Caregiver Social Support and Engagement in the Family Check-Up Across Early and Middle Childhood

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The present study used a longitudinal design to examine the relationship between caregiver social support and engagement in the Family Check-Up (FCU) parenting intervention between child ages 2 to 5, 7.5 to 10.5, and 2 to 10.5. It also assessed the relationship between participation in the FCU feedback session and changes in caregiver social support satisfaction between child ages 2 to 9.5. This study used family data from the intervention arm (n = 367) of the Early Steps Multisite Study, which is a randomized control trial of the FCU among 731 low-income ethnically-diverse families using Women, Infants, and Children Nutritional Supplement Services (WIC) in urban, suburban, and rural locations. Social support satisfaction did not predict engagement in subsequent FCU feedback sessions or follow-up treatment across all age ranges. Received social support did not predict FCU engagement for child ages 2 to 5 and 7.5 to 10.5, but higher received social support at age 2 was significantly associated with greater number of received feedback sessions and follow-up treatment sessions across ages 2 to 10.5. These findings suggest that greater received support may have promoted long-term investment in the FCU and that identifying ways to engage and support caregivers with low levels of social support may provide a critical opportunity to address treatment barriers and improve engagement. Future directions are also considered, including qualitative and mixed-methods approaches and the use of more functional measures of social support.

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1.0 Introduction

Intervention and prevention efforts have been developed and implemented for a variety of mental health outcomes. While many interventions target the individual, interventions aimed at preventing or reducing early-emerging child behavior problems typically involve parents. A plethora of evidence has indicated that family-focused interventions targeting parent management strategies have been effective in preventing and treating child problem behavior (Garvey et al., 2006; Nix et al., 2009; Webster-Stratton & Hancock, 1998), including during early childhood (Dishion et al., 2008, 2014; Sanders, Markie-Dadds, Tully, & Bor, 2000; Shaw, Dishion, Supplee, Gardner, & Arnds, 2006).

Unsurprisingly, the effectiveness of outcomes for these family-based interventions typically varies to the extent to which participants engage in the intervention (e.g., Durlak & DuPre, 2008). Across multiple family-based interventions focused on early- and middle-childhood, research has demonstrated that higher levels of engagement are associated with improved positive parenting behavior (Baydar, Reid, & Webster-Stratton, 2003; de la Rosa, Perry, Dalton, & Johnson, 2005; Guttentag et al., 2014), often the hypothesized mechanism underlying the intervention, and reduced child problem behavior (Connell, Dishion, Yasui, & Kavanagh, 2007; Dishion et al., 2014; Garvey et al., 2006). Engagement is considered a multi-component construct with attitudinal, behavioral, and social dimensions (Gopalan et al., 2010; Ingoldsby, 2010; Lindsey et al., 2014; Staudt, 2007). As such, engagement has been operationalized in a variety of ways depending on the intervention's context, such as enrollment, attendance, and/or participation (Lindsey et al., 2014; Mauricio, Gonzales, & Sandler, 2018; Smith et al., 2018). Recent suggestions for terminology define engagement as the processes related to starting an

intervention, including enrollment and a commitment to attend an initial session, and distinguish engagement from attendance and retention (Sims & Crump, 2018).

Low levels of parent engagement family pose significant challenges for intervention programs (Coatsworth, Duncan, Pantin, & Szapocznik, 2006; Cohen & Linton, 1995; Heinrichs, Bertram, Kuschel, & Hahlweg, 2005; Ingoldsby, 2010; Mendez, Carpenter, LaForett, & Cohen, 2009). For example, reports have indicated that 25-35% of invited individuals enroll in prevention and intervention programs focused on child behavior problems (Baker, Arnold, & Meagher, 2011; Cunningham et al., 2000; Eisner & Meidert, 2011; Garvey et al., 2006; Heinrichs et al., 2005; Myers et al., 1992), although some programs have higher rates of enrollment (e.g., Webster-Stratton, Reid, & Hammond, 2001). Moreover, a considerable proportion of families fail to complete a meaningful portion of the program or drop out prematurely (Eisner & Meidert, 2011; Gomby, 2000; Gomby, Culross, & Behrman, 1999; Gross, Julion, & Fogg, 2001). As such, there has been considerable effort to improve understanding of the factors that predict engagement.

1.1 Theories of Intervention Engagement

Theories have emerged from various fields that attempt to explain individual differences in adults that engage in physical and mental health interventions, which offer useful conceptual frameworks for understanding the factors that contribute to caregiver's engagement in parenting interventions (Andersen, 1995; Jaccard, Litardo, & Wan, 1999; Prentice-Dunn & Rogers, 1986). The Unified Theory of Behavior Change (UTB; Jaccard et al., 1999; Jaccard, Dodge, & Dittus, 2002) is one such theory, and conceptualizes behavior change along two dimensions: 1) factors that influence the immediate determinants of behavior and 2) factors that influence the willingness

to engage in a specific behavior. This second factor encapsulates behavior intention (i.e., willingness, intention, or decision to perform a behavior), which is, in part, influenced by affect and emotions, such as stress. Protection Motivation Theory (PMT; Rogers, 1975; 1983; Rogers & Prentice-Dunn, 1997) suggests that an individual's perception of threat (e.g., stress) influences behavior. Empirical evidence has found that there is a positive relationship between the severity of threat and the likelihood of taking protective action, which suggests that an individual must believe there is some harm and they are vulnerable to this harm to induce action (e.g., Floyd, Prentice-Dunn, & Rogers, 2000).

Theories of help-seeking behavior for mental health services also suggest that an individual must have a perceived need for services to motivate service engagement (Andersen, 1995; Cornally & McCarthy, 2011). While most of this work has been focused on the individual in need, there have been attempts to extend these ideas to the role that parents play in service utilization for their children. For example, Eiraldi and colleagues' (2006) model of help-seeking behavior identifies parents' perceived stress and burden of child behavior as influencing the decision to seek help. Other research has found similar positive relationships between parental awareness and perception of child symptoms and help-seeking behavior (Sayal, 2006; Teagle, 2002). Together, these theories and findings suggest that elevated psychological distress may serve to motivate intervention engagement (i.e., behavior change). As such, it is important to investigate sources of parental distress in the context of parent-focused interventions for children.

1.2 Child Behavioral Factors

As implicated above, sources of parental distress include concerns about child behavior problems (Anastopoulos, Guevremont, Shelton, & DuPaul, 1992; Neece, Green, & Baker, 2012; Östberg, Hagekull, & Hagelin, 2007), and feelings of parental incompetence (Mash & Johnston, 1983; Östberg, 1998). Placed within theories of behavior change and service utilization, the severity of child behavior problems and the subsequent stress experienced by the caregiver may influence the decision to engage in efforts to modify child behavior, such as participation in parent-focused interventions. Accordingly, parents experiencing greater levels of parenting stress because of child behavior problems would be more likely to engage in interventions designed to improve child behavior.

For preschool and early school-aged children, there is some support for positive associations between parent perceptions of child disruptive behavior and engagement in a variety of parent training interventions (Heinrichs et al., 2005; Reid, Webster-Stratton, & Baydar, 2004), including for families of color (Dumas et al., 2007; Garvey et al., 2006), and families from low- and high-SES backgrounds (e.g., Dumas et al., 2007; Haggerty et al., 2002). For example, in a large majority white (51%) multi-site study of the Incredible Years (IY) Parent Training Program delivered at Head Start centers, Reid et al. (2004) observed that mothers who rated their children as having more behavior problems were more likely to attend group sessions, whereas teacher ratings of initial levels of child behavior did not predict attendance. In general, it appears that parent, but not teacher, reports of child problem behavior predict caregiver engagement in family interventions (Baker et al., 2011; Cunningham et al., 2000; Garvey et al., 2006).

However, some studies have found non-significant relationships between parent-reported child problems and caregiver engagement in prevention focused programs. For example, Nix et al.

(2009) utilized a large ethnically-diverse, low-SES sample of first grade children with severe conduct problems and found that neither parent or teacher reports of child behavior predicted attendance or quality of participation in the parent training component of the Fast Track group-based intervention. Similar non-significant patterns have emerged from research utilizing the Triple P intervention (Eisner & Meidert, 2011) and other parent training programs (Gross et al., 2001; Orrell-Valente et al., 1999).

It is also possible that a curvilinear association exists between parent reports of child problem behavior and engagement in parent training programs. As an example, August and colleagues (2003), utilizing a rural sample of low SES majority white (85%) families with kindergarten aged children, found that children with initial disruptive behavior scores >2 standard deviations (SDs) above the mean were less likely to attend intervention sessions over the course of three years for the Incredible Years program than those with scores between 1 and 2 SDs above the mean. However, Cunningham et al. (2000) observed that enrollment in a universal, school-based parent training program aimed at children aged 5 to 8 was higher for families with children 3 SDs above the mean on an externalizing behavior problems scale compared to parents rating their children 2 SDs above the mean (46% vs. 28%).

Although there are possible threshold effects and some null results, overall a majority of studies find that initial levels of parent-reported elevated child behavior problems predict greater parent engagement in family-focused interventions delivered in early and middle childhood. As having a child with behavior problems can increase parental stress and may motivate parents to engage in parent-training programs, it is critical to understand how other facets of caregiver's emotional experiences may contribute to intervention engagement.

1.3 Parental Distress and Engagement

Theoretically, higher levels of parental distress may lead to higher levels of engagement in a parenting intervention; however, higher levels of distress, operationalized by measures of parenting stress, depressive symptoms, and/or general mental health status, could be postulated to prevent engagement, particularly continued engagement in an intervention. Perhaps not surprisingly, associations between parental distress and engagement in parent training programs are mixed, with some studies finding that caregiver distress (e.g., depression, stress) predicts greater engagement and others showing no impact on engagement.

For example, Latimore and colleagues (2017) evaluated a large multisite sample of ethnically diverse families (40% Hispanic, 36% black) engaged in the Healthy Families America (HFA) home-visiting intervention over a six-month period of time, and found that mothers with current mental health problems were more likely to receive a "high" dose of services. Similar results were found in another HFA study by Ammerman et al., (2006), in which mental health problems and higher stress each predicted a greater number of visits and more time spent active in the program for at-risk mothers. This pattern of engagement was also observed in the current sample using the Family Check-Up (FCU) intervention, with a latent construct of parental distress (i.e., depression, daily hassles, and parenting satisfaction) predicting a greater number of visits and more time spent with an interventionist over an eight-year period (Smith et al., 2018). Similar patterns of results have also been observed in studies that look exclusively at depressive symptoms and engagement in parenting-focused interventions for children (Damashek, Doughty, Ware, & Silovsky, 2011; Girvin, DePanfilis, & Daining, 2007).

