly important and could be considered a strength, the sample is not representative of the population at large. One reason this is particularly important in interpreting the current results is that previous moderator studies have demonstrated differences in likelihood of finding moderation by baseline risk as a consequence of characteristics of the sample. Studies in which all children are clinically elevated at baseline often find no significant moderation (Gardner, Hutchings, Bywater, & Whitaker, 2010; Lavigne et al., 2008), whereas for those involving samples in which not all children were clinically elevated, the more problematic a child's behavior was rated at baseline, the greater change in problem behavior occurred (Chamberlain et al., 2008; M. J. Reid et al., 2004; Shaw et al., 2006; Tein, Sandler, MacKinnon, & Wolchik, 2004). As the current sample of children were above mean scores on baseline CP (although a significant minority were not clinically elevated), this could have influenced the likelihood of finding moderation by baseline CP.

It also must be noted that the main child CP outcome in the current study was comprised of only 8 items to capture behaviors that were consistently measured across the full period from age 2 to age 9.5. In longitudinal studies involving young children, there is a tension between capturing developmentally appropriate indicators of child problem behavior while at the same time enabling researchers to model growth in a singular construct over time. Piecewise growth modeling may be an important future direction to allow for the most developmentally meaningful measures of behavior to be captured at younger versus older ages, which would then allow for associations between a more comprehensive set of earlier indicators of CP and later indicators of CP to be explored. For example, in the toddlerhood period, robust indicators of underlying conduct problems may be different than those found during the school age period, and associations between earlier and later indicators could be examined.

There were also some methodological limitations to the current study. It may be considered difficult to draw firm conclusions from the results based on the differences demonstrated in the more and less conservative multi-group modeling frameworks. Although this "dual" approach was chosen to be comprehensive and transparent in how these research questions were examined, the important discrepancies suggests that any differences that were demonstrated with less conservative modeling techniques may not be as trustworthy. The more stringent and more parsimonious model results should be favored based on these issues. With regard to the dual process mediation models, the argument could be made that a purer temporal precedence and limited overlap in the timing of the mediators and outcomes would be preferred. For instance, examining growth in parenting and depression across the early stage of the study and growth in child CP at the later stage would be considered a stricter test of the causal process. Because of the interest in examining whether there were differences in outcomes at each

individual assessment point, multiple analyses were conducted in the current study. The extent to which alpha inflation may have occurred due to the number of analyses conducted should not be ignored.

Although teacher reports of child CP were available at some assessment points and observational measures were used when available, mothers reported on depressive symptoms and child problem behavior. Experimental randomized controlled trials do protect against informant bias to some extent, but additional measures of parental and child variables through multiple means such as observations and peer reports would also be of value. In addition, there are a multitude of ways to define baseline CP. Although the current study attempted to be comprehensive in exploring both continuous and dichotomous measures, there are several ways the cutoff could be defined.

4.1.2 Clinical implications

One encouraging finding from the more conservative multi-group models is that the rate of change in child oppositional/aggressive behavior was consistently found to be steeper for children with higher baseline CP. This could be demonstrating regression to the mean, but the significant overall FCU effects and failure to find less change for children with higher versus lower baseline CP is promising. Showing that individuals with the most elevated problem behavior benefit from interventions is encouraging and provides evidence against the notion that early-starting children are destined to escalate in their antisocial behavior across time (e.g., Dilulio, 1995).

Clinical significance of change in behavior would be another important indicator of intervention effects to pursue in future studies. Growth in CP over time provides valuable information about how behavior may decline (or increase) more generally, but analyses examining meaningful change scores or exploring percentages of children who fall within clinical ranges at each wave and improve at the subsequent wave would provide valuable information about overall functioning compared to normative and clinical samples.

4.1.3 Summary

The present study demonstrated that the FCU intervention was effective in reducing growth in child CP across ages 2 to 9.5. The results advance our understanding of the influence of baseline CP on the effectiveness of the FCU intervention, suggesting that baseline CP may have some limited influence, but on the whole, it is not overwhelmingly predictive of intervention effects. Similarly, level of engagement in the intervention as measured by FB sessions attended has marginal influence on intervention and control group differences. Although it could be considered encouraging that the FCU intervention may not be differentially effective for children with higher and lower baseline CP, with main effects found across the whole group, it still must be acknowledged that the broader intervention literature has found that a substantial subgroup of children and families involved in parenting interventions are not reaching the benefit that they might need. Null moderator findings are informative for describing where differences do not exist but they provide little information about ways to improve interventions for non-responders (Shelleby & Shaw, 2014), which may require examining subgroup differences in newer ways.

Table 1. Demographics and Descriptive Statistics

	Total sample	Pittsburgh	Eugene	Charlottesville
Race				
African American	27.9%	50.4%	1.5%	33.5%
European American	50.1%	38.1%	70.0%	39.4%
Biracial	13.0%	10.0%	23.5%	15.4%
Other	8.9%	1.5%	5.0%	11.7%
Ethnicity				
Hispanic	13.4%	1.8%	20.0%	20.7%
Child age	*M* = 28.2 (*SD* = 3.28)	*M* = 28.3 (*SD* = 3.49)	*M* = 28.5 (*SD* = 2.91)	*M* = 27.7 (*SD* = 3.43)
Child gender	49.5% female	49.6% female	49.8% female	48.9% female
Annual family income <$20,000	66.3%	70.5%	62.4%	66.0%
Family members per household	*M* = 4.5 (*SD* = 1.63)	*M* = 4.4 (*SD* = 1.55)	*M* = 4.5 (*SD* = 1.67)	*M* = 4.6 (*SD* = 1.66)
Education				
High school	41.0%	42.5%	39.5%	40.0%
1-2 years post high school	32.7%	35.7%	34.7%	25.5%
Age 2 measure descriptives				
	Total sample		Percent clinical	
Child conduct problems				
Eyberg Intensity (*t* score)	*M* = 59.03 (*SD* = 7.96)		44.2% clinical	
Eyberg Problem (*t* score)	*M* = 59.18 (*SD* = 8.46)		44.3% clinical	
CBCL Externalizing (*t* score)	*M* = 59.49 (*SD* = 9.39)		48.6% clinical	
Maternal depression (CES-D)	*M* = 16.75 (*SD* = 10.66)		41.5% clinical	

Table 2: Intervention and Control Group Mean Differences in Parenting and Child Behavior

Outcome Variable	Mean (SD)	Mean (SD)	
	Control Group	Treatment Group	*P* value
Observed Maternal Positive/Neutral			
Age 2	0.480 (0.141)	0.473 (0.144)	ns ($p = .563$)
Age 3	0.490 (0.145)	0.525 (0.143)	$p < .01$ **
Age 4	0.434 (0.143)	0.450 (0.150)	*ns* ($p = .197$)
Age 5	0.516 (0.142)	0.535 (0.146)	*ns* ($p = .120$)
Mean ages 3, 4, 5	0.483 (0.120)	0.503 (0.125)	$p < .05$ *
Parent Reported Oppositional/Aggressive			
Age 2	5.102 (2.560)	5.319 (2.785)	*ns* ($p = .274$)
Age 3	4.440 (2.763)	4.399 (2.806)	*ns* ($p = .852$)
Age 4	4.142 (2.774)	3.748 (2.863)	$p = .081$†
Age 5	3.769 (2.902)	3.449 (2.802)	*ns* ($p = .166$)
Age 7	3.879 (3.017)	3.788 (3.250)	*ns* ($p = .728$)
Age 8	3.073 (2.961)	3.154 (3.022)	*ns* ($p = .750$)
Age 9	3.096 (2.913)	2.874 (2.789)	*ns* ($p = .346$)
Mean ages 3, 4, 5, 7, 8, 9	3.762 (2.391)	3.626 (2.382)	*ns* ($p =$. 447)
Parent Reported Externalizing Factor			
Age 2	20.570 (7.040)	20.834 (7.551)	*ns* ($p = .626$)
Age 3	17.862 (8.164)	17.615 (7.941)	*ns* ($p = .694$)
Age 4	16.690 (8.290)	15.063 (8.893)	$p < .05$ *
Age 5	12.051 (8.484)	11.130 (8.209)	*ns* ($p = .173$)
Age 7	12.962 (9.234)	12.723 (9.902)	*ns* ($p = .766$)
Age 8	11.045 (9.560)	10.757 (9.140)	*ns* ($p = .717$)
Age 9	11.113 (8.992)	10.277 (9.072)	*ns* ($p = .263$)
Mean ages 3, 4, 5, 7, 8, 9	13.789 (7.501)	13.294 (7.249)	*ns* ($p = .373$)
Parent Reported Eyberg Intensity Factor			
Age 2	129.404 (27.523)	127.460 (28.613)	*ns* ($p = .350$)
Age 3	130.134 (31.587)	125.786 (33.847)	$p = .09$†
Age 4	128.431 (32.306)	119.661 (34.664)	$p < .01$**
Age 5	120.170 (34.541)	116.630 (35.336)	*ns* ($p = .210$)
Age 8	104.812 (39.719)	101.645 (38.744)	*ns* ($p = .344$)
Mean ages 3, 4, 5, 8	120.850 (30.187)	117.087 (30.477)	$p = .10$†
Parent Reported Eyberg Problem Factor			
Age 2	14.209 (6.517)	14.148 (6.481)	*ns* ($p = .899$)
Age 3	14.685 (7.926)	14.048 (7.768)	*ns* ($p = .301$)
Age 4	15.246 (8.312)	13.813 (8.604)	$p < .05$*

Table 2: Intervention and Control Group Mean Differences in Parenting and Child Behavior

Outcome Variable	Mean (SD)	Mean (SD)	
	Control Group	Treatment Group	*P* value
Age 5	14.026 (8.701)	13.429 (8.737)	*ns* (p = .397)
Age 8	9.904 (9.005)	9.463 (8.591)	*ns* (p = .563)
Mean ages 3, 4, 5, 8	13.515 (7.093)	12.841 (7.093)	*ns* (p = .209)
Teacher Reported Oppositional/Aggressive			
Age 7	2.164 (3.097)	1.753 (3.062)	*ns* (p = .240)
Age 8	2.000 (3.229)	1.918 (3.179)	*ns* (p = .803)
Age 9	2.041 (3.290)	1.762 (2.668)	*ns* (p = .362)
Mean ages 7, 8, 9	2.187 (3.019)	1.946 (2.859)	*ns* (p = .353)
Teacher Reported Externalizing Factor (raw)			
Age 7	8.623 (10.532)	6.870 (9.678)	*ns* (p = .125)
Age 8	8.298 (10.731)	7.659 (10.017)	*ns* (p = .550)
Age 9	8.355 (11.006)	6.723 (8.431)	$p = .10^{\dagger}$
Mean ages 7, 8, 9	8.888 (10.266))	7.507 (9.068)	*ns* (p = .107)
Child Reported Self Report of Delinquency			
Age 9	2.172 (3.290)	2.258 (2.962)	*ns* (p = .757)

Table 3: Hierarchical Multiple Regression Analyses Exploring Baseline CP as a Moderator on Parenting Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Maternal positive/neutral behavior (models include age 2 positive/neutral behavior)			
Outcome (controlling for positive/neutral age 2)	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Maternal positive/neutral age 3	.087 (p = .094)†	.126 (p < .01)**	-.067 (p = .194)
Maternal positive/neutral age 4	.026 (p = .625)	.062 (p = .097)	.022 (p = .688)
Maternal positive/neutral age 5	.018 (p = .741)	.071 (p = .055)	-.021 (p = .700)
Outcome (controlling for positive/neutral age 2)	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Maternal positive/neutral age 3	.126 (p < .01)**	.198 (p < .01)**	-.133 (p < .05)*
Maternal positive/neutral age 4	.091 (p = .084)†	.104 (p < .05)*	-.075 (p = .236)
Maternal positive/neutral age 5	.025 (p = .633)	.119 (p < .05)*	-.089 (p = .150)

Table 4: Hierarchical Multiple Regression Analyses Exploring Baseline CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Parent reported Oppositional/Aggressive Behavior Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age 3	.418 ($p < .01$)*	.004 ($p = .911$)	-.052 ($p = .324$)
Oppositional/aggressive age 4	.380 ($p < .01$)*	-.055 ($p = .136$)	-.047 ($p = .389$)
Oppositional/aggressive age 5	.380 ($p < .01$)*	-.053 ($p = .159$)	-.070 ($p = .196$)
Oppositional/aggressive age 7.5	.273 ($p < .01$)*	-.007 ($p = .870$)	-.025 ($p = .673$)
Oppositional/aggressive age 8.5	.267 ($p < .01$)*	.027 ($p = .508$)	-.042 ($p = .495$)
Oppositional/aggressive age 9.5	.340 ($p < .01$)*	-.032 ($p = .418$)	-.091 ($p = .114$)
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age 3	.339 ($p < .01$)*	-.005 ($p = .924$)	.008 ($p = .895$)
Oppositional/aggressive age 4	.334 ($p < .01$)*	-.045 ($p = .381$)	-.026 ($p = .675$)
Oppositional/aggressive age 5	.326 ($p < .01$)*	-.035 ($p = .489$)	-.028 ($p = .659$)
Oppositional/aggressive age 7.5	.226 ($p < .01$)*	-.027 ($p = .620$)	.044 ($p = .503$)
Oppositional/aggressive age 8.5	.196 ($p < .01$)*	.011 ($p = .841$)	.041 ($p = .540$)
Oppositional/aggressive age 9.5	.255 ($p < .01$)*	-.030 ($p = .577$)	.001 ($p = .988$)