However, a number of studies have found that caregiver distress, particularly mental health concerns, is not related to engagement in parent training programs. Baydar, Reid, and Webster-

Stratton (2003) found no significant relationship between mental health risk (e.g., depression, anger, substance use) and engagement in a large majority white (60.8%) sample of the IY parenting intervention. Other studies utilizing the IY intervention have also found no relationship between depression/stress and enrollment, attendance, and attrition (Baker et al., 2011; Gross et al., 2001). Depression and stress have not predicted engagement in the parent training component of the Fast Track intervention (Nix et al., 2009; Orrell-Valente et al., 1999), and in universal (Cunningham et al., 2000) and other targeted group based parenting interventions (Garvey et al., 2006).

In sum, the literature appears to be mixed as to the role that parental distress plays in predicting caregiver engagement in parent-focused interventions. Despite the mixed set of findings showing relations between higher levels of parental distress and engagement in parent training programs, it remains to be seen if other under-studied forms of parental well-being and distress are related to engagement in such parenting programs. Social support is one such under-studied type of parental distress.

1.4 Social Support

Social support has been defined as, "the social resources that persons perceive to be available or that are actually provided to them by nonprofessionals in the context of both formal support groups and informal helping relationships" (Cohen, Gottlieb, & Underwood, 2000, p. 4). This definition of social support excludes professional relationships; however, professionals, such as interventionists, can serve as important sources of support and may play important roles for those that experience inadequate social support from nonprofessional resources (e.g., Ammerman et al., 2006; Crnic, Greenberg, & Slough, 1986). A range of support-related concepts has been

used to examine the broad construct of social support (Barrera, 1986; Barth, Schneider, & von Kanel, 2010; Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005). Two commonly evaluated constructs of social support are received and perceived support, which can be further divided into subtypes (e.g., instrumental support, emotional support). While the constructs of received and perceived support are related (Heller & Swindle, 1983), they are generally considered to be distinct (Haber, Cohen, Lucas, & Baltes, 2007; Lakey & Lutz, 1996; Reinhardt & Bleiszner, 2000). Overall it appears that perceived support plays a strong and consistent role in the experience of stress and mental health related outcomes (e.g., Thoits, 2011; Turner & Brown, 2010). Specifically, parents with lower levels of perceived social support experience greater parenting stress and psychological distress (e.g., Cutrona, 1984; Glazier, Elgar, Goel & Holzapfel, 2004; McConnell, Breitkreuz, & Savage, 2010; Östberg, Hagekull, & Wettergren, 1997). Moreover, there is evidence that the relationship between social support and psychological distress is bidirectional, although relatively little work on this topic has been conducted with mothers of young children (e.g., Haeffel & Mathew, 2010; Platt, Lowe, Galea, Norris, & Koenen, 2016).

1.5 Social Support and Engagement in Parenting Interventions

The primacy of caregiver social support on parental distress and well-being suggests that it is an important factor to consider in the context of intervention engagement. Moreover, as caregiver social support might be improved by engaging with an interventionist, it follows that lower levels of social support could be associated with higher levels of engagement in parenting interventions. To our knowledge, six studies have examined the role of social support in the context of caregiver engagement with parenting-focused interventions. Three of these studies find that

caregivers with lower levels of social support were more likely to engage with parenting-focused interventions. Ammerman et al. (2006) evaluated engagement in sample of at-risk first time mothers participating in the HFA home-visiting intervention. These mothers were majority white (54%) and recruited prenatally through three months postpartum. Mothers with lower levels of social support were more likely to stay for a longer period of time (i.e. the number of days between the first and last visit) and receive more home visits during the first year of the program. The authors interpreted these findings to indicate that home-visiting interventions may reduce barriers that impede socially isolated families from participating in externally based interventions, and that socially isolated mothers may engage more because the intervention emphasizes forming close-relationships with participating caregivers. Furthermore, Birkel and Reppucci (1983) found that mothers with less-dense social networks and less contact with family attended significantly more parent education group sessions that utilized a strength based approach in a sample of high-risk (e.g., child behavior problems, inconsistent punishment), low-income families with children under age five. Finally, Navaie-Waliser and colleagues (2000) observed that mothers with more emotional and instrumental social support needs (i.e., low support) were more likely to be longer-than shorter-term participants in a sample of majority African American (57%) mothers participating in a prevention-focused home-visiting program for at-risk pregnant women.

In addition, one study found a positive association between social support and intervention enrollment. Baker et al. (2011) used an urban sample of ethnically diverse families (31% Puerto Rican, 30% Caucasian, 25% African American) with preschool children that were recruited from classrooms to participate in the IY intervention. They found that higher levels of perceived social support predicted greater likelihood of enrollment, but did not predict attendance. However, two other studies found non-significant relationships with different measures of social support. Nix et

al. (2009) found that social support satisfaction did not predict attendance or participation in the parent training component of the Fast Track intervention, and Chiang et al. (2018) observed that the number of social contacts per month was not related to home-visiting program retention.

Overall, there is some but not uniform support regarding the influence of caregiver social support on engagement in parenting-focused interventions. These studies have examined social support using measures of perceived support and social embeddedness. Measures of perceived support are most consistently associated with psychological distress (e.g., Thoits, 2011). Thus, measures of perceived support are of particular interest given the theoretical perspective of this proposal. However, perceived social support is a multifaceted construct, and does not necessarily elicit information regarding the adequacy of social support.

1.6 Social Support Satisfaction

Satisfaction with social support, a sub-component of perceived support, is the only support framework that evaluates an individual's unmet needs. Social support satisfaction has been associated with parenting behaviors, such that higher satisfaction is related to more positive parenting behaviors (Corse, Schmid, & Trickett, 1990; Crnic, Greeberg, Robinson, & Ragozin, 1984; Jennings, Stagg, & Conners, 1991; MacPhee, Fritz, & Miller-Heyl, 1996). Low satisfaction with social support also has been found to be associated with increased psychological distress (e.g., depression, anxiety, stress) for adults and parents (Crnic & Booth, 1991; Huurre, Eerola, Rahkonen, & Aro, 2007; Koeske & Koeske, 1990; Trouillet, Gana, Lourel, & Fort, 2009). Within the current theoretical framework, social support satisfaction is a good candidate to evaluate the

influence of inadequate social support (i.e., a stressor) on parenting-focused intervention engagement.

Only one study has utilized an index of social support satisfaction to evaluate engagement in a parenting intervention. As previously detailed, Nix and colleagues (2009) found no significant relationship between support satisfaction and attendance/participation in the parent training component of the Fast Track intervention. Importantly, the authors note that the general lack of meaningful predictors of attendance in this study likely reflects Fast Track's specific efforts to facilitate participation (e.g., monetary incentive, transportation, child care). As such, it is important to understand the role that social support satisfaction may play in different intervention contexts.

1.7 The Family Check-Up

The Family Check-Up (FCU) is a brief three-session intervention that uses motivational interviewing to promote positive parenting and family management practices (Dishion & Stormshak, 2007). The sessions include an initial interview, an assessment session, and a feedback session with an interventionist focused on the results of the assessment. At the end of the feedback, based on the results of the assessment, families are offered follow-up treatment sessions largely focused on improving parenting skills, but also on improving the parent's adaptive coping and use of local resources. The feedback session allows the FCU to be tailored to the family's needs, accounting for both normative data on child development and the family's motivation to address goals of interest. The embedding of motivational interviewing into the FCU makes it different from conventional parenting interventions that utilize standardized curriculums.

Previous analysis of the Early Steps Multisite Study (ESMS) has found that 76% of families offered the FCU at the first time point engaged in a feedback session (i.e., the criterion for engagement), with 90% having at least one feedback by child age 5, and 93.5% receiving at least one feedback between child ages 2 to 10.5 (Dishion et al., 2014; Smith et al., 2018). Over time fewer families engaged in FCU feedback sessions, with 59% of families receiving a feedback at age 10.5. In addition, Dishion and colleagues (2014) found that the effectiveness of the FCU on child disruptive behavior was improved based on the number of annual feedbacks parents attended. Moreover, improvements in child behavior from ages 2 to 4 predicted positive change in caregiver social support satisfaction from ages 2 to 5 (McEachern et al., 2013).

When examining predictors of engagement in the current sample from child ages 2 to 10.5, previously conducted research suggests that higher levels of perceived parenting stress (i.e., a latent variable comprised of daily parenting hassles, caregiver depressive symptoms, and parenting competency satisfaction) predicted engaging in more annual feedback sessions, while higher levels of observer rated child problem behavior at age 2 predicted less participation between ages 2 to 10.5 (Smith et al., 2018). However, families with high levels of stress and high levels of child problem behavior at child age 2 participated at a higher rate, suggesting that caregiver stress at 2 is a more salient predictor of caregiver participation than child problem behavior. These results align with Ammerman and colleagues' (2006) conclusions that home-visiting interventions may provide a context for engaging socially isolated and stressed caregivers. However, parent engagement in the FCU has yet to account for the potential contribution of social support satisfaction at the study's outset as an independent predictor of engagement. Theoretically, caregivers with lower levels of social support satisfaction would be expected to engage in more total feedback sessions than caregivers with higher levels of support satisfaction when viewing

inadequate social support as an additional proximal family stressor. Additionally, there is evidence that the FCU improves social support satisfaction by improving child problem behavior, at least in early childhood. It remains to be seen whether continued engagement in the FCU would lead to longer-term increases in social support satisfaction.

1.8 The Present Study

The current study sought to enrich our understanding of factors that predict engagement in family-focused interventions by examining the role that social support satisfaction may play in promoting caregivers' decisions to engage in the FCU, which was delivered nearly annually over an eight-year period. The goal was to extend findings from the ESMS that previously showed elevated parental distress at child age 2 to predict greater engagement in the FCU over this same eight-year period (Smith et al., 2018) by assessing if greater dissatisfaction with social support predicts higher levels of family engagement both initially and continually through the 8-year period (child ages 2 to 10.5), including whether initial levels of social support dissatisfaction have long-term effects on engagement in the FCU from child ages 2 to 10.5. Based on the possibility that engagement in the FCU will have cumulative positive effects on social support satisfaction, the current study also will assess associations between FCU engagement and social support satisfaction from ages 2 to 9.5. Additionally, two series of exploratory analyses were conducted. First, we assessed whether lower levels of social support satisfaction were related to families' participation in follow-up intervention sessions following feedback sessions. Second, assessed associations between received social support and engagement with the FCU to rule out the possibility that frequency of support relates to engagement (feedbacks and follow-ups).

The following hypotheses were examined: 1) Based on previous research suggesting that higher levels of parental distress often lead to higher levels of parental engagement in family-based interventions, it was expected that lower levels of social support satisfaction would predict yearly participation in the FCU feedback session between ages 2 to 5; 2) Following the rationale for Hypothesis 1, lower levels of social support satisfaction at child age 5 were expected to predict a greater number of FCU feedback sessions between ages 7.5 and 10.5; 3) Based on similar logic and evidence, lower levels of social support satisfaction at child age 2 would predict a greater number of FCU feedback sessions between ages 2 and 10.5; and 4) As bidirectional relations are likely to be evident between social support satisfaction and engagement in the FCU, it was expected that participation in a higher number of feedbacks between child ages 2 to 5 would predict improvements in social support satisfaction between child ages 2 and 9.5.

2.0 Method

2.1 Participants

Seven-hundred and thirty-one families were recruited between 2002 and 2003 from WIC programs in Pittsburgh, PA (37%), Eugene, OR (37%), and Charlottesville, VA (26%). Participating families were selected based on having a two-year-old child and fulfilling criteria by having child, family, and/or socioeconomic risk factors for problem behavior. Risk factors were assessed using screening measures for child behavior problems (conduct problems, high-conflict relationships with adults), family problems (maternal depression, substance-use problems, daily parenting challenges, teen parent), and SES (low education achievement, low family income). The families in this study were deemed to be at high risk for later child disruptive behavior based on the presence of risk in two or more of these domains.

Biological parents were the primary caregivers that participated, with mothers accounting for an average of 95% of the caregivers assessed between the ages 2-10.5. At age two assessments, 49% of children were girls, and 50% of participating children were European American, 28% African American, 13% Hispanic/Latinx, 13% biracial, 9% were of other ethnic backgrounds. At recruitment, more than two thirds of families had an annual income of less than $20,000, and 90% had an income less than $30,000. All qualified for low income status based on eligibility criteria established by WIC centers. Forty-one percent of primary caregivers (97% mothers) had a high school diploma, and an additional 32% had 1-2 years of post-high school education or training. All families gave informed consented to participate.

2.2 Procedures

Participants were randomly selected to participate in the Family Check-Up intervention protocol or to the control condition (WIC services as usual, which do not include parent training; see Dishion et al., 2008 for randomization procedures). Of the 731 families in this study 367 were assigned to the intervention and 364 were assigned to the control condition. These families were scheduled for a 2.5-hour home visit each year for the completion of the family assessment, which consisted of caregiver's completing questionnaires and recording parent-child interactions during observational tasks (Dishion et al., 2008). Families were provided a monetary incentive for completion of the yearly assessment (e.g., $100 at the age 2 assessment).

For families assigned to the FCU intervention condition, parents were offered to engage in an initial interview and feedback components of the FCU following the assessment. During the initial interview the parent consultant explored parent concerns, focusing on issues that were currently the most critical for the child's well-being. In the feedback session the consultant shared findings from the initial interview and assessment sessions regarding strengths and challenges for the family, incorporating motivational interviewing to discuss areas of potential change, and generate goals the parents had for the child and family in the coming year. As an option for attaining these goals, families were invited to continue working with the parent consultant, using evidence-based family management skills to improve parenting and related issues (e.g., parental well-being, adaptive coping, co-parenting). To provide a modest incentive for engaging in the FCU, intervention families were also provided a $25 gift certificate for completing the initial interview and feedback sessions.

2.3 Measures

FCU engagement. Participation in the FCU feedback session was assessed each year as a binary outcome from child ages 2, 3, 4, and 5, and from ages 7.5, 8.5, 9.5, and 10.5, for a maximum total of eight feedback sessions. Post-feedback follow-up treatment sessions were also offered to families each year with no limit on the number of sessions a family could receive. See Tables 3-4 for descriptive information on feedback and follow-up sessions at each year.

Social Support. Caregiver's completed the General Life Satisfaction (GLS; Crnic, Greenberg, Rogozin, Robinson, & Basham, 1983) from child age 2 to 5, and 9.5. The GLS is a 12-item measure that assesses available support resources in three domains: intimate relationships, friendships, and neighborhood/community, as well as satisfaction with the support received in these domains. Primary caregivers reported the presence and/or availability of these types of resources, followed by a rating of their satisfaction within these domains on a 4-point scale ranging from *Very dissatisfied (I wish things were very different)* to *Very satisfied (I'm really pleased)*, and on a 7-point scale ranging from *None* to *A very great deal* regarding the amount of satisfaction obtained. Three items were used to assess the presence and/or availability of support (i.e., received). Although internal consistencies for these three items were low across assessments (ranged from .311-.429 from child ages 2 to 9.5), as these items were not originally designed to co-occur on the GLS, receipt support should be viewed more as an index than a scale (Streiner, 2003). Conversely, on the seven items used to assess social support satisfaction on the GLS by the measure's authors, internal consistency ranged from .756 at child age 2 to .807 at child age 9.5. The GLS contains items with different scale ranges, and so the proportion of maximum scaling method was used to create composite scores for the satisfaction and received support variables, which is a recommended approach when working with longitudinal data (Little, 2013; Moeller,

2015). See Appendix B for the specific questions and response options for social support satisfaction and received social support.

Depressive symptoms. Primary caregiver's depressive symptoms were assessed at child age 2 using the 20-item Center for Epidemiological Studies on Depression Scale (CES-D; Radloff, 1977). Primary caregivers reported how frequently they experienced depressive symptoms on a scale ranging from 0 (less than one day) to 3 (5-7 days), which is summed to create an overall score. Internal consistency was $\alpha = .87$. Sample items include I had trouble keeping my mind on what I was doing and I had crying spells.

Parenting daily hassles. Caregivers completed the Parenting Daily Hassles (PDH) Questionnaire at child age 2 (Crnic & Greenberg, 1990). The PDH is a 20-item measure that assesses the perceived frequency of hassles and their perceived intensity on a 5-point scale (1=low, 5=high). The frequency subscale was used in the current study, which assesses how often parents feel hassled by certain activities (e.g., Being nagged, whined at or complained to and Kids are difficult to manage in public places). Internal consistency was $\alpha = .85$.

Child behavior problems. Caregivers completed the Child Behavior Checklist for Ages 1.5-5 (CBCL/1.5-5; Achenbach & Rescorla, 2000) at child age 2. The CBCL/1.5-5 is a 99-item questionnaire that assesses behavioral problems in young children. The broad-band externalizing factor was used to evaluate problem behavior. Internal consistency for primary caregiver reports of broad-band externalizing behavior at child age 2 was $\alpha = .82$.

Demographic questionnaire. Parents responded to questions about parental education and income, family structure, and race/ethnicity. Parental education was assessed on a scale of 1 ("no formal schooling") to 9 ("graduate degree"). Parental income was assessed on a scale of 1 ("$4,999 or less") to 13 ("$90,000 or more"). For the current analysis, parental education was reduced from

nine groups into three: less than high school education, high school/GED, and more than high school education. Income, which was measured categorically, was used continuously in analyses by using $4,999 to represent "$4,999 or less" on the categorical scale, and subsequent values were calculated by finding the mean of each category's range.

3.0 Data Analysis

SPSS 26.0 was used for data organization and to obtain descriptive information. Analyses were conducted using R version 3.5.1, and the Blimp application was used for multiple imputation to account for missing data (Enders, Keller, & Levy, 2018; Keller & Enders, 2017). The 'tidyverse' package was used for ANOVA tests, the package 'lme4' was used for multilevel analyses, the 'mitml' package was used to obtain model estimates from multiple imputed data sets, and the 'MASS' and 'pscl' packages were used to explore appropriate models for count data.

3.1 Descriptive Statistics and Inter-Correlations

Descriptive statistics for study variables are presented in Tables 1-4. Outliers were tested for using interquartile range (IQR) multipliers (Tukey, 1977), and no extreme outliers were detected for predictor variables (i.e., more than three IQRs). Table 5 presents correlations for predictor, covariate, and dependent variables. Covariates that represented caregiver's psychological distress were significantly related in expected direction, including caregiver depression and daily hassles, and child externalizing behavior at age 2 (rs ranged from .21 to .344, all ps < .001). Income was significantly negatively associated with externalizing behavior (r = -.165, p < .01), and positively associated with social support satisfaction at age 5 and feedbacks between 2 to 5 and 2 to 10.5 (rs ranged from .106 to .138, all ps < .05). Social support satisfaction at ages 2 and 5 was significantly and negatively related to depression and daily hassles (rs ranged from -.129 to -.317, all ps < .05). Depressive symptoms were significantly related to total feedback

sessions between ages 2 to 5 ($r = .11$, $p < .05$) and 2 to 10.5 ($r = .107$, $p < .05$), and to total follow-up sessions across all age ranges (rs ranged from .124 to .154, all ps < .05). Relevant to the primary hypotheses social support satisfaction at ages 2, 5, and 9.5 were unrelated to engagement in total feedback session across all age ranges. Relevant to the exploratory analyses received social support at age 2 was related to total number of feedbacks and follow-up sessions across all age ranges (rs ranged from .114 to .171, all ps < .05).

One-way ANOVA tests were used to assess relations between categorical covariates (i.e., site, race, education) and engagement (i.e., feedback and follow-up sessions) at all age ranges (see tables 6-8). Education was significantly related to feedbacks between ages 2 to 10.5, $F(2,364) = 4.51$, $p = .012$ and ages 7.5 to 10.5, $F(2,364) = 4.25$, $p = .015$, and significantly related to follow-up treatment between ages 2 to 5, $F(2,364) = 3.83$, $p = .023$, 2 to 10.5, $F(2,364) = 4.9$, $p = .008$, and ages 7.5 to 10.5, $F(2,364) = 3.91$, $p = .021$. Post-hoc comparisons using the Tukey HSD test indicated that there were significant differences in engagement, such that caregivers with greater than a high school education attended more feedbacks compared to caregivers with less than a high school education.

Site location was significantly related to feedbacks between ages 2 to 5, $F(2,364) = 5.52$, $p = .004$, and significantly related to follow-up sessions between 2 to 5, $F(2,364) = 6.59$, $p = .002$, ages 7 to 10.5, $F(2,364) = 6.66$, $p = .001$, ages 2 to 10.5, $F(2,364) = 5.86$, $p = .003$. Post-hoc Tukey HSD comparisons indicated that there were significant differences in feedback sessions, such that caregivers in Eugene and Pittsburgh attended more feedbacks than caregivers in Charlottesville and more follow-ups from 2 to 10.5. Only significant differences between Eugene and Charlottesville were present for follow-up sessions across ages 2 to 5 and between Pittsburgh and Charlottesville for follow-up sessions across ages 2 to 10.5.