Parent-reported Externalizing Behavior Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 3	.446 ($p < .01$)*	-.002 ($p = .950$)	-.054 ($p = .307$)
Externalizing age 4	.327 ($p < .01$)*	-.085 ($p < .05$)*	.021 ($p = .701$)
Externalizing age 5	.355 ($p < .01$)*	-.050 ($p = .195$)	-.060 ($p = .280$)
Externalizing age 7.5	.259 ($p < .01$)*	-.005 ($p = .895$)	.009 ($p = .881$)
Externalizing age 8.5	.316 ($p < .01$)*	-.003 ($p = .934$)	-.076 ($p = .209$)
Externalizing age 9.5	.355 ($p < .01$)*	-.041 ($p = .303$)	-.118 ($p < .05$)*
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 3	.345 ($p < .01$)*	-.026 ($p = .585$)	.037 ($p = .538$)
Externalizing age 4	.275 ($p < .01$)*	-.127 ($p < .05$)*	.072 ($p = .253$)
Externalizing age 5	.274 ($p < .01$)*	-.055 ($p = .295$)	.013 ($p = .840$)
Externalizing age 7.5	.216 ($p < .01$)*	-.048 ($p = .375$)	.084 ($p = .201$)
Externalizing age 8.5	.209 ($p < .01$)*	-.020 ($p = .716$)	.043 ($p = .523$)
Externalizing age 9.5	.242 ($p < .01$)*	-.035 ($p = .521$)	-.007 ($p = .919$)

Parent-reported Eyberg Intensity Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Eyberg Intensity age 3	.508 ($p < .01$)**	-.046 ($p = .181$)	-.046 ($p = .376$)

Table 4: Hierarchical Multiple Regression Analyses Exploring Baseline CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Eyberg Intensity age 4	.399 ($p < .01$)**	-.114 ($p < .01$)**	.028 ($p = .596$)
Eyberg Intensity age 5	.451 ($p < .01$)**	-.042 ($p = .260$)	-.058 ($p = .279$)
Eyberg Intensity age 8.5	.386 ($p < .01$)**	-.030 ($p = .461$)	-.080 ($p = .184$)
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Eyberg Intensity age 3	.384 ($p < .01$)**	-.081 ($p = .096$)	.052 ($p = .388$)
Eyberg Intensity age 4	.341 ($p < .01$)**	-.153 ($p < .01$)**	.065 ($p = .293$)
Eyberg Intensity age 5	.351 ($p < .01$)**	-.032 ($p = .536$)	-.013 ($p = .838$)
Eyberg Intensity age 8.5	.253 ($p < .01$)**	-.064 ($p = .245$)	.076 ($p = .253$)
Parent-reported Eyberg Problem Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Eyberg Problem age 3	.308 ($p < .01$)**	-.032 ($p = .396$)	.015 ($p = .786$)
Eyberg Problem age 4	.186 ($p < .01$)**	-.072 (p=.062)†	.121 ($p < .05$)**
Eyberg Problem age 5	.303 ($p < .01$)**	-.026 ($p = .507$)	.017 ($p = .762$)
Eyberg Problem age 8.5	.343 ($p < .01$)**	-.024 ($p = .568$)	-.082 ($p = .188$)
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Eyberg Problem age 3	.263 ($p < .01$)**	-.092 (p=.068)†	.106 (p=.092)†
Eyberg Problem age 4	.156 (p <.01)**	-.182 ($p < .01$)**	.192 ($p < .01$)**
Eyberg Problem age 5	.202 ($p < .01$)**	-.093 (p=.080)†	.128 (p=.051)*
Eyberg Problem age 8.5	.245 ($p < .01$)**	-.041 ($p = .468$)	.044 ($p = .521$)
Teacher-reported Oppositional/Aggressive Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age 7.5	-.047 ($p = .586$)	-.048 ($p = .386$)	.103 ($p = .231$)
Oppositional/aggressive age 8.5	-.049 ($p = .537$)	-.009 ($p = .855$)	.099 ($p = .211$)
Oppositional/aggressive age 9.5	. 048 ($p = .517$)	-.024 ($p = .626$)	.025 ($p = .735$)
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age 7.5	-.010 ($p = .902$)	-.102 ($p = .175$)	.101 ($p = .270$)
Oppositional/aggressive age 8.5	.009 ($p = .895$)	-.005 ($p = .943$)	-.009 ($p = .909$)
Oppositional/aggressive age 9.5	.033 ($p = .632$)	-.027 ($p = .678$)	.003 ($p = .967$)
Outcome	Age 5 CP (continuous ECBI intensity)	Intervention	CP X Intervention
Oppositional/aggressive age 7.5	.081 ($p = .286$)	-.062 ($p = .257$)	.078 ($p = .310$)
Oppositional/aggressive age 8.5	-.010 ($p = .898$)	-.040 (p - .440)	.110 ($p = .137$)
Oppositional/aggressive age 9.5	.084 ($p = .244$)	-.016 ($p = .746$)	-.059 ($p = .417$)
Outcome	Age 5 CP (dichotomous	Intervention	CP X

Table 4: Hierarchical Multiple Regression Analyses Exploring Baseline CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

	ECBI intensity)		Intervention
Oppositional/aggressive age 7.5	.034 (*p* = .657)	-.125 (*p*=.058)†	.109 (*p* = .193)
Oppositional/aggressive age 8.5	-009 (*p* = .902)	-.092 (*p* = .149)	.103 (*p* = .190)
Oppositional/aggressive age 9.5	.092 (*p* = .189)	-.016 (*p* = .790)	-.004 (*p* = .956)
Teacher-reported Externalizing Outcomes			
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 7.5	-.032 (*p* = .709)	-.070 (*p* = .204)	.087 (*p* = .314)
Externalizing age 8.5	-.064 (*p* = .415)	-.029 (*p* = .571)	.098 (*p* = .213)
Externalizing age 9.5	.069 (*p* = .343)	-.063 (*p* = .193)	-.030 (*p* = .677)
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 7.5	.008 (*p* = .923)	-.014 (*p* = .128)	.084 (*p* = .362)
Externalizing age 8.5	-.016 (*p* = .823)	-.031 (*p* = .647)	.003 (*p* = .975)
Externalizing age 9.5	.044 (p = .523)	-.036 (p = .575)	-.049 (p = .531)
Outcome	Age 5 CP (continuous ECBI intensity)	Intervention	CP X Intervention
Externalizing age 7.5	.102 (*p* = .181)	-.083 (*p* = .130)	.060 (*p* = .429)
Externalizing age 8.5	.040 (*p* = .591)	-.054 (*p* = .299)	.075 (*p* = .307)
Externalizing age 9.5	.138 (*p* = .052)†	-.055 (*p* = .275)	-.099 (*p* = .167)
Outcome	Age 5 CP (dichotomous ECBI intensity)	Intervention	CP X Intervention
Externalizing age 7.5	.022 (*p* = .772)	-.145 (*p*=.029)*	.105 (*p* = .212)
Externalizing age 8.5	.028 (*p* = .692)	-.087 (*p* = .173)	.056 (*p* = .469)
Externalizing age 9.5	.131 (*p* = .058)†	-.040 (*p* = .509)	-.038 (*p* = .622)
Child self-report of delinquency (SRD)			
Outcome	Baseline CP (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Self-Report Delinquency age 9.5	-.112 (*p* = .062)	.027 (*p* = .652)	.007 (*p* = .927)
Outcome	Baseline CP (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Self-Report Delinquency age 9.5	-.070 (*p* = .259)	.031 (*p* = .475)	.002 (*p* = .968)
Outcome	Age 5 CP (dichotomous ECBI intensity)	Intervention	CP X Intervention
Self-Report Delinquency age 9.5	.029 (*p* = .638)	-.006 (*p* = .919)	.036 (*p* = .603)
Outcome	Age 5 CP (continuous ECBI intensity)	Intervention	CP X Intervention
Self-Report Delinquency age 9.5	.024 (*p* = .700)	.012 (*p* = .798)	-.019 (*p* = .765)

Figure 1: Interaction between Baseline CP and Intervention on Maternal Positive/Neutral Behavior at Age 3 (Dichotomous Baseline CP)

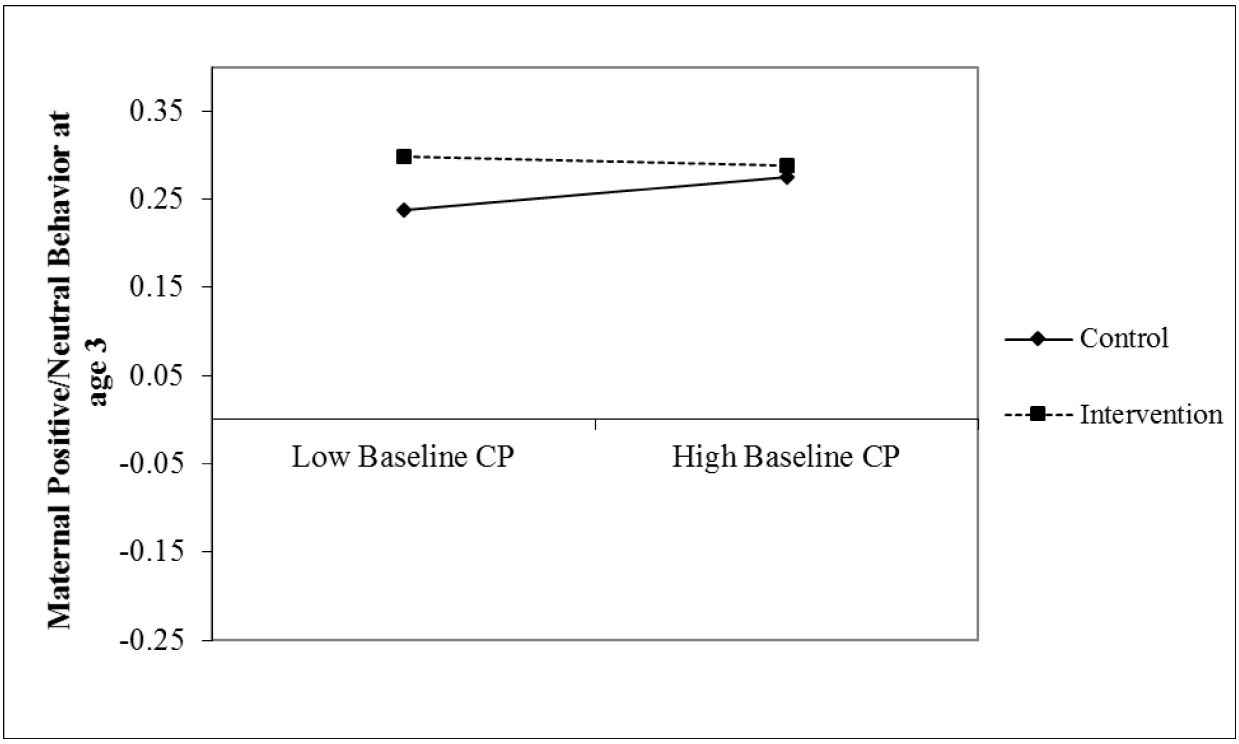


Figure 2: Interaction between Baseline CP and Intervention on Parent-Reported Externalizing Behavior at Age 9.5 (continuous baseline CP)

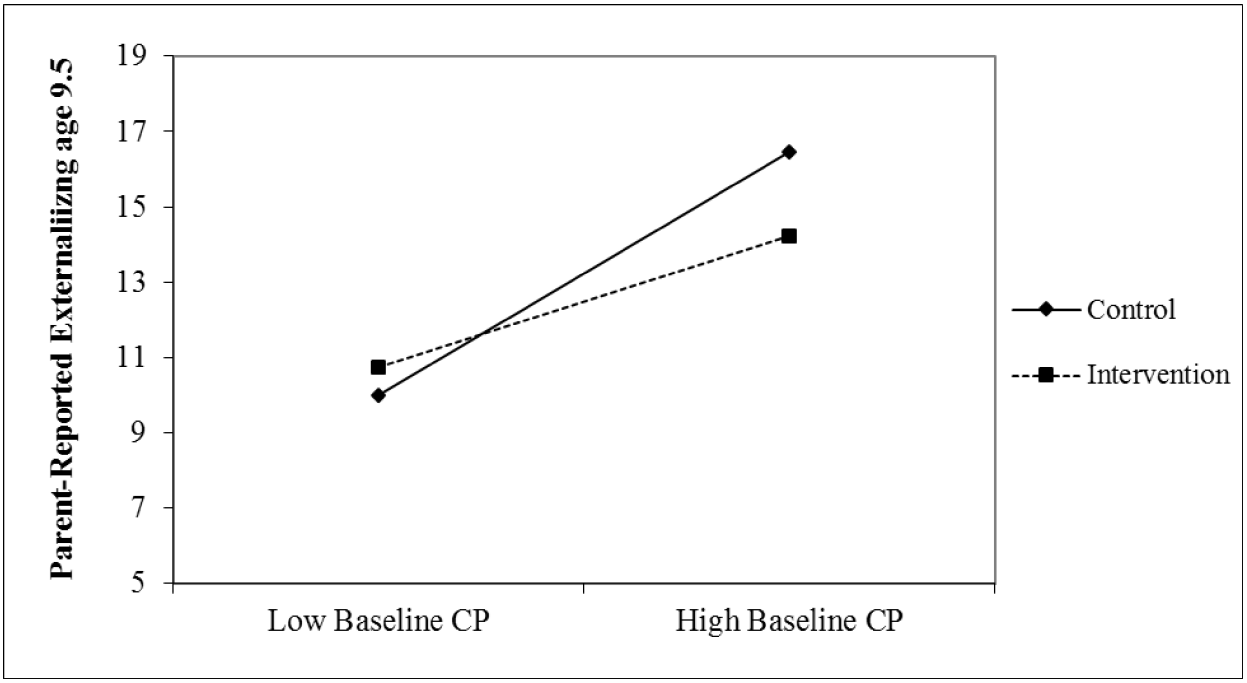


Figure 3: Interaction between Baseline CP and Intervention on Parent-Reported Eyberg Problem Behavior at Age 4 (Dichotomous Baseline CP)

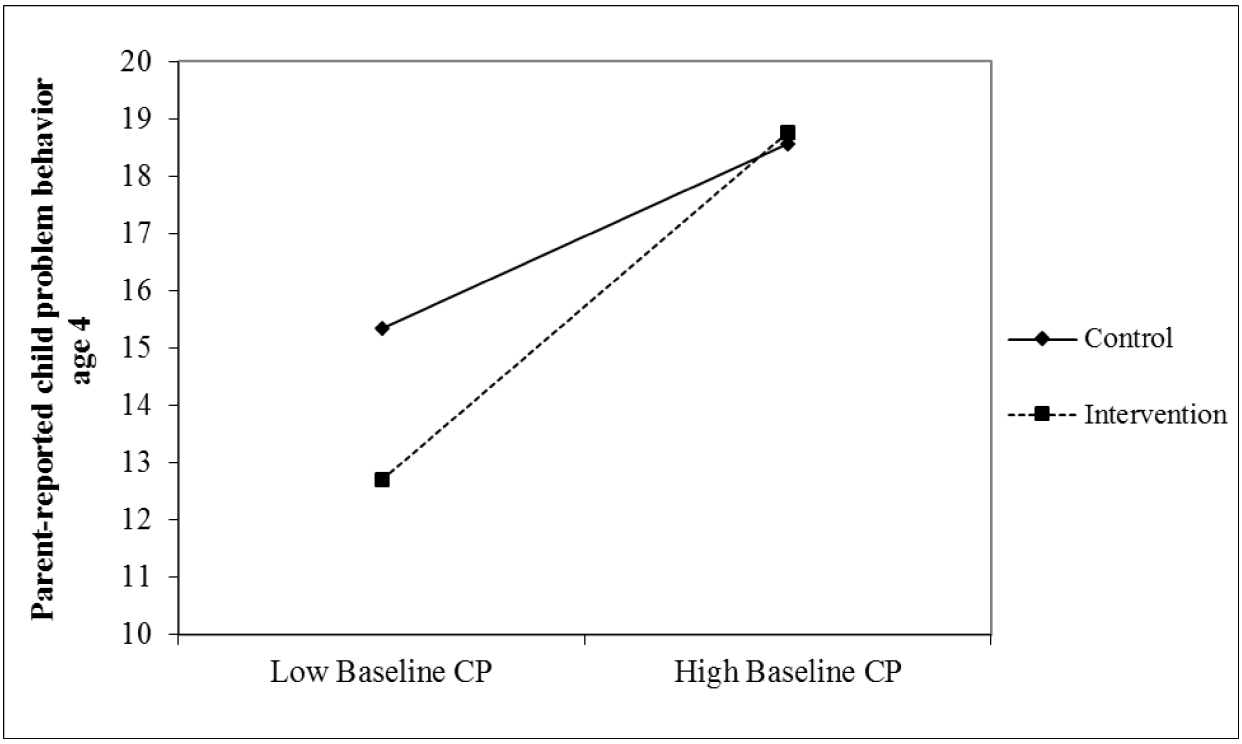


Figure 4: Interaction between Baseline CP and Intervention on Parent-Reported Eyberg Problem Behavior at Age 4 (Dichotomous Baseline CP)

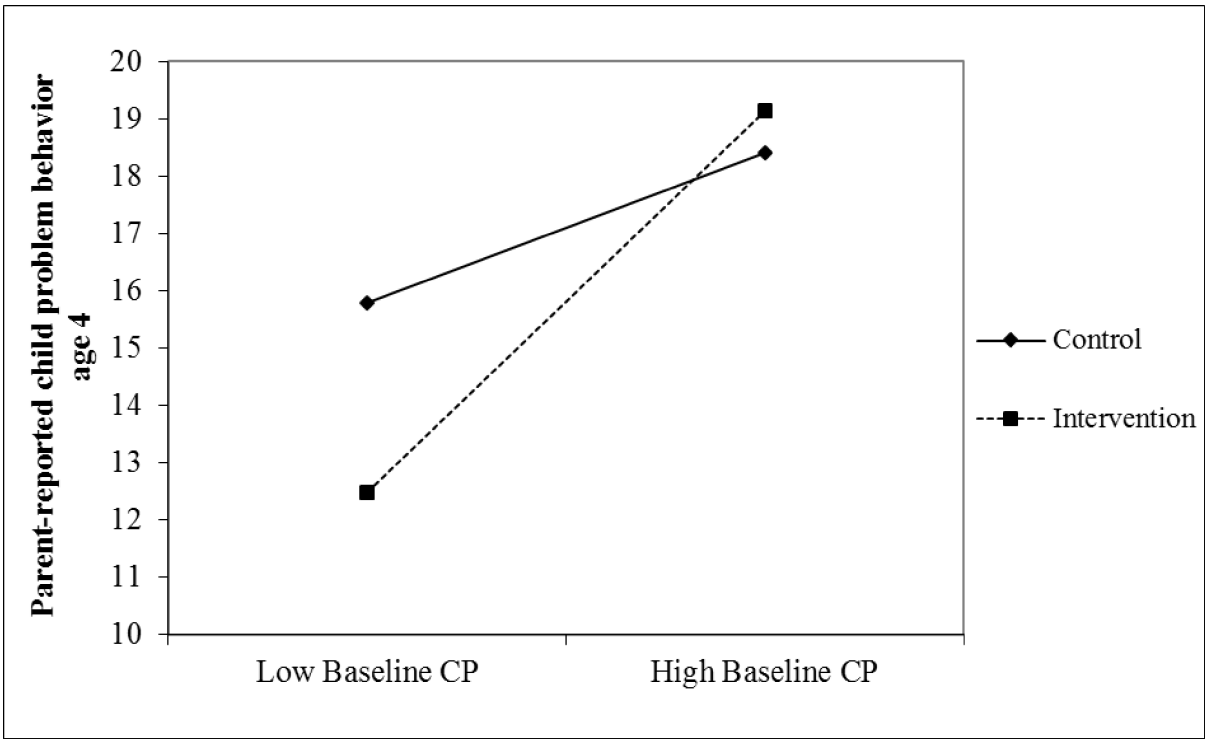


Figure 5: Interaction between Baseline CP and Intervention on Parent-Reported Eyberg Problem Behavior at Age 5 (Dichotomous Baseline CP)

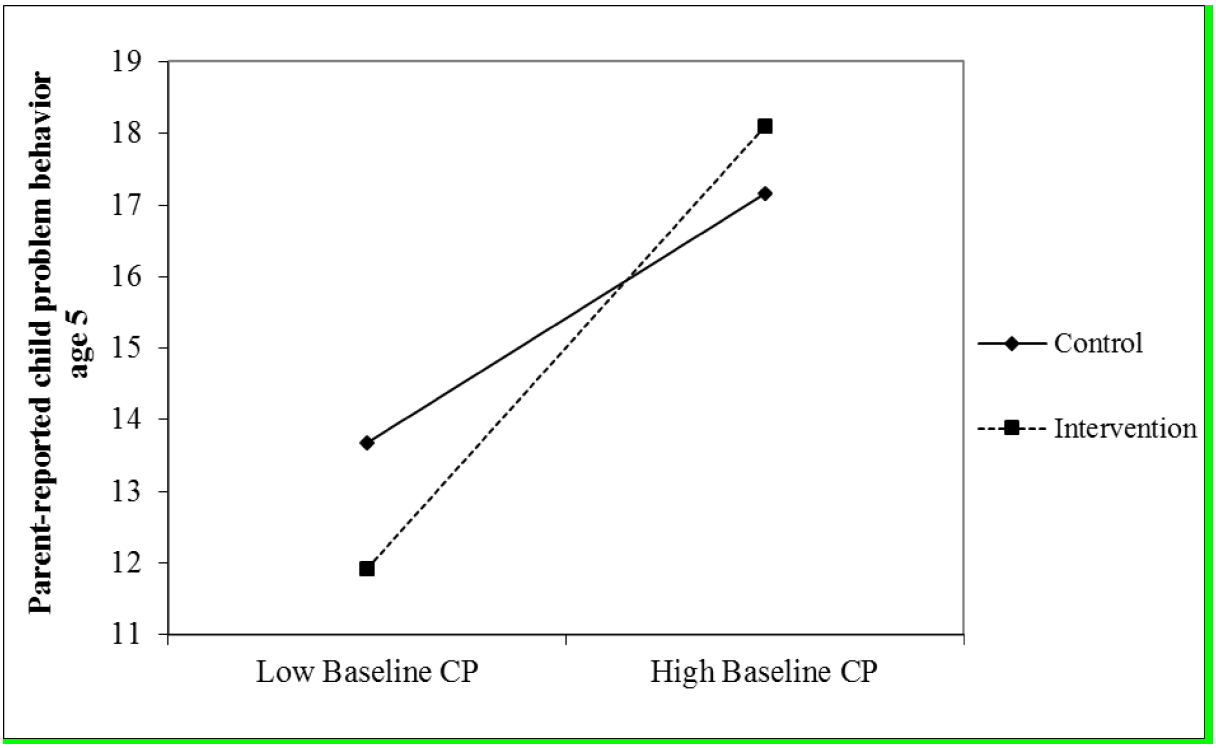


Table 5: Hierarchical Multiple regression Analyses Exploring the Previous Measure of CP as a Moderator on Parenting Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Positive/Neutral Behavior			
Outcome (controlling for positive/neutral age 2)	CP at previous age (continuous ECBI intensity)	Intervention	CP X Intervention
Positive/neutral age 4	.017 (p = .768) (age 3)	.070 (p = .069)†	.021 (p = .708)
Positive/neutral age 5	.014 (p = .811) (age 3)	.067 (p = .079)†	.010 (p = .863)
Outcome (controlling for positive/neutral age 2)	CP at previous age (dichotomous ECBI intensity)	Intervention	CP X Intervention
Positive/neutral age 4	.010 (p = .846) (age 3)	.048 (p = .361)	.041 (p = .518)
Positive/neutral age 5	-.002 (p = .963)(age 4)	.082 (p=.093)†	-.038 (p = .529)

Table 6: Hierarchical Multiple Regression Analyses Exploring the Previous Measure of CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Parent-reported Oppositional/Aggressive Behavior Outcomes			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	CP X Intervention
Oppositional/aggressive age 4	.612 (p < .01) (age 3)**	-.028 (p = .408)	-.089 (p = .073)†
Oppositional/aggressive age 5	.550 (p <.01) (age 4)**	-.009 (p = .804)	-.053 (p = .305)
Oppositional/aggressive age 7.5	.525 (p < .01) (age 5)**	.018 (p = .629)	-.040 (p = .436)
Oppositional/aggressive age 8.5	.526 (p < .01) (age 5)**	.059 (p= .131)	-.071 (p = .187)
Oppositional/aggressive age 9.5	.661 (p <.01) (age 8.5)**	-.025 (p = .465)	-.025 (p = .574)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	CP X Intervention
Oppositional/aggressive age 4	.495 (p <.01) (age 3)**	-.017 (p = .727)	-.037 (p=.520)
Oppositional/aggressive age 5	.411 (p <.01) (age 4)**	-.020 (p = .675)	-.045 (p = .450)
Oppositional/aggressive age 7.5	.413 (p < .01) (age 5)**	-.004 (p = .940)	-.002 (p = .967)
Oppositional/aggressive age 8.5	.322 (p < .01) (age 5)**	.054 (p = .334)	-.025 (p = .711)
Oppositional/aggressive age 9.5	.535 (p < .01) (age 8.5)**	-.022 (p = .603)	-.050 (p = .367)
Parent-reported Externalizing Behavior Outcomes			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	CP X Intervention
Externalizing age 4	.583 (p < .01) (age 3)**	-.061 (p=.073)†	-.056 (p = .261)
Externalizing age 5	.603 (p < .01) (age 4)**	.002 (p = .947)	-.082 (p=.111)
Externalizing age 7.5	.566 (p <.01) (age 5)**	.019 (p = .602)	-.072 (p = .156)
Externalizing age 8.5	.564 (p <.01) (age 5)**	.038 (p = .317)	-.105 (p <.05)*

Table 6: Hierarchical Multiple Regression Analyses Exploring the Previous Measure of CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

Externalizing age 9.5	.672 (*p* <.01) (age 8.5)**	-.034 (*p* = .297)	.001 (*p* = .983)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	CP X Intervention
Externalizing age 4	.472 (*p* <.01) (age 3)**	-.066 (*p* = .166)	-.004 (*p* = .946)
Externalizing age 5	.462 (*p* <.01) (age 4)**	-.004 (*p* = .938)	-.057 (*p* = .329)
Externalizing age 7.5	.424 (*p* <.01) (age 5)**	.006 (*p* = .907)	-.021 (*p* = .722)
Externalizing age 8.5	.457 (*p* <.01) (age 5)**	.043 (*p* = .377)	-.070 (*p* = .249)
Externalizing age 9.5	.558 (*p* <.01) (age 8.5)**	-.036 (*p* - .388	-.037 (*p* = .498)
Parent-reported Eyberg Intensity Outcomes			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	CP X Intervention
Eyberg Intensity age 4	.674 (*p* <.01) (age 3)**	-.091 (*p* <.01)**	-.028 (*p* = .525)
Eyberg Intensity age 5	.755 (*p* <.01) (age 4)**	.022 (*p*= .458)	-.064 (*p* = .146)
Eyberg Intensity age 8.5	.681 (*p* < .01) (age 5)**	.025 (*p* = .461)	-.050 (*p* = .291)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	CP X Intervention
Eyberg Intensity age 4	. 522 (*p* < .01) (age 3)**	-0.125 (*p* <.01)**	.041 (*p* = .456)
Eyberg Intensity age 5	. 593 (*p* <.01) (age 4)**	.004 (*p* = .928)	-.055 (*p* = .308)
Eyberg Intensity age 8.5	. 529 (*p* < .01) (age 5)**	0.001 (*p* = .985)	-0.022 (*p* = .708)
Parent-reported Eyberg Problem Outcomes			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	CP X Intervention
Eyberg Problem age 4	.563 (*p* < .01) (age 3)**	-.041 (*p* = .246)	-.059 (*p* = .256)
Eyberg Problem age 5	.534 (*p* < .01) (age 4)**	.025 (*p* = .487)	.034 (*p* = .515)
Eyberg Problem age 8.5	.589 (*p* < .01) (age 5)**	.030 (*p* = .430)	-.058 (*p* = .277)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	CP X Intervention
Eyberg Problem age 4	.420 (*p* <.01) (age 3)**	-.067 (*p* = .180)	.031 (*p* = .607)
Eyberg Problem age 5	.429 (*p* <.01) (age 4)**	-.049 (*p* = .294)	.082 (*p*=.157)
Eyberg Problem age 8.5	.421 (*p* < .01) (age 5)**	-.002 (*p* - .966)	.005 (*p* = .937)
Teacher-reported Oppositional/Aggressive Outcomes			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age 9.5	.217 (*p* < .01) (age 8.5)**	-.024 (*p* = .628)	-.080 (*p* = .261)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Oppositional/aggressive age	.198 (*p* < .01) (age 8.5)**	0.012 (*p* = .835)	-.119 (*p* = .126)