3.2 Missing Data

Little's MCAR test revealed that missing data across the study's waves for measures used in the analyses were missing completely at random, $\chi 2$ (1377, n = 367) = 1408.45, p = .284. Missing data was present for social support variables across time (12-27% missing), depression at age 2 (<1% missing), and income (1.1% missing). Multiple imputation methods are well suited to account for missing data for multilevel analysis, and avoid issues regarding single-level imputation for multilevel data structures (Enders, 2017; Enders, Mistler, & Keller, 2016). The Blimp application was used for imputation because it can accommodate nominal, ordinal, and continuously scaled data (Enders et al., 2018). A fully conditional specification approach was used to create one hundred imputed data sets to maximize precision (van Buuren, 2018; van Buuren, et al. 2006). Prior to imputation, the categorical variables education and race were collapsed to ensure that all the categories of these variables had observed values with all the other variables. This method allows the model to be identified and thus estimated; otherwise the estimation algorithm does not have sufficient information to estimate correlations and the imputation will not converge (van Buuren, 2018).

This imputation process draws values from a normal curve stretching from negative to positive infinity, and thus assumes a normal distribution of the data. In this sample, social support satisfaction, depressive symptoms, and income were slightly skewed in the expected directions (i.e., depression and income were right-skewed, and social support was left-skewed). Based on this patterning, a natural log transformation was conducted prior to imputation to put the data on a metric that is more appropriate for a normal distribution imputation, and then the data were back-transformed to preserve the skewed distribution of the variables. This process acts to constrain the range of imputed values and may induce bias (C. Enders, personal communication, June 24-5,

2020). All analyses were rerun using the skewed imputed data to compare results obtained from these two imputation approaches. Unless explicitly stated in the Results section, no differences between imputed data sets were present.

3.3 Hypothesis Testing

Multilevel logistic regression was used to test hypothesis 1 regarding the association between social support satisfaction and FCU engagement, single-level Poisson regression was used to test hypothesis 2 and 3 (similar in substance to hypothesis 1), and multilevel regression was used to test hypothesis 4 examining associations between feedbacks and subsequent social support satisfaction. Multilevel models nested social support and engagement, which were measured repeatedly over time, within individuals, and included a random effect to account for the nesting of data within individuals (Raudenbush & Bryk, 2002). The multilevel model utilized to test hypothesis 1 used data structured to match social support and feedbacks at concurrent ages (e.g., age 2 matched with age 2), because the assessment of parental social support was often measured weeks in advance of the FCU feedback session. The multilevel model utilized to test hypothesis 4 used data structured to match feedbacks from ages 2 to 5 and social support satisfaction from ages 3 to 9.5, with age 2 social support satisfaction included as a covariate.

3.4 Exploratory Analyses

Exploratory analyses corresponding to hypothesis 1 utilized multilevel Poisson regression for analyses. Single-level Poisson regression was first used to test exploratory analyses using follow-up treatment sessions as the outcome variable for ages 7.5 to 10.5 and 2 to 10.5, as study measurement design did not allow for a multilevel model structure when examining the role of social support in later childhood. However, these models suggested that the assumptions of the Poisson general linear model (GLM) were not met. Count data commonly exhibits characteristics of overdispersion (i.e., excess variability) and zero-inflation (i.e., excess of zeros; Yang et al., 2010). Thus, negative binomial (NB), zero-inflated (ZI), and zero-inflated negative binomial (ZINB) models were generated to account for dispersion and zero-inflation, and then used to compare model fit (Beaujean & Morgan, 2016; Zeileis, Kleiber, & Jackman, 2008; Zuur, 2009).

ZINB analyses using multiple imputed datasets were unable to be modeled in R because the package used to estimate model effects from the BLIMP application was not designed to run zero-inflated analyses. Because the missing data in this sample are missing completely at random (MCAR; see above), list-wise deletion was utilized to test ZI and NB models on the non-imputed data set. The dispersion for NB, ZI, and ZINB models was calculated using a $\chi 2$ approximation of the residual deviance (Zuur, 2009). NB and ZINB models achieved acceptable dispersion (i.e., near 1), but the data did not appear to meet dispersion criteria for ZI models with dispersion scores, which ranged from 5.26-5.3 for models examining engagement from ages 7.5 to 10.5 to 19.25-19.81 for models examining engagement from ages 2 to 10.5. The Vuong test was used to compare NB and ZINB models (Vuong, 1989). Vuong statistics tend to favor zero-inflated models and bias corrections are recommended (Desmarais & Harden, 2013). Bias-corrected analyses favored NB

models (see table 9). Based on these findings, NB models were used to analyze total FCU follow-up sessions for age ranges 7.5 to 10.5 and 2 to 10.5.

4.0 Results

4.1 Hypothesis Testing

Hypothesis 1 (Tables 10-11). In testing the hypothesis that social support satisfaction would predict engagement in an FCU feedback back session between ages 2 to 5, after accounting for covariates, social support satisfaction did not significantly predict engagement for analyses that used transformed and non-transformed imputed data.

Hypothesis 2 (Table 12). In testing the hypothesis that social support satisfaction at age 5 would predict the total number of feedback sessions between ages 7.5 to 10.5, after accounting for covariates, social support satisfaction did not significantly predict engagement in middle childhood for analyses that used transformed and non-transformed imputed data.

Hypothesis 3 (Table 13). In testing the hypothesis that social support satisfaction at age 2 would predict the total number of feedback sessions between ages 2 to 10.5, after accounting for covariates, social support satisfaction did not significantly predict total engagement across the Early Steps study for analyses that used transformed and non-transformed imputed data.

Hypothesis 4 (Tables 14-15). In testing the hypothesis that number of feedbacks attended between ages 2 and 5 would predict social support satisfaction between ages 3 and 9.5, after accounting for age 2 social support satisfaction and covariates, engagement in feedback sessions was not found to predict social support satisfaction for analyses that used transformed and non-transformed imputed data.

4.2 Exploratory Analyses

4.2.1 Social Support Satisfaction to Follow-Up Sessions

Imputed Data

Exploratory Analysis 1 (Tables 16-17). Social support satisfaction did not predict the number of follow-up sessions between child ages 2-5 after accounting for covariates for analyses that used transformed and non-transformed imputed data. However, depression only emerged as a significant predictor in the non-transformed model ($b = 0.013$, $p = .047$), but not in the transformed model ($b = 0.012$, $p = .057$). Based on the skewed distribution of the depression variable and the assumption of normality made during imputation, the more conservative results from the transformed data will be retained for interpretation.

Non-imputed Data

Exploratory Analysis 2 (Table 18). Social support satisfaction at age 5 did not predict the number of follow-up sessions between child ages 7.5-10.5 after accounting for covariates.

Exploratory Analysis 3 (Table 19). Social support satisfaction at age 2 did not predict the number of follow-up sessions between child ages 2-10.5 after accounting for covariates.

4.2.2 Received Social Support to Feedbacks

Exploratory Analysis 1 (Tables 20-21). Received social support between ages 2 to 5 did not significantly predict engagement in a feedback session between ages 2 to 5 after accounting for covariates for analyses that used transformed and non-transformed imputed data.

Exploratory Analysis 2 (Table 22). Received social support at age 5 did not predict the total number of feedbacks between ages 7.5 to 10.5 after accounting for covariates for analyses that used transformed and non-transformed imputed data.

Exploratory Analysis 3 (Table 23). Received social support at age 2 significantly predicted the total number of feedbacks between ages 2 to 10.5 after accounting for covariates for analyses that used transformed and non-transformed imputed data. For everyone one unit increase in received support the expected number of feedback sessions increased by a factor of 1.19 or 19%.

4.2.3 Received Social Support to Total Follow-Up Sessions

Imputed Data

Exploratory Analysis 1 (Tables 24-25). Received social support between ages 2 to 5 did not significantly predict the number of follow-up sessions between ages 2 to 5 after accounting for covariates for analyses that used transformed and non-transformed imputed data. Depression was significant for non-transformed data ($b = 0.013$, $p = .04$), but not for transformed data ($b = 0.012$, $p = .05$). This pattern was also observed in the model examining support satisfaction and follow-up sessions between ages 2 to 5 and, again, the more conservative results were retained.

Non-imputed Data

Exploratory Analysis 2 (Table 26). Received social support at age 5 did not predict the total number of feedbacks between ages 7.5 to 10.5 after accounting for covariates.

Exploratory Analysis 3 (Table 27). Received social support at age 2 significantly predicted the sum total of follow-up sessions between ages 2 to 10.5 after accounting for covariates, such that greater received support was associated with greater engagement. For everyone one unit

increase in received support the expected number of follow-up sessions increased by a factor of 1.47 or 47%.

5.0 Discussion

5.1 Social Support Satisfaction and Engagement in the Family Check-Up

Based on theory and research suggesting that caregiver psychological distress would promote help-seeking behavior amongst parents with young children at risk for behavior problems (e.g., Ammerman et al., 2006; Andersen, 1995; Eiraldi et al., 2006; Smith et al., 2018), we hypothesized that low social support satisfaction would predict greater caregiver engagement in the Family Check-Up (FCU) across all ages. Overall, social support satisfaction was not significantly related to greater engagement in FCU feedback sessions across all age ranges examined. There are a few reasons for why these expected associations were not found. First, from a substantive perspective, it could be that social support satisfaction is not a reliable predictor of engagement in the FCU perhaps because it does not directly address parent well-being as more direct measures do (e.g., depression, anxiety, self-efficacy). It remains unclear whether the current null findings would be limited to the FCU and other comparably structured models (i.e., brief "check-up" framework offered annually over time) or be more predictive of engagement in more traditional individual- or group-based parenting approaches (e.g., standardized protocols delivered over 10-20 weekly sessions).

Secondly, similar to other longitudinal studies of parenting interventions that have administered the General Life Satisfaction scale (Crinic et al., 1983; e.g., Smart Beginnings clinical trial), caregiver reports of social support satisfaction in the ESMS study were skewed toward higher satisfaction across all study waves. While there was still variation within caregiver reports of social support satisfaction, only about 5% of caregivers reported overall levels of

dissatisfaction with social support at age 2 (i.e., scores reflecting an average satisfaction level of "somewhat dissatisfied" or below). Thus, is it possible that a ceiling effect might have influenced our ability to detect an association between social support satisfaction and engagement in the FCU. It remains unclear if a measure of perceived social support with more variation would be related to FCU engagement in the current sample.

Relatedly, because we were unable to analyze the specific support sources that caregivers reported using, it is possible that the relation between inadequate support and engagement in the FCU is domain specific. Functional measures of social support are multidimensional and provide more domain specific information (e.g., emotional support, instrumental support, companionship support) and are considered most appropriate for studying how social resources contribute to coping with stressors (Wills & Shinar, 2000). Thus, functional measures are recommended for future studies assessing engagement patterns in parenting-focused interventions.

5.2 Engagement in the Family Check-Up and Later Social Support Satisfaction

We also hypothesized that greater engagement in the FCU between child ages 2 to 5 would predict improvements in social support satisfaction between child ages 2 and 9.5. This hypothesis was based on research findings that home visiting interventions have been found to enhance caregiver social support (e.g., McCurdy, 2001) and prior work with the current sample indicating that improvements in child behavior problems as a result of engaging in the FCU predicted positive changes in caregiver's reported general life satisfaction, including social support (McEachern et al., 2013). However, in the current study engagement in the FCU was not associated with later social support satisfaction. Again, this null finding might simply reflect that engagement in the

FCU through the feedback session may not be directly related to changes in social support satisfaction.

Importantly, this study did not test for the indirect effects that were found in McEachern et al. (2013) and thus does not exclude the possibility that the FCU intervention may indirectly improve perceived social support by improving some other facet of child or parent behavior. Additionally, the current sample used only caregivers in the intervention condition of the FCU with no other exclusion criteria, while McEachern et al. (2013) used a sample of families from both intervention and control conditions, excluding caregivers without a romantic partner.

As such, there are a multitude of possible explanations for the divergent findings.

Finally, based on the skewed distribution of social support satisfaction scores and relatively little change in mean ratings at each time point, there could again be a ceiling effect. To this point, it has been noted that the skewed nature of perceived social support can reduce sensitivity for detecting effects of an intervention (Wills & Shinar, 2000). Interventions that are interested in directly effecting social support should consider which support sources are targets for change, and choose and develop relevant scales that measure the target areas of social support (see Wills & Shinar, 2000 for detailed considerations regarding measurement for social support interventions). It is perhaps unsurprising then that baseline reports of social support satisfaction were the strongest predictor of later social support satisfaction.

5.3 Exploratory Analyses and Results

5.3.1 Social Support Satisfaction and Follow-Up Treatment Sessions

Similar to the results of the hypothesized models, social support satisfaction did not predict the number of follow-up treatment sessions between ages 2 to 5, 7.5 to 10.5, and 2 to10.5. Again, it is possible that social support satisfaction is not a reliable predictor of long-term engagement, perhaps because it does not directly capture caregiver well-being. It is also possible that the skewed distribution of data for social support satisfaction made it challenging to observe a significant effect on FCU engagement. Finally, it remains unclear if a broader measure of perceived support that includes multiple support domains (e.g., emotional, instrumental) might predict engagement. Overall, it appears that social support satisfaction was not related to either component of FCU intervention engagement in the ESMS.

5.3.2 Received Social Support Satisfaction and Engagement

Caregiver reports of *received* (i.e., quantity/frequency) social support did not predict engagement in FCU feedback sessions or the quantity of follow-up treatment sessions between ages 2 to 5 and 7.5 to10.5. However, higher received social support at age 2 predicted greater cumulative engagement in the eight offerings of the FCU and the total number of follow-up treatment sessions from ages 2 to 10.5. These findings suggest that greater received support cumulatively promoted longer-term investment in the FCU intervention. Initial levels of received support could reflect individual differences in caregiver's ability to engage social resources (e.g., social skills, sociability) and to the general availability of social support within an individual's

network. Importantly, we did not measure who was initiating the social contact and so it is possible that reports of greater received support could reflect the characteristics of the caregiver's social network rather than the caregiver's ability to garner social resources. Even so, families with fewer social resources or low ability to engage support systems may need other sources of motivation to maintain engagement in FCU over time based on concerns about their child's behavior or other family factors (e.g., level of depressive symptoms, resources for their child). Identifying ways to initiate and sustain engagement of caregivers with low levels of social support provides a critical opportunity to address treatment barriers and improve intervention engagement in the FCU and perhaps other parenting interventions initiated in early childhood.

Alternatively, higher levels of received support may reflect higher levels of distress for caregivers. For example, in a study of the transition to parenthood caregivers that scored lower on parenting adjustment scales, which reflect anxiety, moodiness, avoidance of close relationships, and worry about ability to cope with stress, had more frequent contact with social supports across the transition to parenthood (Bost et al., 2002). This pattern would align with interpretations regarding the positive relationship between received support and distress that available support is engaged in times of high stress (Dunkel-Schetter & Bennett, 1990; Wills & Shinar, 2000). However, it is challenging to reconcile the interpretation of received support as a marker of distress with the proposed theories of caregiver engagement and the current pattern of findings. Specifically, we would expect that the most proximal measures of distress would predict engagement, which were most appropriately modeled examining outcomes from ages 2 to 5 using multilevel regression analyses. Received support was not a significant predictor in these models, in contrast to other proximal measures of distress (i.e., depression—see below) that did predict engagement. If received support were a marker of distress in this sample, it would suggest that

when other distress variables are accounted for, received support does not provide additional relevance regarding engagement in the FCU.

5.4 Covariates and Prediction of FCU Engagement

5.4.1 Depressive Symptoms

Higher depressive symptoms predicted greater engagement in FCU feedback sessions between child ages 2 to 5 and 2 to 10.5, but not from ages 7.5 to 10.5. Higher depression also predicted the total number of follow-up sessions between ages 7.5 to 10.5 and 2 to 10.5, but did not predict total number of follow up treatment sessions at each year between ages 2 to 5. These findings are consistent with theories of help-seeking behavior that suggest that psychological distress may motivate service engagement for families (Andersen, 1995; Eiraldi et al., 2006), and suggest the continued use of parent depressive symptoms as a screen for identifying parents that who are likely to engage in the FCU. Furthermore, continued use of a depression inventory is warranted in identifying families that may benefit from engaging in the FCU over time as the FCU has demonstrated short-term effects on maternal depression (Shaw et al., 2009), which is linked to the prevention of child and adolescent internalizing and externalizing problems (Connell et al., 2019; Hentges et al., 2020; Reuben et al., 2015; Shaw et al., 2009).

5.4.2 Geographic Location

Geographic location also predicted engagement in FCU feedback sessions from child ages 2 to 5, but different patterns emerged in models that accounted for social support satisfaction vs. received social support. Specifically, urban (Pittsburgh, PA) and suburban (Eugene, OR) sites had greater engagement compared to the rural site (Charlottesville, VA) in models with support satisfaction, but only the suburban site had greater engagement compared to the rural site in models with received support. Site did not predict number of feedback sessions from child ages 7.5 to 10.5 and 2 to 10.5. Urban and suburban sites tended to have more follow-up treatment sessions compared to the rural site across child ages 7.5 to 10.5 and 2 to 10.5. The suburban site predicted greater engagement compared to the rural site for follow-up sessions between ages 2 to 5, but there were no significant differences between the urban and rural locations.

Overall, these results suggest that there may be unique barriers to participation in more rural locations. As such, implementation efforts should focus on identifying and addressing barriers to access in rural communities. However, this issue was not directly tested, and it is also possible that other factors related to therapeutic engagement such as interventionist working alliance and/or fidelity could account for these site-specific effects seen in the current sample.

5.4.3 Education Level

Compared to having less than a high school education, caregivers that had greater than a high school education were more likely to have a greater number of follow-up treatment sessions between ages 2 to 5, but were not more likely to engage in the FCU. Furthermore, caregivers with greater than a high school education were more likely to engage in a greater number of FCU

feedback sessions and follow-up sessions across ages 7 to 10.5 and 2 to 10.5. These findings suggest that even within a predominately low-income sample, greater educational attainment appears to promote sustained long-term engagement in the FCU. It may be that caregivers with more education are more willing to continue services over long periods of time because they are more likely to believe that continued engagement with the intervention will help support their family (Spoth & Redmond, 1995; Spoth, Redmond, Yoo, & Dodge, 1993; Spoth & Conroy, 1993). Alternatively, it may be that parents with higher levels of education have work schedules that allow the time necessary for longer term participation in the FCU intervention, while parents with less than a high school education may work multiple jobs and have less available time and energy to participate.

These results highlight the potential difficulties that caregivers with low educational attainment may have in sustaining engagement in the FCU. As such, it will be important to identify additional resources and incentives that could help motivate and support these caregivers in long-term engagement in parenting programs. Despite the evidence that these caregivers were less likely to have long-term engagement, lower educational attainment did not predict fewer FCU feedback sessions between child ages 2 to 5, which suggests that these caregivers were able to successfully engage with a brief intervention over multiple years during early childhood. This pattern is of particular relevance because significant intervention effects of the FCU are observed based on participation through the feedback session, and are not further enhanced by participation in follow-up treatment sessions (Dishion et al., 2008; 2014; Shaw et al., 2016). Future research is needed to advance our understanding of the differences between participation in the feedback and continued engagement in follow-up treatment.

5.5 Strengths, Limitations, and Future Directions

These results and interpretations should be borne with the methodological strengths and limitations of this study. A significant strength of the ESMS sample is its longitudinal and randomized design, which allowed for the assessment of different patterns of intervention engagement across developmental periods. Moreover, the ability to examine engagement patterns across different geographic regions strengthens the external validity of these findings. Finally, these findings in the context of the FCU's health maintenance model, which featured nearly annual check-ups over a 9-year period, make a unique contribution to the literature on parent intervention engagement, which has typically focused on engagement in more short-term, traditional intervention designs.

Several limitations should also be considered. One limitation relates to the incomplete collection of caregiver social support data (collected at child ages 2 to 5 and 9.5) relative to the number of years the intervention was offered (child ages 2 to 5 and 7.5 to 10.5). As such, a multilevel regression model, which helps account for the nesting of data within individuals over time, could only be used to assess the relationship between social support and FCU engagement between ages 2 to 5. Subsequent single-level regression analyses of FCU feedback sessions used count, rather than binary data, as the primary outcome, which makes comparisons across analyses (i.e., age ranges) more complicated. These models fail to account for the nesting of data within individuals in longitudinal analyses, and should be interpreted with some caution.

Another limitation relates to the process of imputing nested data with categorical, ordinal, and numerical variables. The imputation process required that the race and education variables be collapsed so that the imputation model could be identified and estimated. This issue is particularly relevant in light of the significant findings that education level predicted long-term engagement in

the FCU. As such, we could not determine at what point after a high school education does educational attainment significantly relate to long-term engagement. The generalizability of the study's findings to other populations should also be considered. The study recruited high-risk low-income families from WIC centers, which are not demographically representative of their respective counties. This means these results may not generalize to higher-income families, families not using WIC in the region, or low-risk families using WIC. Furthermore, these results may not generalize to more traditional community intervention frameworks that do not use a brief check-up approach. There may also be differences in caregiver motivation to participate when comparing real-world intervention settings to research settings (e.g., help-seeking vs. recruited, financial compensation). However, successful recruitment is a critical component when prevention efforts are implemented on a large-scale, such as in Pennsylvania with Governor Tom Wolf backing a Department of Human Services lead effort to expand evidence-based home visiting services, such as the FCU, to all families with first-born children and families with additional risk factors and new borns. In this case and for other prevention-based interventions, the current study design has good external validity (i.e., recruitment based), and the results provide important insight into engaging high-risk families.