Table 6: Hierarchical Multiple Regression Analyses Exploring the Previous Measure of CP as a Moderator on Child Behavior Outcomes (All Models Include Child Gender, Race/Ethnicity, Site, and Income)

9.5			
Teacher-reported Externalizing Outcome			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 9.5	.236 (p < .01) (age 8.5)**	-.057 (p = .254)	-.090 (p = .201)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Externalizing age 9.5	.228 (p < .01) (age 8.5)**	-0.10 (p = .865)	-.148 (p = .052)*
Child self-report of delinquency			
Outcome	CP at previous age (continuous ECBI intensity)	Intervention	Baseline CP X Intervention
Delinquency age 9.5	.168 (p < .01) (age 8.5)**	.047 (p = .297)	-.056 (p =.362)
Outcome	CP at previous age (dichotomous ECBI intensity)	Intervention	Baseline CP X Intervention
Delinquency age 9.5	.124 (p < .05) (age 8.5)**	.052 (p = .316)	-.017 (p = .690)

Figure 6: Interaction between Age 5 CP and Intervention on Parent-Reported Externalizing Behavior at Age 8.5 (Continuous Age 5 CP)

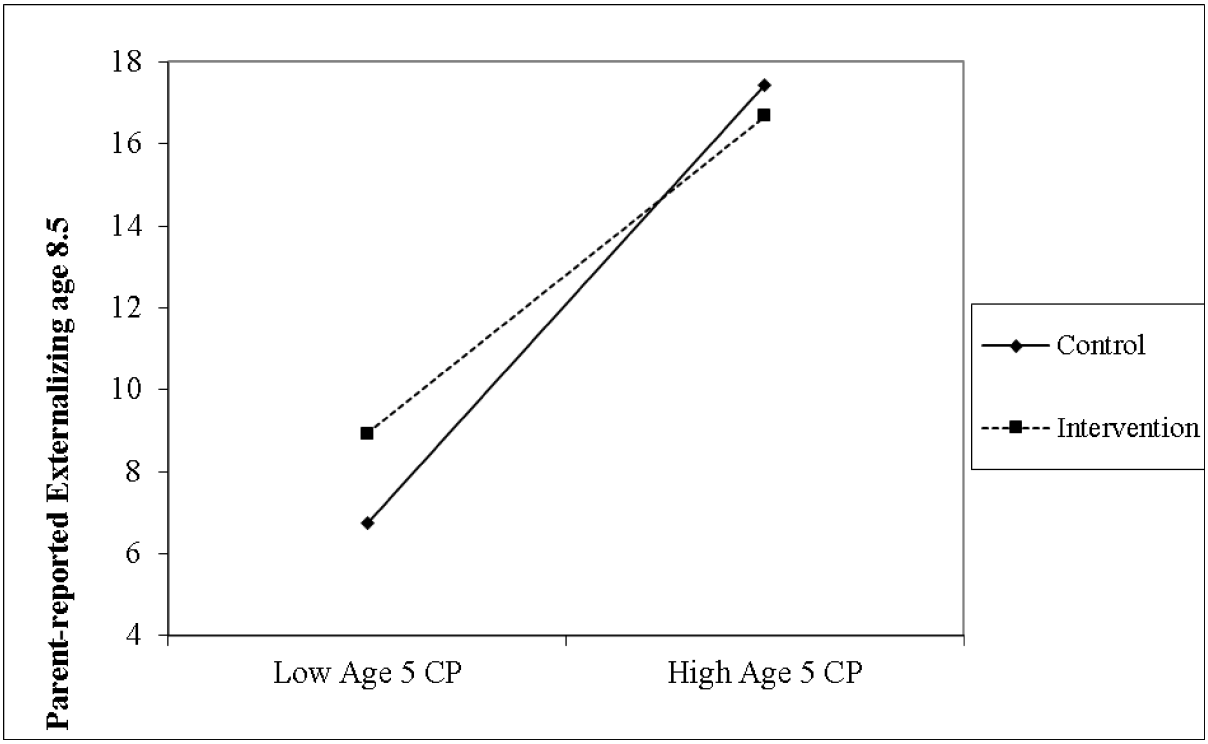


Figure 7: Interaction between Age 8.5 CP and Intervention on Teacher-Reported Externalizing Behavior at Age 9.5 (Dichotomously Scored)

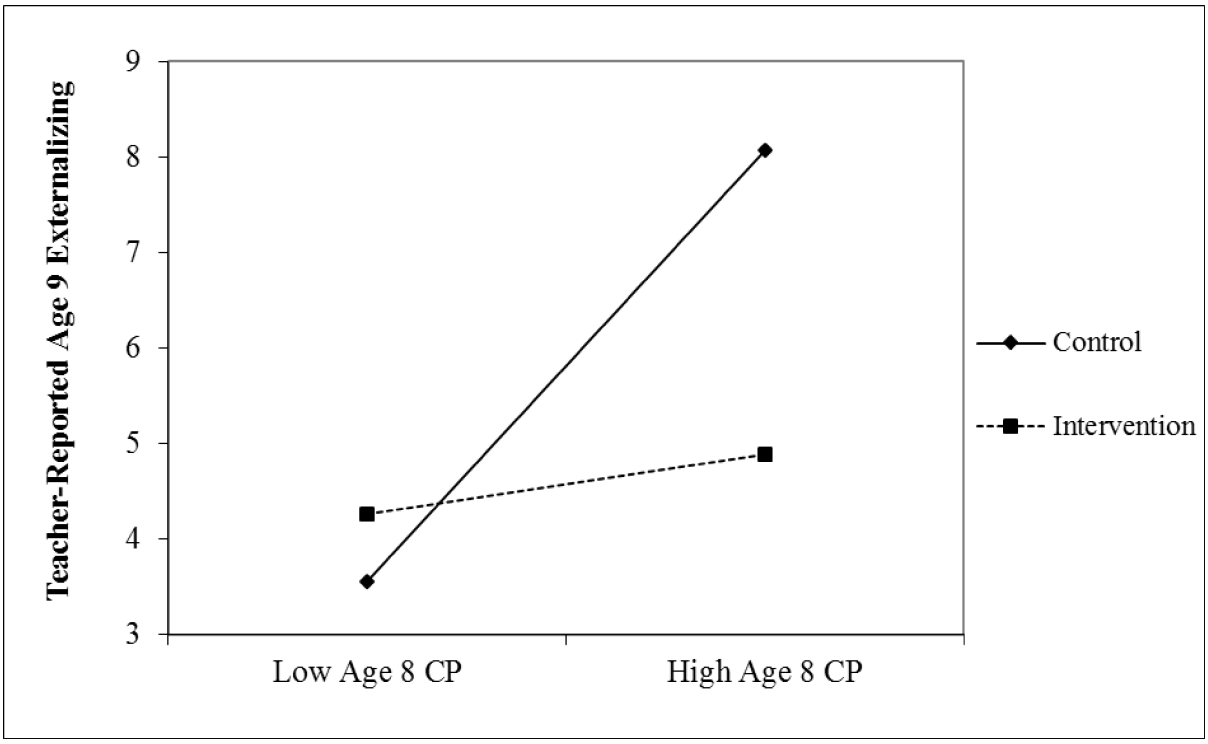


Figure 8: Growth in Parent-Reported Oppositional/Aggressive Behavior

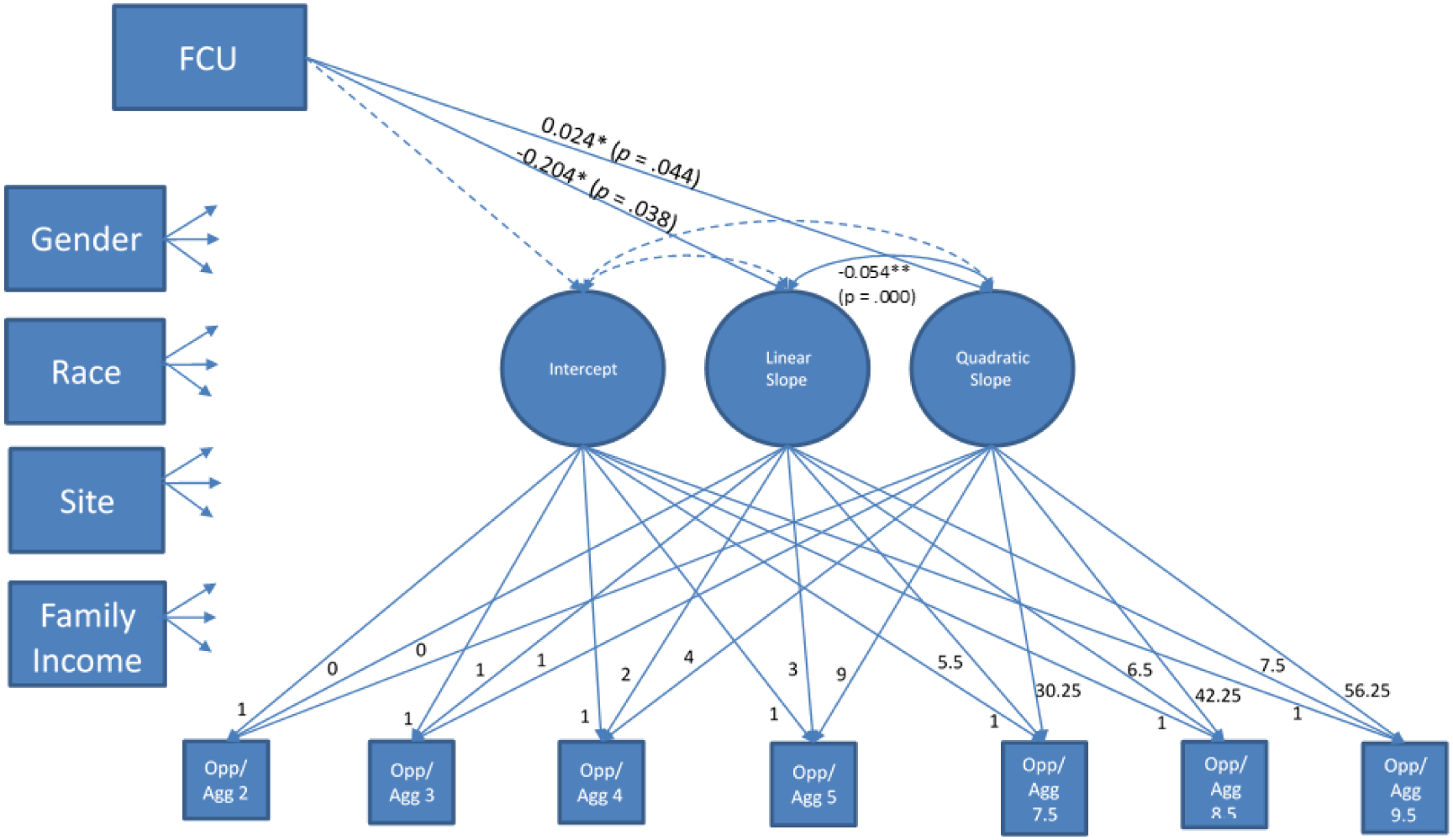


Figure 9: Multi-Group Model Comparing High and Low Baseline CP Groups on Growth in Parent-Reported Oppositional/Aggressive Behavior (More Conservative)