Finally, this study did not examine provider-level factors, such as cultural competency and intervention fidelity, nor the working alliance between caregiver and interventionist. Assessing the dynamic interaction between the caregiver and interventionist is of particular relevance, because many recipients perceive the interventionist as the program (McCurdy & Jones, 2000), and because factors across multiple levels (e.g., parent, provider, neighborhood) are considered to be relevant for understanding caregiver involvement in family support programs (McCurdy & Daro, 2001). Provider experiences of stress, burnout, and social and institutional support can impact delivery

style and intervention fidelity, and should be considered in future studies of engagement. Future research should also include measures of caregiver perceptions of working alliance and intervention fidelity (e.g., cultural competency, delivery style, adherence to protocols). Furthermore, while this study used a quantitative approach to assess engagement, qualitative assessments of caregiver perceptions of treatment and interventionist fidelity could provide valuable information regarding caregiver decisions to engage. Future research should consider qualitative and mixed-method approaches to examining caregiver and provider level factors that predict engagement and retention in parenting programs.

Appendix A Tables

Table 1 Descriptive Statistics for Continuous Variables

Variable	Age (Years)	*n*	Range	*M*	*SD*
Income	2	363	4,999-55,000	17,652.34	9,942.48
Depressive Symptoms	2	366	0-55	16.94	10.30
Daily Hassles	2	367	27-80	46.84	8.77
Externalizing Behavior	2	367	1-46	20.83	7.55
Social Support Satisfaction	2	338	.83-7	4.97	1.29
	3	315	.33-7	4.99	1.44
	4	301	1.17-7	5.18	1.30
	5	284	1-7	5.24	1.36
	9.5	268	1-7	5.20	1.31
Received Social Support	2	338	0-3	1.28	0.51
	3	322	0-3	1.33	0.54
	4	297	0-3	1.32	0.56
	5	278	0-3	1.35	0.56
	9.5	259	0.25-3	1.46	0.55

Table 2 Descriptive Statistics for Categorical Variables

Variable	Category	*n*	%
Site			
	Charlottesville	95	25.9
	Eugene	136	37.1
	Pittsburgh	136	37.1
Race			
	White	203	55.3
	Black/African American	102	27.8
	Hispanic/Latinx	41	11.2
	Other	21	5.7
Education			
	Less than high school/GED	80	21.8
	High school/GED	163	44.4
	More than high school/GED	124	33.8

Note. At age 2

Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"

Table 3 Descriptive Statistics for FCU Engagement: Feedback Sessions and Follow-up Treatment

Child Age (Years)	FCU Feedback		Follow-Up Sessions			
	Yes (%)	No	*n* (%)	Range	*M*	*SD*
2	281 (76.6)	86	285 (77.7)	0-31	3.36	5.12
3	229 (68.4)	138	240 (71.6)	0-47	3.05	5.07
4	219 (69.7)	148	226 (72.0)	0-39	3.45	5.82
5	202 (66.2)	165	208 (68.2)	0-76	5.34	10.11
7.5	180 (64.7)	187	182 (65.5)	0-34	2.62	5.54
8.5	191 (74.6)	176	195 (76.2)	0-32	2.60	6.56
9.5	197 (68.9)	170	203 (71.0)	0-28	2.21	5.05
10.5	166 (59.3)	201	169 (60.4)	0-31	1.97	5.45

Table 4 Descriptive Statistics for Total FCU Feedback Sessions Ages 2 to 10.5

Received Feedbacks	Number of Families (%)
0	24 (6.5)
1	37 (10.1)
2	32 (8.7)
3	44 (12.0)
4	43 (11.7)
5	38 (10.4)
6	36 (9.8)
7	50 (13.6)
8	63 (17.2)

Table 5 Bivariate Correlations of Study Variables Using Unimputed Data

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Income	1														
2. Depression	-.078	1													
3. Daily Hassles	-.017	.250**	1												
4. Ext Behavior	-.165**	.210**	.344**	1											
5. SS Sat Age 2	.056	-.317**	-.04	-.129*	1										
6. SS Sat Age 5	.138*	-.230**	-.071	-.160**	.426**	1									
7. SS Sat Age 9.5	-.027	-.083	-.058	-.051	.239**	.315**	1								
8. Rec SS Age 2	-.031	-.124*	-.045	-.037	.404**	.122*	.013	1							
9. Rec SS Age 5	.088	-.066	-.067	-.11	.208**	.404**	.081	.374**	1						
10. FB 2-10.5[a]	.106*	.107*	.069	-.063	-.018	-.102	-.092	.171**	-.003	1					
11. FB 7.5-10.5[a]	.067	.079	.074	-.068	-.005	-.078	-.079	.167**	.021	.885**	1				
12. FB 2-5[a]	.121*	.110*	.046	-.042	-.029	-.097	-.079	.131*	-.029	.867**	.534**	1			
13. Tx 2-10.5[a]	.079	.154**	.069	.026	-.011	-.114	-.215**	.139*	.028	.476**	.416**	.419**	1		
14. Tx 7.5-10.5[a]	.085	.153**	.044	.004	-.025	-.044	-.203**	.114*	.059	.406**	.430**	.276**	.860**	1	
15. Tx 2-5[a]	.058	.124*	.075	.038	.002	-.144*	-.182**	.131*	-.002	.439**	.324**	.450**	.915**	.580**	1

Note. Ext = Externalizing; SS = Social support; Sat = Satisfaction; Rec = Received; FB = Feedback session, Tx = Follow-up treatment session

[a] Average total engagement across identified child age ranges (in years)

*$p < 0.05$ (2-tailed) **$p < 0.01$ (2-tailed) ***$p < 0.001$ (2-tailed)

Table 6 One-way ANOVAs for Education and Engagement Outcomes: Total Feedback and Follow-up Treatment Sessions

Outcome Variable [a]	Less than HS/GED		High School/GED		Greater than HS/GED		*F*(2,364)	*p*
	M	*SD*	*M*	*SD*	*M*	*SD*		
FB 2-5	2.28	1.48	2.51	1.38	2.74	1.41	2.712	.068
FB 7.5-10.5	1.61	1.58	2.01	1.46	2.24	1.51	4.254	.015*
FB 2-10.5	3.89	2.70	4.52	2.47	4.98	2.56	4.509	.012*
Tx 2-5	8.43	8.73	11.7	19.7	15.6	21.6	3.826	.023*
Tx 7.5-10.5	3.78	10.1	6.23	13.5	9.51	18.4	3.905	.021*
Tx 2-10.5	12.2	15.6	17.9	29.8	25.1	35.6	4.896	.008**

Note. HS = High school diploma; FB = FCU feedback sessions; Tx = Follow-up treatment sessions

[a] Average total engagement across identified child age ranges (in years)

*$p < .05$ ** $p < .01$ *** $p < .00$

Table 7 One-way ANOVAs for Site and Engagement Outcomes: Total Feedback and Follow-up Treatment Sessions

Outcome Variable [a]	Charlottesville		Eugene		Pittsburgh		*F*(2,364)	*p*
	M	*SD*	*M*	*SD*	*M*	*SD*		
FB 2-5	2.13	1.45	2.70	1.41	2.66	1.36	5.516	.004**
FB 7.5-10.5	1.99	1.59	2.00	1.53	2.01	1.46	0.004	.996
FB 2-10.5	4.12	2.69	4.70	2.65	4.67	2.39	1.727	.179
Tx 2-5	7.37	10.7	16.3	20.8	11.8	20.1	6.590	.002**
Tx 7.5-10.5	2.83	3.39	6.45	13.8	9.93	19.4	6.664	.001**
Tx 2-10.5	10.2	13.1	22.7	30.2	21.7	36.3	5.865	.003**

Note. FB = FCU feedback sessions; Tx = Follow-up treatment sessions

[a] Average total engagement across identified child age ranges (in years)

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 8 One-way ANOVAs for Race/Ethnicity and Engagement Outcomes: Total Feedback and Follow-up Treatment Sessions

Outcome Variable [a]	White		Black/AA		Hispanic/Latinx		Other		*F*(3,363)	*p*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FB 2-5	2.69	1.42	2.30	1.38	2.44	1.43	2.33	1.46	1.976	.117
FB 7.5-10.5	2.07	1.54	2.08	1.45	1.46	1.52	2.00	1.55	1.952	.121
FB 2-10.5	4.76	2.61	4.38	2.36	3.90	2.73	4.33	2.78	1.529	.207
Tx 2-5	14.40	22.20	9.26	13.80	9.07	7.55	13.00	15.70	2.167	.092
Tx 7.5-10.5	7.66	16.40	6.68	11.20	1.73	1.91	9.05	24.70	2.000	.114
Tx 2-10.5	22.00	34.70	15.90	21.20	10.80	8.720	22.10	38.80	2.179	.090

Note. FB = FCU feedback sessions; Tx = Follow-up treatment sessions; AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"

[a] Average total engagement across identified child age ranges (in years)

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 9 Vuong Tests of Model Selection

Model	Vuong's Z Statistic		*p*	Preferred Model
SS Sat to Tx 7.5-10.5 [a]	Raw	1.311	.095	ZINB
	AIC-corrected	-0.794	.214	NB
	BIC-corrected	-4.623	<.001***	NB
SS Sat to Tx 2-10.5 [a]	Raw	1.311	.256	ZINB
	AIC-corrected	-0.794	<.001***	NB
	BIC-corrected	-4.623	<.001***	NB
Rec SS to Tx 7.5-10.5 [a]	Raw	2.534	.006**	ZINB
	AIC-corrected	0.036	.485	ZINB
	BIC-corrected	-4.481	<.001***	NB
Rec SS to Tx 2-10.5 [a]	Raw	0.908	.182	ZINB
	AIC-corrected	-2.981	.001**	NB
	BIC-corrected	-10.388	<.001***	NB

Note. SS Sat = Social support satisfaction, Rec SS = Received social support, Tx = Follow-up treatment sessions; AIC = Akaike information criterion; BIC = Bayesian (Schwarz) information criterion

[a] Average total engagement across identified child age ranges (in years)