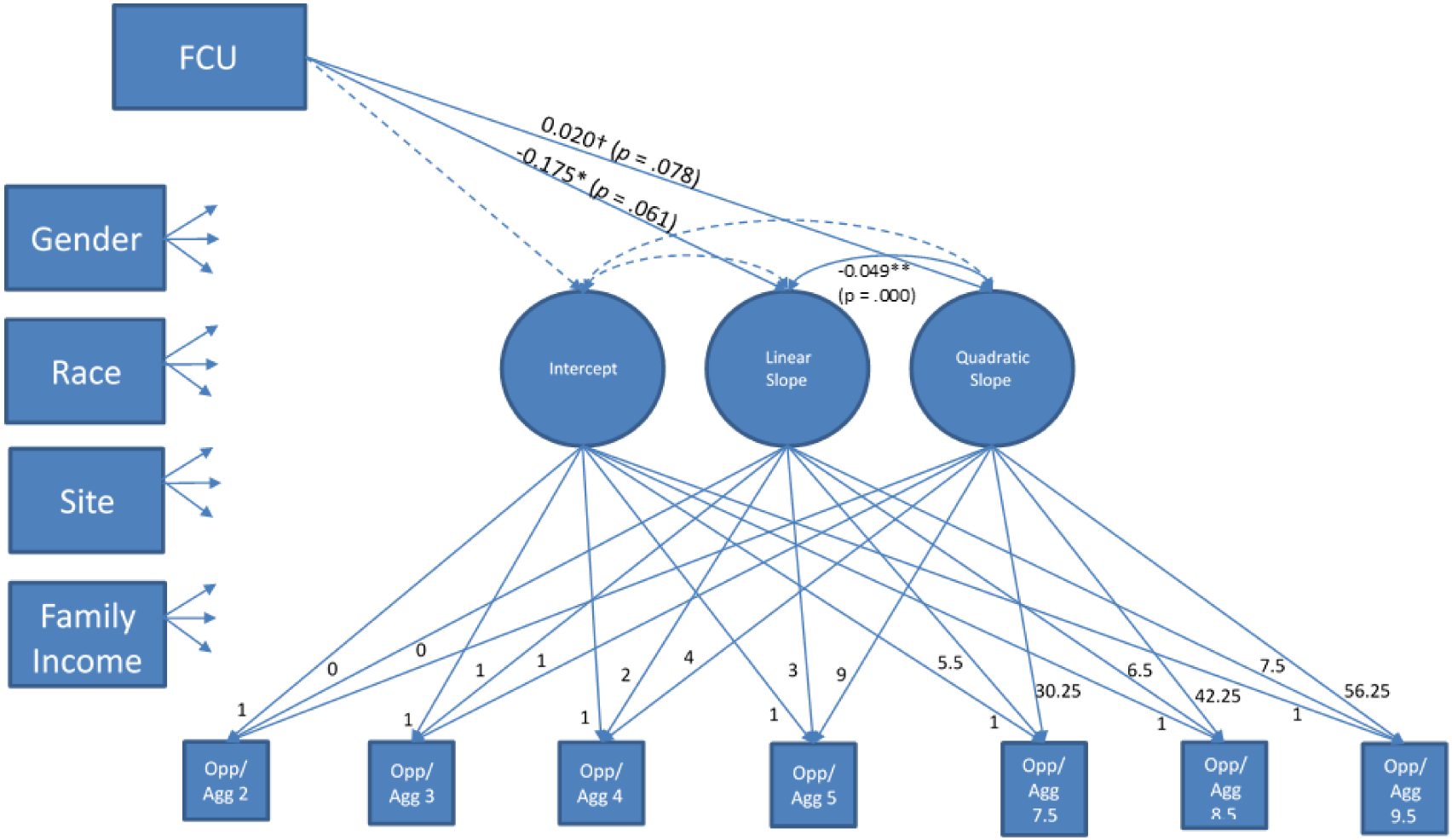


Figure 10: Multi-Group Model Comparing High and Low Baseline CP Groups on Growth in Parent-Reported Oppositional/Aggressive Behavior (Less Conservative)

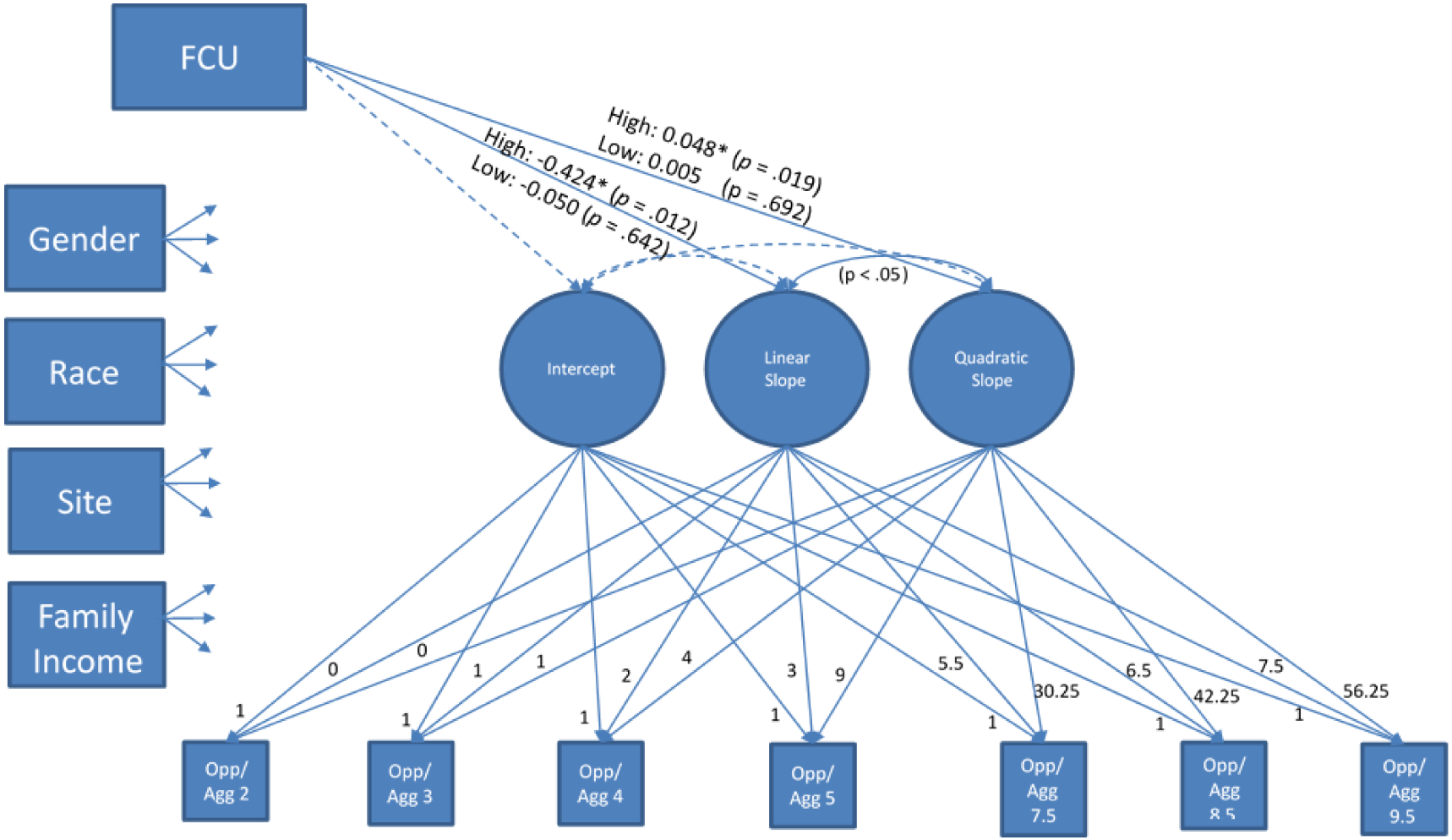


Figure 11: Growth in Teacher-Reported Oppositional/Aggressive Behavior

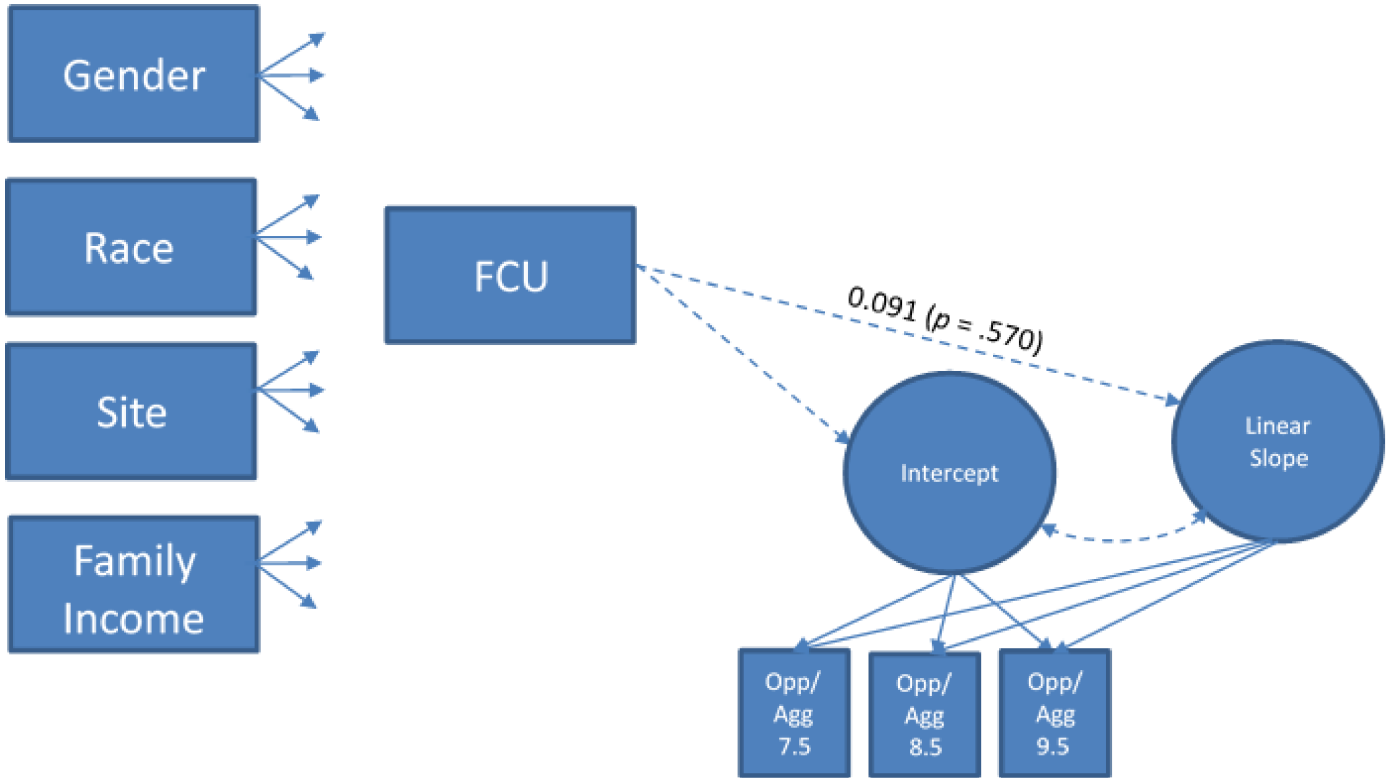


Figure 12: Growth in Observed Maternal Positive/Neutral Behavior

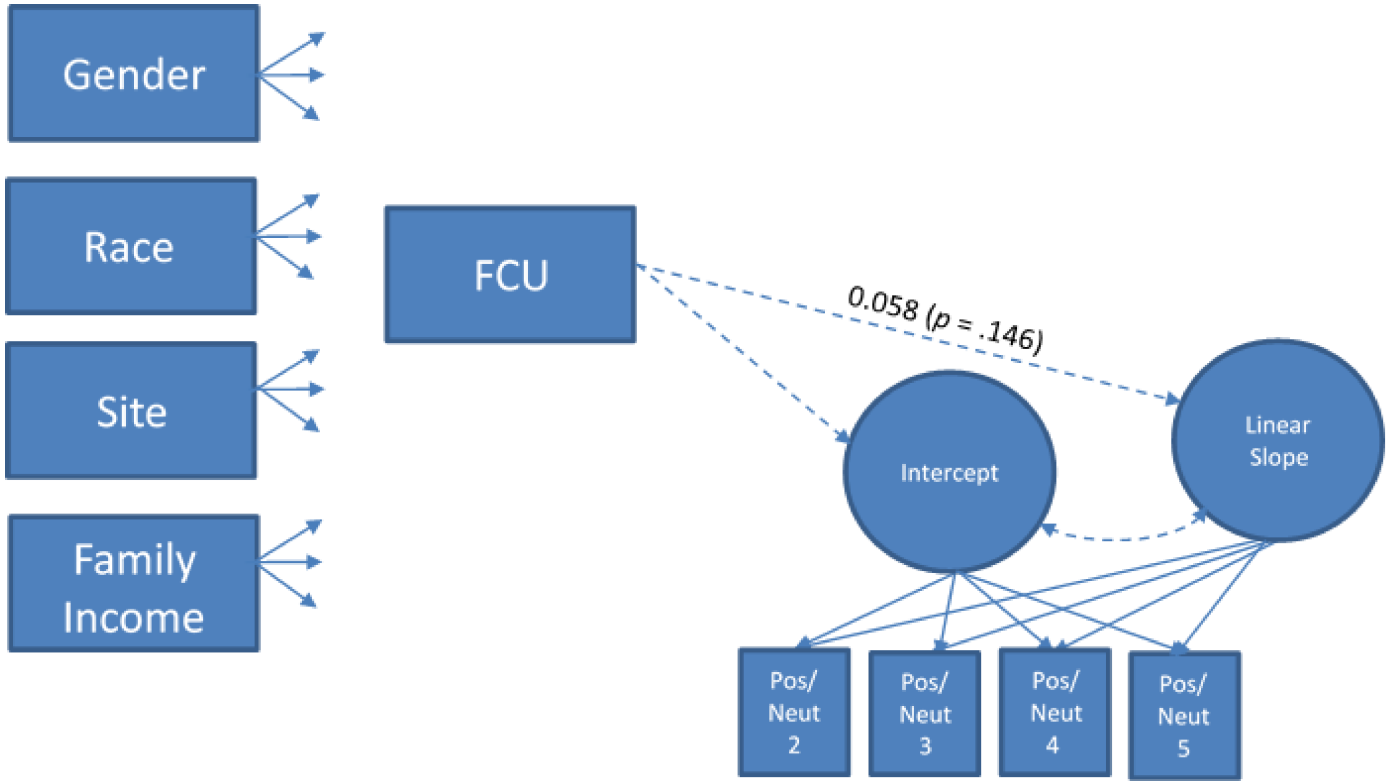


Figure 13: Multi-Group Model Comparing High and Low Baseline CP Groups on Growth in Maternal Positive/Neutral Behavior (More Conservative)

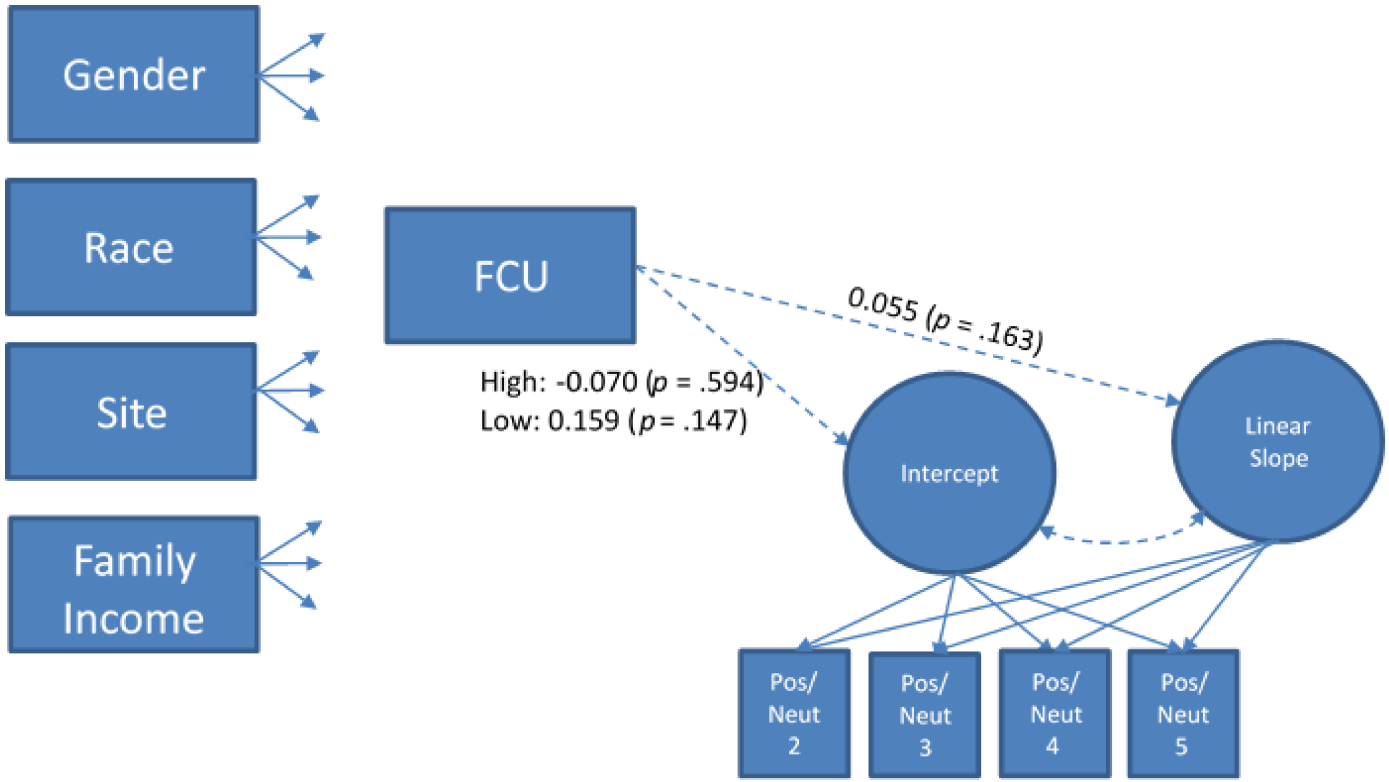


Figure 14: Multi-Group Model Comparing High and Low Baseline CP Groups on Growth in Maternal Positive/Neutral Behavior (Less Conservative)

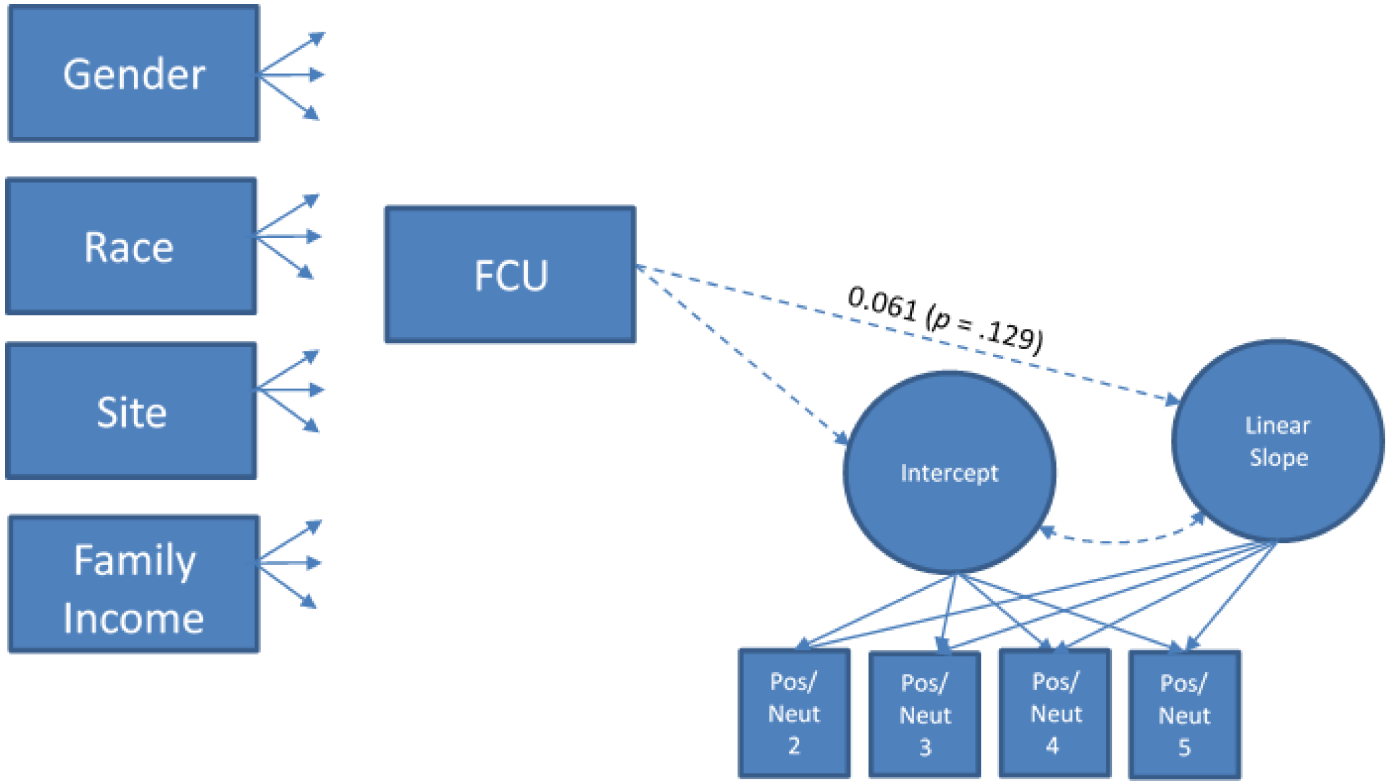


Figure 15: Group-Based Trajectories of Oppositional/Aggressive Behavior across Ages 3 to 9.5

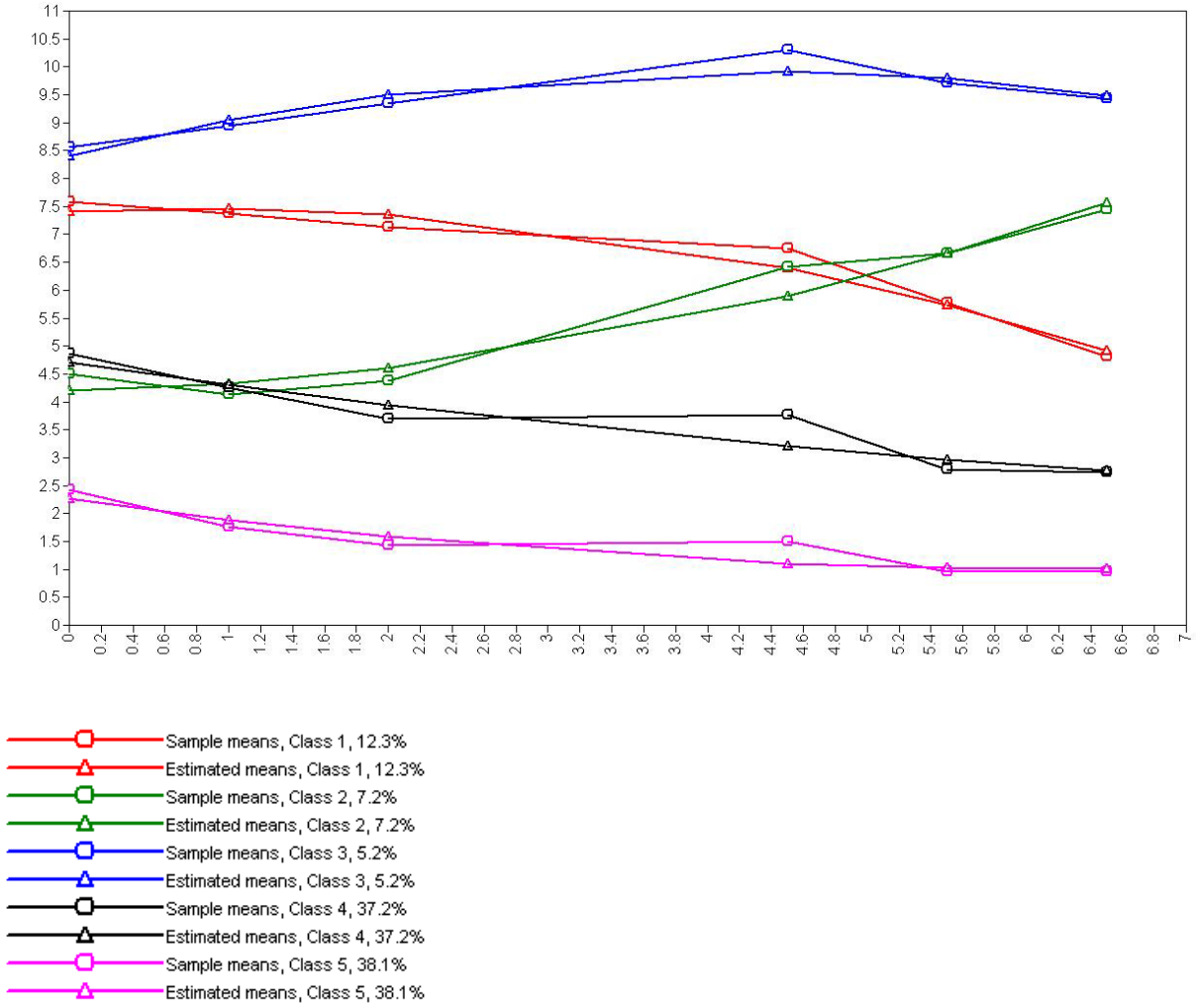


Table 7a: Fit Indices - Bayesian Information Criterion (BIC)

Number of Groups	BIC	AIC	Entropy
2	16691.33	16650.05	0.877
3	16354.98	16301.01	0.796
4	16234.82	16168.14	0.781
5	16151.37	16071.98	0.788
6	16088.46	15996.38	0.787

Table 7b: Age 3 to 9.5 Trajectory Group Likelihood by Intervention and Baseline CP

Predictor	4 vs. 1		4 vs. 2		4 vs. 3		4 vs. 5	
	Estimate	*p*	*Estimate*	*p*	*Estimate*	*p*	*Estimate*	*p*
Intervention	-0.234	0.563	0.168	0.695	-0.242	0.351	0.145	0.520
Baseline CP	1.129	0.005**	-0.039	0.934	2.463	0.000**	-1.137	0.000*

** $p < .01$; * $p < .05$; † $p < .10$

Figure 16: Group-Based Trajectories of Oppositional/Aggressive Behavior across Ages 2 to 9.5

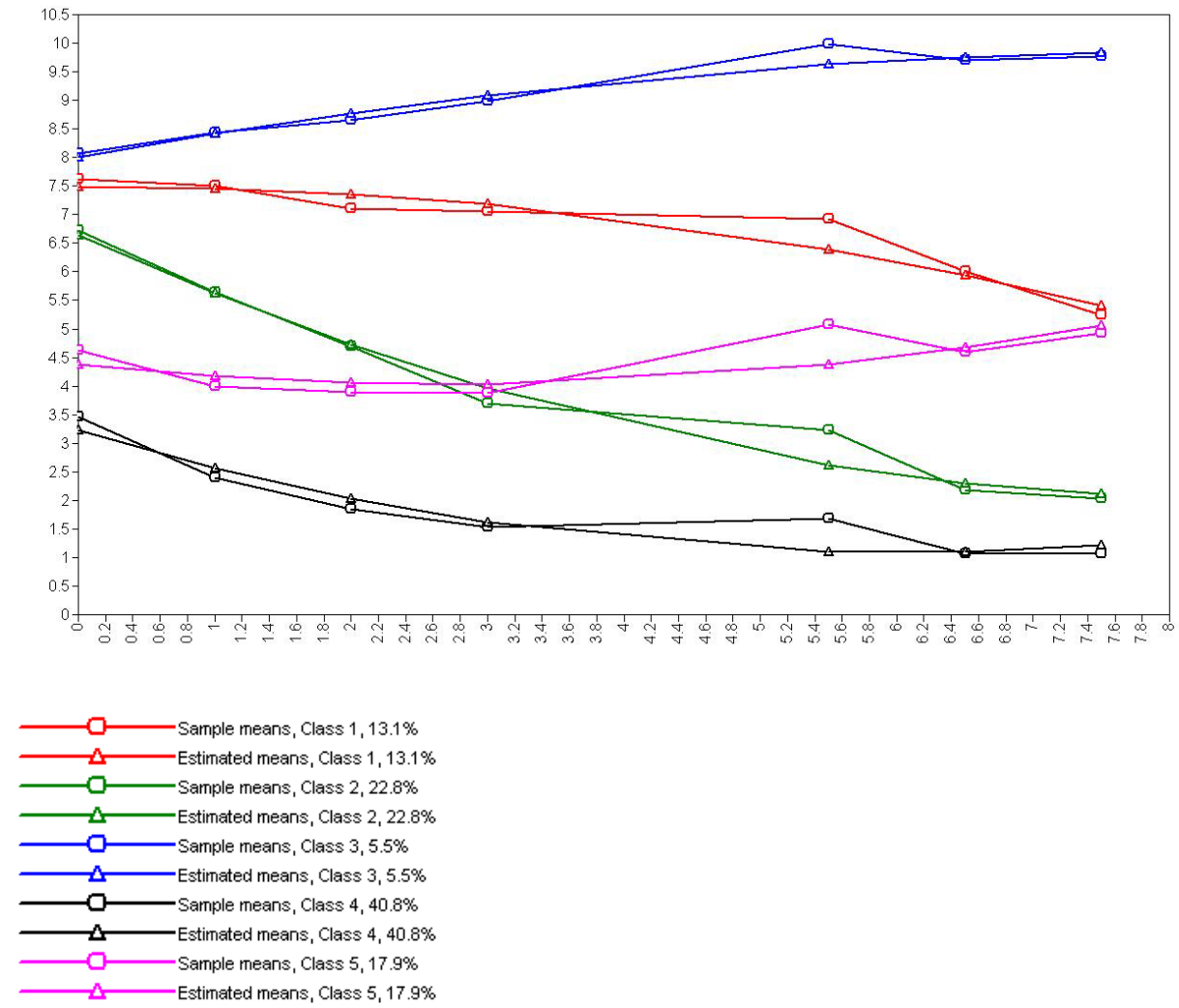


Table 8a: Fit Indices - Bayesian Information Criterion (BIC)