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 10 H1: Fixed Effects Estimates for Multilevel Logit Model for Social Support Satisfaction and FCU Feedbacks: Ages 2-5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	-0.139	1.536	-0.091	.928	0.067	0.063	0.004	1.459	0.003	.998	0.118	0.106
Year	-0.194	0.344	-0.566	.572	0.103	0.094	-0.178	0.314	-0.568	.570	0.203	0.169
Eugene	0.796	0.365	2.179	.029*	0.005	0.005	0.807	0.366	2.205	.027*	0.008	0.008
Pittsburgh	0.734	0.373	1.97	.049*	0.006	0.006	0.757	0.372	2.031	.042*	0.011	0.011
Black/AA	-0.536	0.353	-1.52	.128	0.008	0.008	-0.533	0.352	-1.512	.130	0.012	0.012
Hispanic/Latinx	0.112	0.472	0.237	.813	0.004	0.004	0.101	0.47	0.215	.830	0.006	0.006
Other	-0.951	0.591	-1.61	.107	0.004	0.004	-0.943	0.589	-1.600	.110	0.007	0.007
HS/GED	0.25	0.355	0.705	.481	0.005	0.005	0.256	0.354	0.724	.469	0.004	0.004
Greater than HS/GED	0.695	0.398	1.745	.081	0.007	0.007	0.698	0.398	1.754	.079	0.006	0.006
Income	<0.001	<0.001	1.869	.062	0.044	0.042	<0.001	<0.001	1.858	.063	0.064	0.06
Depression	0.035	0.014	2.409	.016*	0.026	0.026	0.033	0.015	2.239	.025*	0.085	0.078
Daily Hassles	0.001	0.018	0.049	.961	0.019	0.018	0.002	0.018	0.122	.903	0.022	0.022
Externalizing Behavior	-0.016	0.020	-0.778	.437	0.006	0.006	-0.016	0.02	-0.81	.418	0.009	0.009
SS Satisfaction	0.224	0.270	0.830	.406	0.104	0.094	0.190	0.239	0.795	.427	0.191	0.161
Year x SS Satisfaction	-0.047	0.064	-0.731	.465	0.109	0.099	-0.050	0.058	-0.865	.387	0.223	0.183

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma; SS = Social support; SE = Standard error; RIV = Relative increase in variance. Variables with large amounts of missing data and/or that are weakly correlated with other variables will have higher RIV's (see van Buuren, 2018; e.g., RIV = .026 for depression means that the estimated sampling variance is 2.6% larger than variance if data on depression were complete); FMI = Fraction of missing information. FMI is the proportion of total sampling variance that is due to missing data (see van Buuren, 2018; e.g., FMI = 0.026 for depression means that 2.6% of the total sampling variance is attributable to missing data).

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 11 H1: Random Effects for Multilevel Logit Model for Social Support Satisfaction and FCU Feedbacks: Ages 2-5

'Random Effect	Non-transformed			Transformed		
	s^2	Correlations		s^2	Correlations	
		1	2		1	2
Participant						
1. Intercept	1.003	-		1.210	-	
2. Social support satisfaction	0.055	-.183	-	0.025	-.083	-
Participant						
1. Intercept	0.657	-		0.510	-	
2. Year	0.110	.223	-	0.100	.189	-

Note. All estimates are based on 100 imputed data sets.

Table 12 H2: Poisson Regression Model of Social Support Satisfaction and Feedback Sessions: Ages 7.5-10.5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	0.618	0.307	2.014	.044	0.074	0.069	0.623	0.303	2.056	.040	0.12	0.107
Eugene	0.015	0.102	0.151	.880	0.003	0.003	0.014	0.102	0.142	.887	0.006	0.006
Pittsburgh	-0.059	0.097	-0.612	.541	0.002	0.002	-0.059	0.097	-0.603	.546	0.006	0.006
Black/AA	0.049	0.096	0.513	.608	0.003	0.003	0.05	0.096	0.517	.605	0.005	0.005
Hispanic/Latinx	-0.268	0.149	-1.804	.071	0.004	0.004	-0.266	0.149	-1.785	.074	0.009	0.009
Other	-0.054	0.164	-0.328	.743	0.001	0.001	-0.054	0.164	-0.331	.741	0.003	0.003
HS/GED	0.16	0.108	1.486	.137	0.002	0.002	0.159	0.108	1.477	.140	0.006	0.006
Greater than HS/GED	0.232	0.115	2.025	.043*	0.003	0.003	0.231	0.115	2.012	.044*	0.007	0.007
Income	<0.001	<0.001	0.858	.391	0.018	0.018	<0.001	<0.001	0.835	.404	0.022	0.022
Depression	0.005	0.004	1.357	.175	0.011	0.011	0.005	0.004	1.337	.181	0.021	0.021
Daily Hassles	0.006	0.005	1.27	.204	0.002	0.002	0.006	0.005	1.262	.207	0.007	0.007
Externalizing Behavior	-0.011	0.005	-2.036	.042*	0.004	0.004	-0.011	0.005	-2.043	.041*	0.008	0.008
SS Satisfaction (Age 5)	-0.046	0.030	-1.51	.131	0.239	0.194	-0.045	0.028	-1.597	.111	0.432	0.303

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 13 H3: Poisson Regression Models for Social Support Satisfaction and Feedback Sessions: Ages 2-10.5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	1.131	0.205	5.53	<.001***	0.030	0.029	1.136	0.204	5.57	<.001***	0.053	0.05
Eugene	0.120	0.068	1.75	.080	<0.001	<0.001	0.120	0.068	1.75	.080	0.001	0.001
Pittsburgh	0.086	0.066	1.30	.193	<0.001	<0.001	0.087	0.066	1.31	.191	0.001	0.001
Black/AA	-0.031	0.065	-0.48	.633	0.002	0.002	-0.032	0.065	-0.49	.627	0.003	0.003
Hispanic/Latinx	-0.096	0.093	-1.03	.303	<0.001	<0.001	-0.096	0.093	-1.04	.300	0.001	0.001
Other	-0.121	0.111	-1.08	.279	<0.001	<0.001	-0.12	0.111	-1.08	.280	<0.001	<0.001
HS Education	0.114	0.070	1.62	.106	0.001	0.001	0.114	0.07	1.62	.105	0.001	0.001
Greater than HS	0.186	0.075	2.47	.013*	0.002	0.002	0.187	0.075	2.48	.013*	0.002	0.002
Income	<0.001	<0.001	1.55	.122	0.024	0.023	<0.001	<0.001	1.50	.133	0.032	0.031
Depression	0.006	0.003	2.48	.013*	0.011	0.011	0.006	0.003	2.43	.015*	0.037	0.036
Daily Hassles	0.003	0.003	1.08	.278	<0.001	<0.001	0.003	0.003	1.09	.275	0.001	0.001
Ext Behavior	-0.007	0.004	-1.90	.057	0.001	0.001	-0.007	0.004	-1.90	.057	0.003	0.003
SS Satisfaction	0.003	0.021	0.15	.882	0.098	0.089	0.003	0.021	0.13	.898	0.172	0.147

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 14 H4: Fixed Effect Estimates of Multilevel Regression Models for Feedbacks and Subsequent Social Support: Ages 3-9.5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	3.59	0.443	8.105	<.001***	0.38	0.277	3.612	0.64	5.647	<.001***	1.02	0.507
Year	0.051	0.03	1.702	.089	0.584	0.37	0.072	0.051	1.426	.155	1.455	0.596
Eugene	-0.085	0.132	-0.646	.518	0.24	0.194	-0.083	0.168	-0.493	.622	0.432	0.303
Pittsburgh	-0.113	0.128	-0.881	.378	0.25	0.201	-0.088	0.167	-0.526	.599	0.493	0.332
Black/AA	-0.014	0.125	-0.11	.912	0.188	0.158	0.002	0.159	0.009	.992	0.383	0.278
Hispanic/Latinx	-0.238	0.179	-1.324	.186	0.351	0.261	-0.14	0.231	-0.606	.545	0.598	0.376
Other	-0.085	0.214	-0.395	.693	0.236	0.192	-0.101	0.269	-0.374	.708	0.386	0.280
HS Education	-0.067	0.135	-0.493	.622	0.33	0.249	-0.125	0.165	-0.761	.447	0.402	0.288
Greater than HS	-0.077	0.148	-0.516	.606	0.317	0.242	-0.104	0.181	-0.573	.567	0.408	0.291
Income	<0.001	<0.001	0.651	.515	0.222	0.182	<0.001	<0.001	0.751	.453	0.380	0.276
Depression	-0.004	0.005	-0.69	.490	0.288	0.224	-0.006	0.007	-0.88	.379	0.493	0.332
Daily Hassles	-0.004	0.006	-0.675	.500	0.299	0.231	-0.003	0.008	-0.452	.652	0.445	0.309
Ext Behavior	-0.005	0.007	-0.735	.463	0.278	0.218	-0.005	0.009	-0.502	.616	0.468	0.320
SS Satisfaction (Age 2)	0.372	0.042	8.816	<.001***	0.399	0.286	0.363	0.059	6.117	<.001***	1.179	0.544
Feedback	0.058	0.204	0.284	.776	0.358	0.264	0.05	0.306	0.164	0.87	0.778	0.44

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 15 Random Effects for Multilevel Regression Models for Feedbacks and Subsequent Social Support:

Ages 3-9.5

Random Effect	Non-transformed			Transformed		
	s^2	Correlations		s^2	Correlations	
		1	2		1	2
Participant						
1. Intercept	0.288	-		0.650	-	
2. Social support satisfaction	0.049	-.021	-	0.232	-.027	-
Participant						
1. Intercept	0.793	-		1.37	-	
2. Year	0.024	-.133	-	0.062	-.283	-

Note. All estimates are based on 100 imputed data sets.