Number of Groups	BIC	AIC	Entropy
2	20072.61	20028.16	0.863
3	19671.21	19614.05	0.786
4	19541.63	19471.77	0.764
5	19444.53	19361.97	0.763
6	19356.8	19261.54	0.777

Table 8b: Age 2 to 9.5 Trajectory Group Likelihood by Intervention and Baseline CP

Predictor	5 vs. 1		5 vs. 2		5 vs. 3		5 vs. 4	
	Estimate	*p*	*Estimate*	*p*	*Estimate*	*p*	*Estimate*	*p*
Intervention	0.293	0.518	0.008	0.985	0.027	0.957	0.161	0.566
Baseline CP	1.659	0.005**	1.641	0.000**	3.221	0.00**	-0.680	0.044*

** $p < .01$; * $p < .05$; † $p < .10$

Table 9: Analysis of Variance and Means of Maternal Positive/Neutral Behavior and Child Oppositional/Aggressive Behavior

Outcome	*F*	Mean for Control Group (1)	Mean for Intervention with Feedback (2)	Mean for Intervention without feedback (3)	Pairwise Difference
Parenting Out comes					
Positive/neutral age 3	5.629**	0.490	0.531	0.502	2 > 1
Positive/neutral age 4	2.650†	0.434	0.462	0.426	2 > 1
Positive/neutral age 5	1.966	0.516	0.541	0.518	
Child Outcomes					
Oppositional/Aggressive age 3	0.758	4.440	4.307	4.773	
Oppositional/Aggressive age 4	1.843	4.142	3.662	3.931	
Oppositional/Aggressive age 5	1.017	3.769	3.486	3.368	
Oppositional/Aggressive age 7.5	0.995	3.879	3.973	3.432	
Oppositional/Aggressive age 8.5	0.964	3.073	3.337	2.821	
Oppositional/Aggressive age 9.5	0.506	3.096	2.829	2.952	
Three or more feedbacks across ages 2, 3, 4, and 5					
Oppositional/Aggressive age 7.5	0.072	3.879	3.768	3.828	
Oppositional/Aggressive age 8.5	0.057	3.073	3.168	3.125	
Oppositional/Aggressive age 9.5	0.628	3.096	2.797	3.010	

* $p < .05$; ** $p < .01$; † $p < .10$

Figure 17: Parallel Process Growth Model of Positive/Neutral Parenting and Parent-Reported Oppositional/Aggressive Behavior

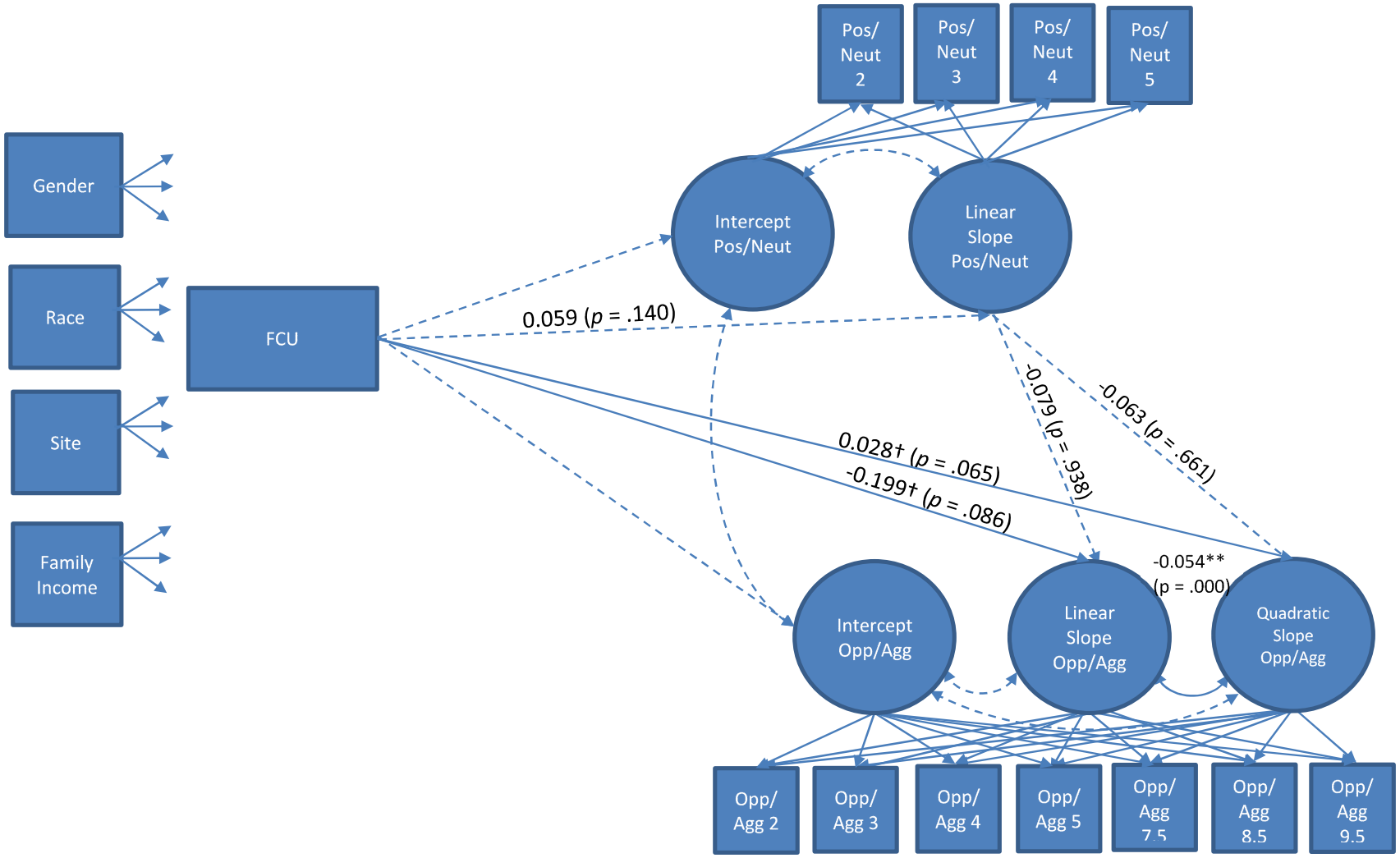


Figure 18: Multi-Group Parallel Process Growth Model of Positive/Neutral Parenting and Parent-Reported Oppositional/Aggressive Behavior (More Conservative)

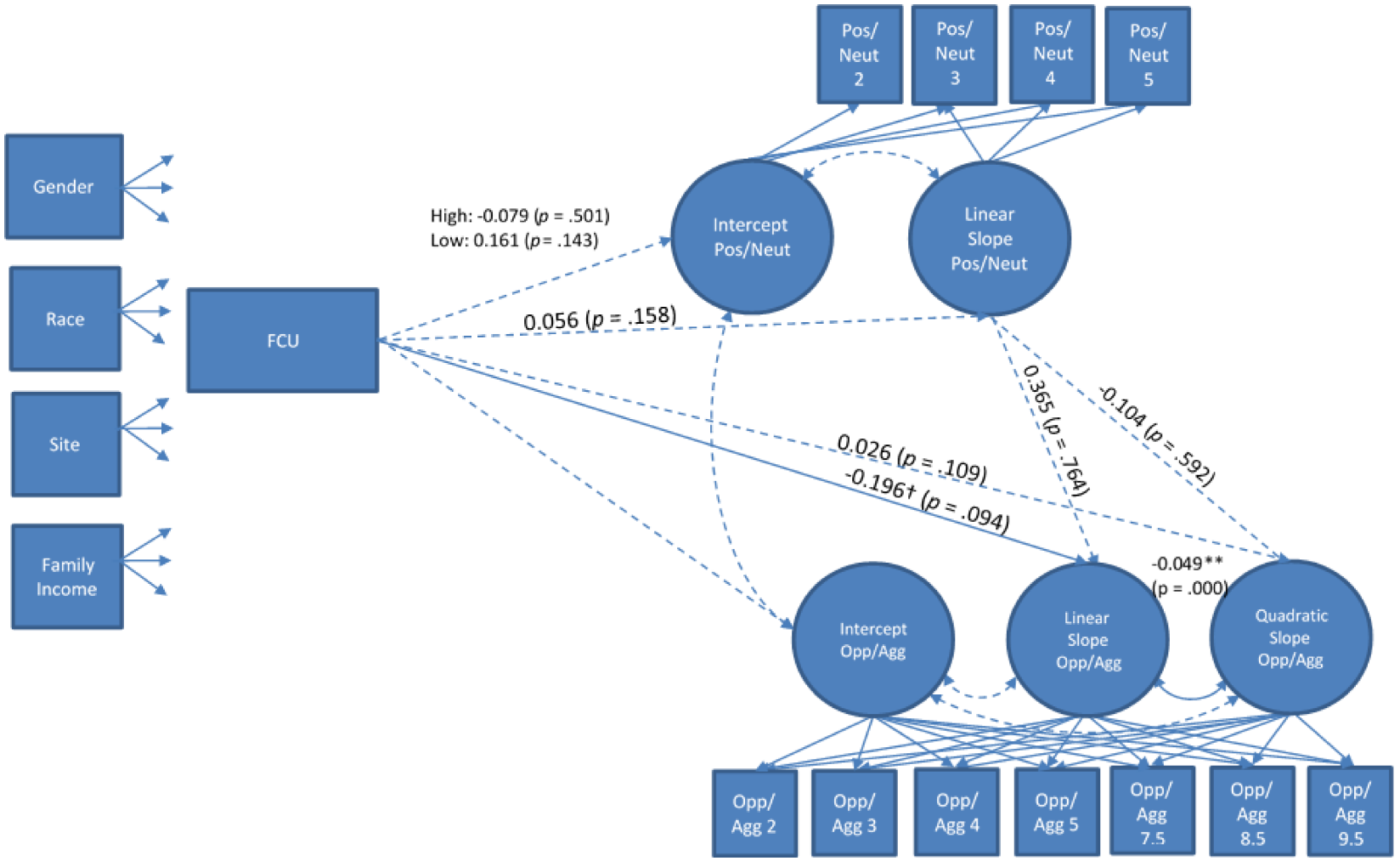


Figure 19: Multi-Group Parallel Process Growth Model of Positive/Neutral Parenting and Parent-Reported Oppositional/Aggressive Behavior (Less Conservative)

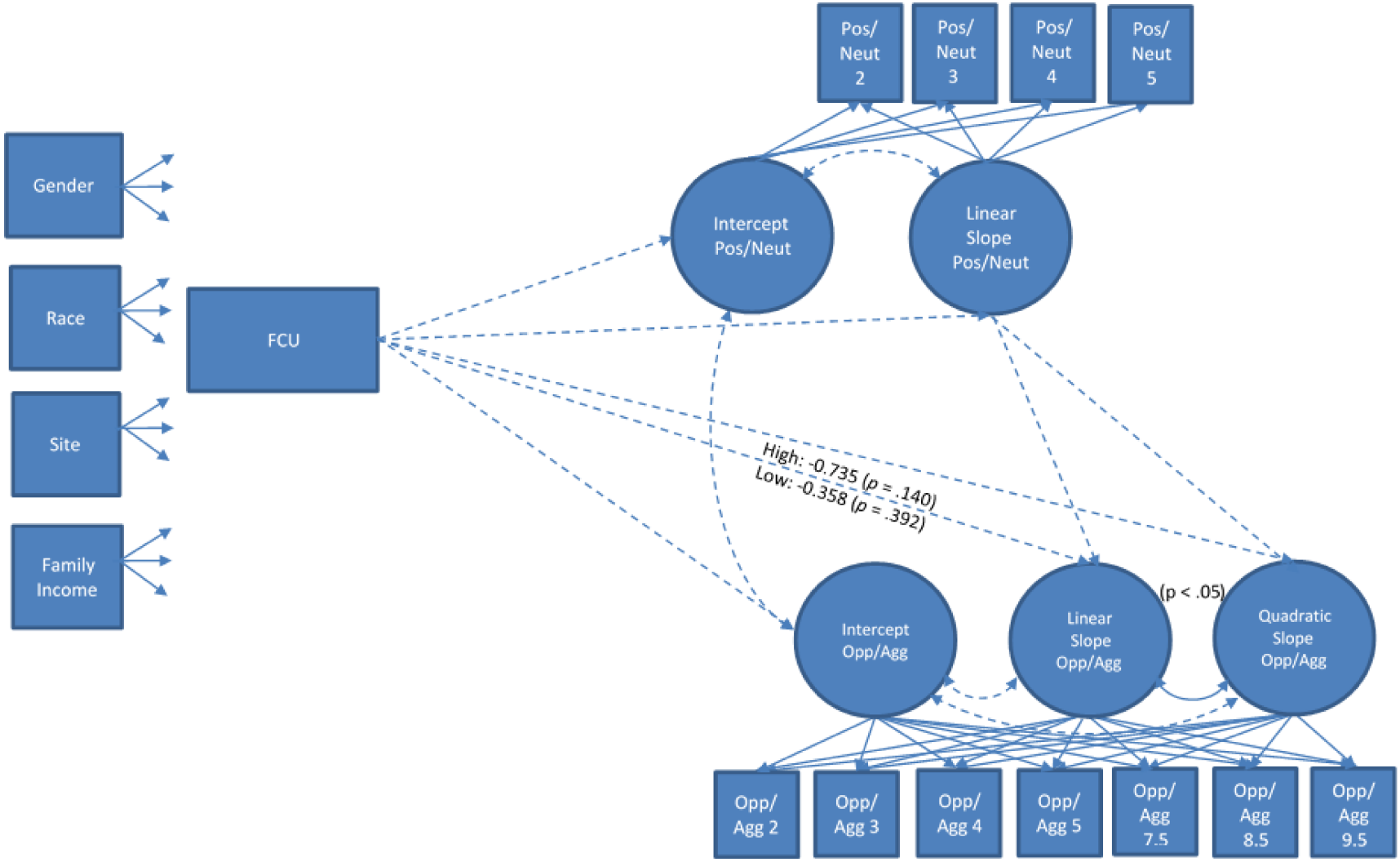


Figure 20: Parallel Process Growth Model of Maternal Depression and Parent-Reported Oppositional/Aggressive Behavior

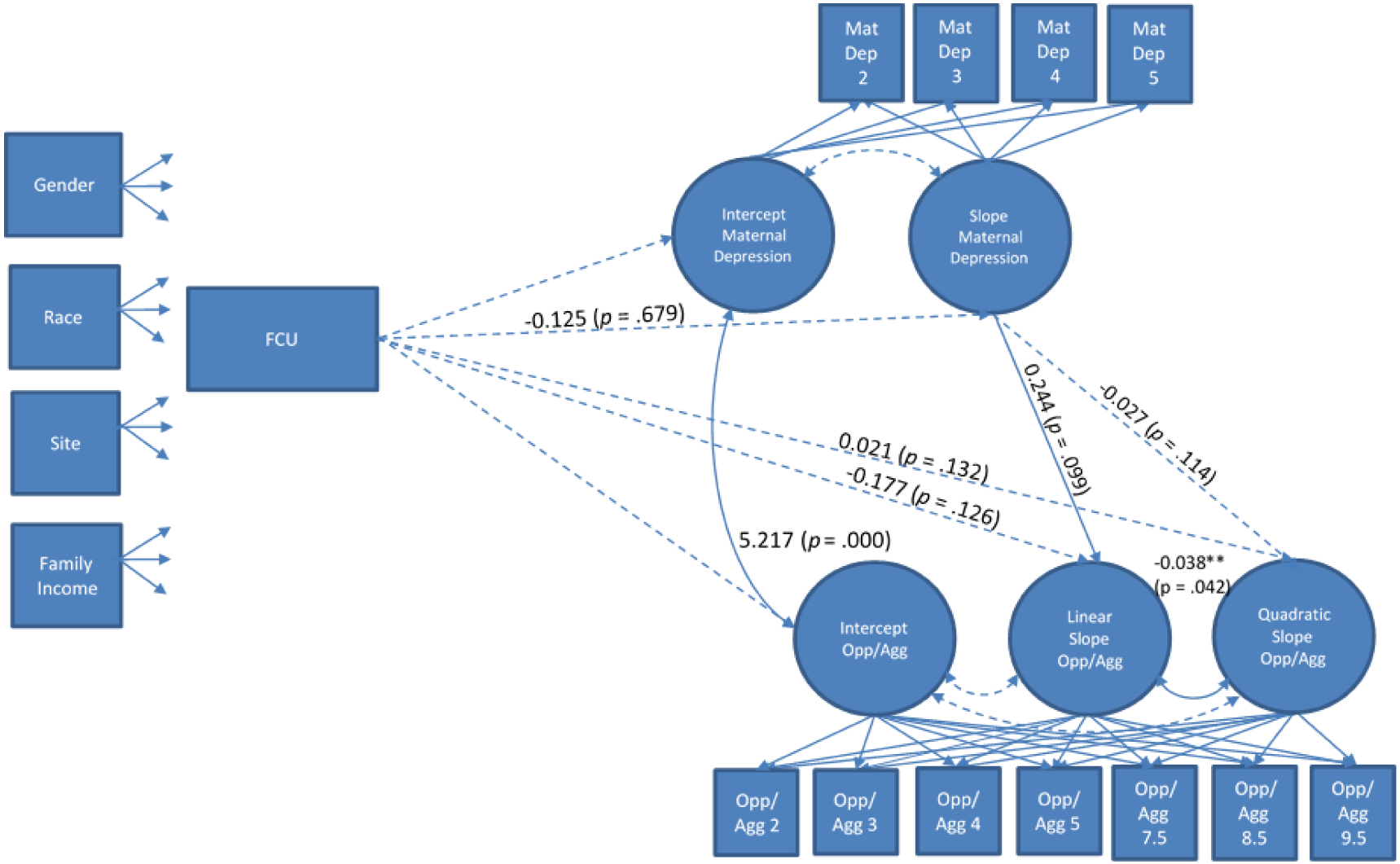


Figure 21: Multi-Group Parallel Process Growth Model of Maternal Depression and Parent-Reported Oppositional/Aggressive Behavior (More Conservative)

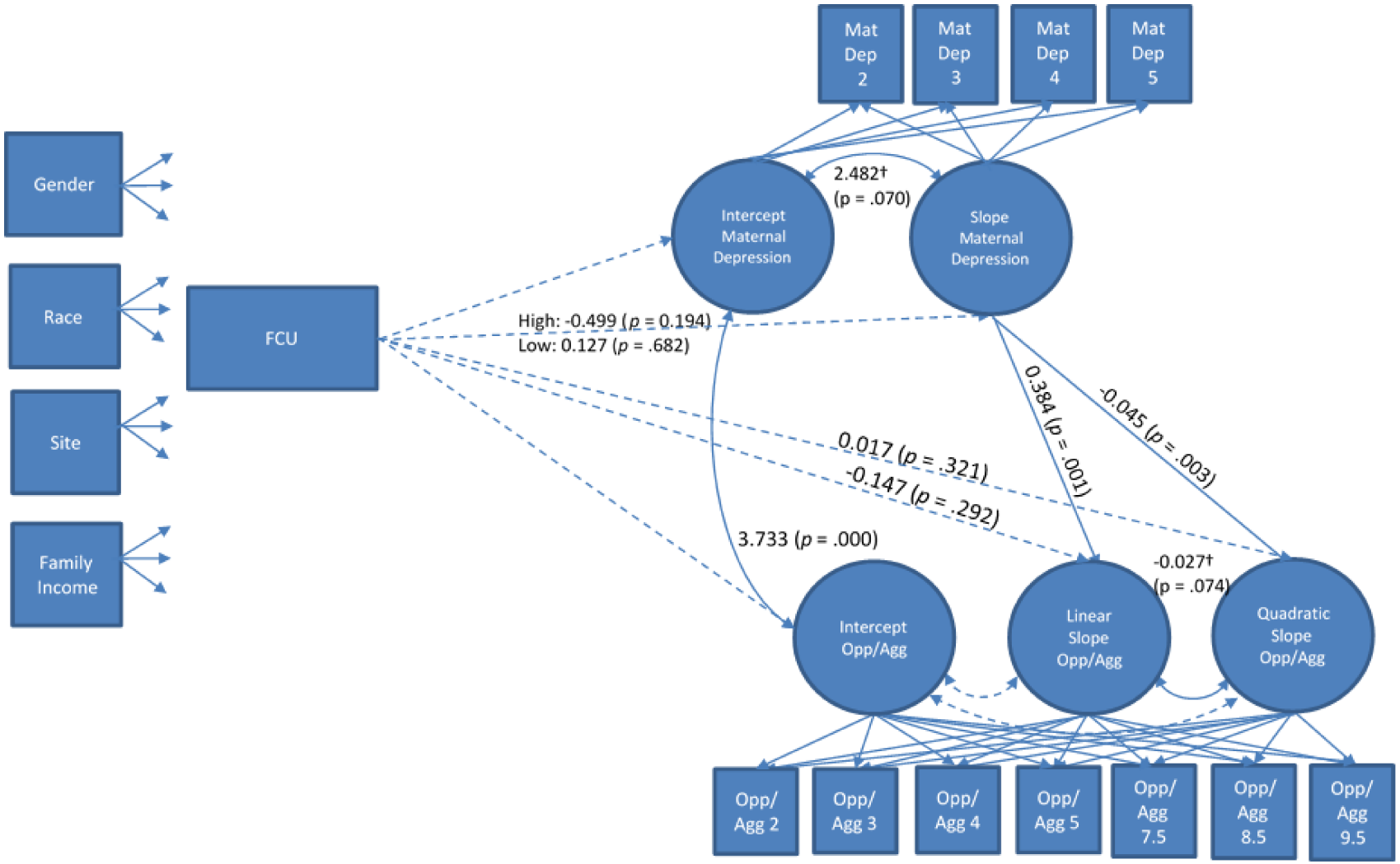
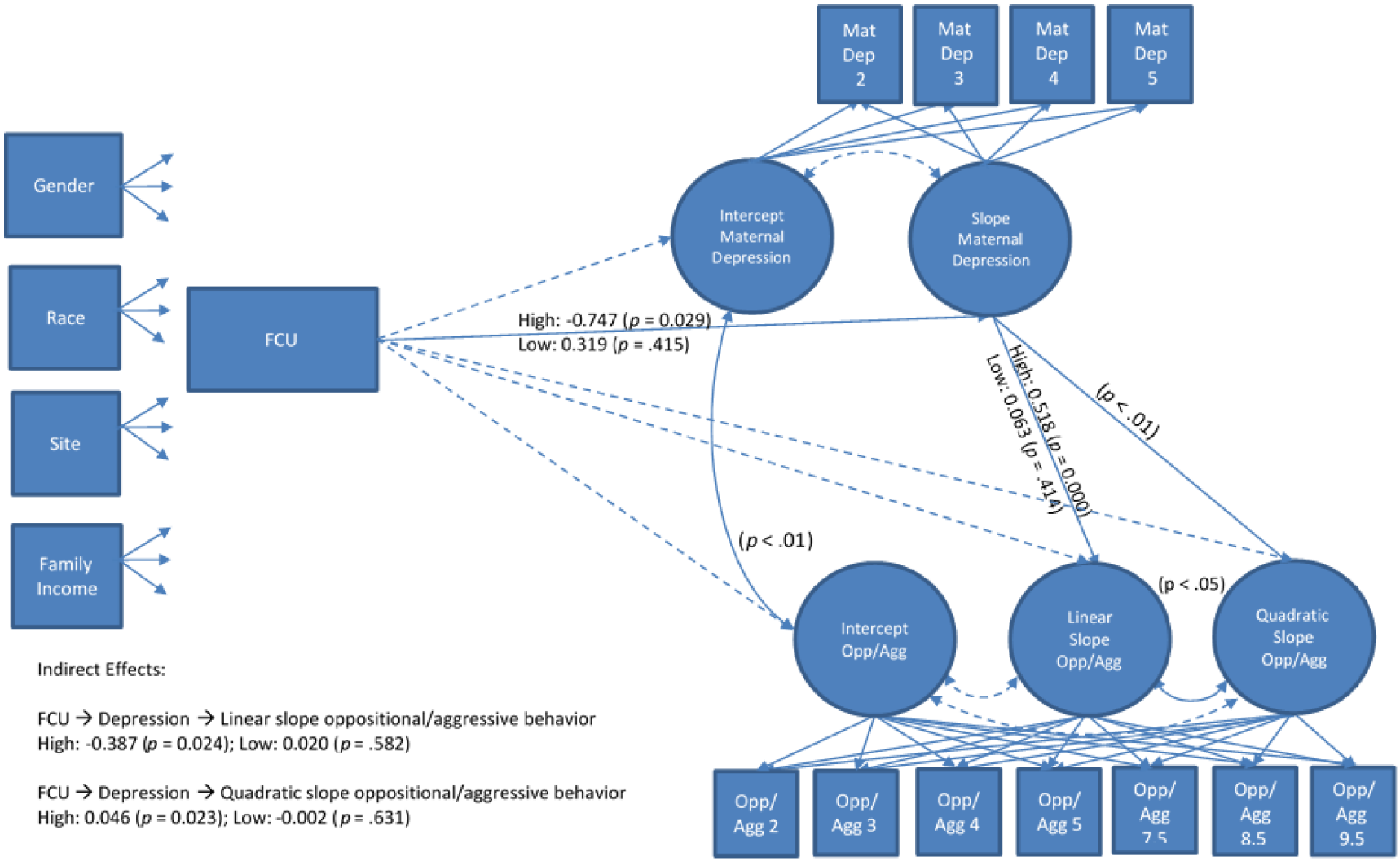


Figure 22: Multi-Group Parallel Process Growth Model of Maternal Depression and Parent-Reported Oppositional/Aggressive Behavior (Less Conservative)



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