Table 16 Fixed Effects for Multilevel Poisson Regression Models of Social Support Satisfaction and Follow-up Treatment Sessions: Ages 2

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	-0.222	0.625	-0.355	.723	0.080	0.074	-0.187	0.621	-0.302	.763	0.131	0.116
Year	-0.250	0.129	-1.934	.053	0.197	0.165	-0.230	0.127	-1.813	.070	0.288	0.224
Eugene	0.691	0.166	4.161	<.001***	0.006	0.006	0.696	0.166	4.197	<.001***	0.008	0.008
Pittsburgh	0.053	0.167	0.319	.750	0.005	0.005	0.056	0.166	0.334	.738	0.007	0.007
Black/AA	-0.176	0.163	-1.079	.281	0.008	0.008	-0.170	0.162	-1.048	.295	0.009	0.008
Hispanic/Latinx	0.104	0.214	0.484	.628	0.005	0.005	0.104	0.214	0.488	.625	0.008	0.008
Other	-0.365	0.270	-1.355	.175	0.024	0.023	-0.356	0.269	-1.324	.186	0.023	0.022
HS Education	0.108	0.166	0.65	.515	0.005	0.005	0.105	0.165	0.633	.527	0.006	0.006
Greater than HS	0.432	0.182	2.377	.017*	0.007	0.007	0.421	0.181	2.321	.020*	0.009	0.009
Income	<0.001	<0.001	1.185	.236	0.032	0.031	<0.001	<0.001	1.196	.232	0.047	0.045
Depression	0.013	0.006	1.986	.047*	0.020	0.020	0.012	0.006	1.903	.057	0.066	0.062
Daily Hassles	0.004	0.008	0.511	.609	0.006	0.006	0.004	0.008	0.504	.614	0.013	0.013
Ext Behavior	0.011	0.009	1.248	.212	0.008	0.008	0.011	0.009	1.21	.226	0.013	0.012
SS Satisfaction	0.022	0.086	0.255	.798	0.166	0.143	0.017	0.085	0.204	.839	0.277	0.218
Year x SS Satisfaction	0.002	0.024	0.078	.938	0.221	0.181	-0.002	0.023	-0.067	.947	0.328	0.248

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 17 Random Effects for Multilevel Poisson Regression Models of Social Support Satisfaction and Follow-up Treatment Sessions: Ages 2-5

Random Effect	Non-transformed			Transformed		
	s^2	Correlations		s^2	Correlations	
		1	2		1	2
Participant						
1. Intercept	3.001	-		2.538	-	
2. Social support satisfaction	0.098	-.536	-	0.085	-.453	-
Participant						
1. Intercept	2.398	-		2.370	-	
2. Year	0.279	-.653	-	0.278	-.652	-

Note. All estimates are based on 100 imputed data sets.

Table 18 Estimates of Negative Binomial Model for Social Support Satisfaction on Follow-up Treatment Sessions: Ages 7.5-10.5

Variable	Estimate	*SE*	*z*	*p*
(Intercept)	1.353	0.645	2.098	.036*
Eugene	0.795	0.231	3.442	<.001***
Pittsburgh	0.933	0.216	4.328	<.001***
Black/African American	-0.106	0.207	-0.514	.607
Hispanic/Latinx	-0.954	0.347	-2.751	.006**
Other	-0.947	0.344	-2.754	.006**
High school/GED	0.087	0.227	0.384	.701
Greater than high school/GED	0.498	0.243	2.048	.041*
Income	0.010	0.009	1.142	.253
Depression	0.024	0.008	2.998	.003**
Daily Hassles	-0.010	0.010	-0.998	.318
Externalizing Behavior	0.003	0.012	0.292	.771
Social Support Satisfaction (Age 5)	-0.074	0.060	-1.238	.216

Note. This model used unimputed data with listwise deletion.

Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; SE = Standard error;

Income = Income in thousands of dollars

Table 19 Estimates of Negative Binomial Model for Social Support Satisfaction on Follow-up Treatment Sessions: Ages 2-10.5

Variable	Estimate	*SE*	*z*	*p*
(Intercept)	1.382	0.483	2.861	.004**
Eugene	0.671	0.162	4.135	<.001***
Pittsburgh	0.510	0.16	3.194	.001**
Black/African American	-0.106	0.157	-0.672	.502
Hispanic/Latinx	-0.212	0.215	-0.988	.323
Other	-0.255	0.264	-0.966	.334
High school/GED	0.305	0.165	1.856	.064
Greater than high school/GED	0.600	0.179	3.343	<.001***
Income	0.005	0.006	0.866	.387
Depression	0.028	0.006	4.345	<.001***
Daily Hassles	-0.001	0.007	-0.19	.850
Externalizing Behavior	0.004	0.009	0.425	.671
Social Support Satisfaction (Age 2)	0.039	0.049	0.779	.436

*Not*e. This model used unimputed data.

Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; SE = Standard error; Income = Income in thousands of dollars

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 20 Fixed Effects for Multilevel Logit Models for Received Social Support and Feedback Sessions: Ages 2-5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	0.891	1.113	0.800	.424	0.032	0.031	0.857	1.118	0.767	.443	0.040	0.038
Year	-0.52	0.200	-2.602	.009**	0.078	0.072	-0.495	0.203	-2.44	.015*	0.123	0.109
Eugene	0.726	0.365	1.990	.047*	0.007	0.007	0.739	0.367	2.013	.044*	0.008	0.008
Pittsburgh	0.693	0.378	1.834	.067	0.007	0.007	0.707	0.378	1.87	.061	0.007	0.007
Black/AA	-0.576	0.360	-1.601	.109	0.008	0.007	-0.570	0.359	-1.588	.112	0.009	0.009
Hispanic/Latinx	0.145	0.466	0.311	.756	0.005	0.005	0.143	0.467	0.306	.759	0.005	0.005
Other	-0.981	0.582	-1.687	.092	0.002	0.002	-0.974	0.586	-1.662	.097	0.002	0.002
HS Education	0.209	0.358	0.584	.559	0.008	0.008	0.210	0.360	0.584	.559	0.008	0.008
Greater than HS	0.654	0.401	1.629	.103	0.008	0.008	0.659	0.401	1.643	.100	0.007	0.007
Income	<0.001	<0.001	1.862	.063	0.046	0.044	<0.001	<0.001	1.827	.068	0.064	0.060
Depression	0.033	0.014	2.360	.018*	0.013	0.013	0.032	0.014	2.248	.025*	0.064	0.061
Daily Hassles	0.002	0.017	0.091	.927	0.005	0.005	0.002	0.017	0.098	.922	0.009	0.009
Externalizing Behavior	-0.016	0.020	-0.794	.427	0.006	0.006	-0.016	0.020	-0.799	.424	0.007	0.007
Received SS	0.116	0.586	0.198	.843	0.067	0.063	0.147	0.599	0.245	.806	0.089	0.082
Year x Received SS	0.070	0.146	0.48	.631	0.096	0.087	0.050	0.147	0.338	.736	0.148	0.129

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED;; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 21 Random Effects for Multilevel Logit Models for Received Social Support and Feedback Sessions: Ages 2-

Random Effect	Non-transformed			Transformed		
	s^2	Correlations		s^2	Correlations	
		1	2		1	2
Participant						
1. Intercept	0.743	-		0.847	-	
2. Received social support	0.036	.13	-	0.046	.129	-
Participant						
1. Intercept	0.206	-		0.176	-	
2. Year	0.142	.15	-	0.143	.139	-

Note. All estimates are based on 100 imputed data sets.

Table 22 Poisson Regression Models of Received Social Support and Total Feedback Sessions: Ages 7.5-10.5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	0.313	0.269	1.165	.244	0.024	0.023	0.328	0.27	1.215	.225	0.036	0.035
Eugene	0.01	0.103	0.095	.924	0.003	0.003	0.011	0.103	0.105	.916	0.006	0.006
Pittsburgh	-0.063	0.097	-0.646	.518	<0.001	<0.001	-0.063	0.097	-0.651	.515	0.001	0.001
Black/AA	0.051	0.096	0.533	.594	0.003	0.003	0.052	0.097	0.535	.593	0.004	0.004
Hispanic/Latinx	-0.25	0.149	-1.686	.092	0.001	0.001	-0.252	0.149	-1.695	.090	0.001	0.001
Other	-0.05	0.164	-0.307	.759	<0.001	<0.001	-0.051	0.164	-0.309	.758	<0.001	<0.001
HS Education	0.162	0.108	1.508	.132	0.001	0.001	0.163	0.108	1.515	.130	0.001	0.001
Greater than HS	0.234	0.115	2.035	.042*	0.002	0.002	0.235	0.115	2.049	.041*	0.002	0.002
Income	<0.001	<0.001	0.758	.448	0.015	0.015	<0.001	<0.001	0.74	.459	0.018	0.018
Depression	0.006	0.004	1.745	.081	0.001	0.001	0.006	0.004	1.743	.081	0.002	0.002
Daily Hassles	0.006	0.005	1.23	.219	<0.001	<0.001	0.006	0.005	1.229	.219	<0.001	<0.001
Ext Behavior	-0.01	0.005	-1.841	.066	0.002	0.002	-0.01	0.005	-1.85	.064	0.003	0.003
Received SS	0.025	0.072	0.344	.731	0.195	0.164	0.016	0.073	0.216	.829	0.306	0.235

Note. All estimates are based on 100 imputed data sets. Received social support measured at child age 5.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 23 Poisson Regression Models of Received Social Support and Total Feedback Sessions: Ages 2-10.5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	0.898	0.182	4.948	<.001***	0.012	0.012	0.902	0.182	4.959	<.001***	0.021	0.021
Eugene	0.08	0.069	1.148	.251	0.003	0.003	0.08	0.069	1.151	.250	0.005	0.005
Pittsburgh	0.058	0.067	0.876	.381	0.003	0.003	0.057	0.067	0.857	.392	0.004	0.004
Black/AA	-0.057	0.065	-0.873	.382	0.005	0.005	-0.056	0.065	-0.862	.389	0.005	0.005
Hispanic/Latinx	-0.071	0.093	-0.768	.442	0.001	0.001	-0.072	0.093	-0.775	.439	0.002	0.002
Other	-0.129	0.111	-1.162	.245	0.005	0.005	-0.13	0.112	-1.166	.244	0.008	0.008
HS Education	0.103	0.07	1.465	.143	0.002	0.002	0.104	0.07	1.476	.140	0.002	0.002
Greater than HS	0.178	0.075	2.366	.018*	0.003	0.003	0.179	0.075	2.37	.018*	0.004	0.004
Income	<0.001	<0.001	1.607	.108	0.022	0.022	< 0.001	<0.001	1.533	.125	0.032	0.031
Depression	0.007	0.002	2.962	.003**	0.004	0.004	0.007	0.002	2.895	.004**	0.031	0.03
Daily Hassles	0.004	0.003	1.224	.221	0.003	0.003	0.004	0.003	1.241	.215	0.003	0.003
Ext Behavior	-0.006	0.004	-1.722	.085	0.002	0.002	-0.006	0.004	-1.709	.087	0.005	0.005
Received SS	0.177	0.05	3.567	<.001***	0.077	0.071	0.175	0.05	3.53	<.001***	0.126	0.112

Note. All estimates are based on 100 imputed data sets. Received social support measured at child age 2.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; SS = Social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 24 Fixed Effect Estimates for Multilevel Poisson Regression Models for Received Support and Follow-up Sessions: Ages 2-5

Variable	Non-transformed						Transformed					
	Estimate	*SE*	*t*	*p*	RIV	FMI	Estimate	*SE*	*t*	*p*	RIV	FMI
(Intercept)	-0.218	0.511	-0.427	.670	0.04	0.038	-0.194	0.514	-0.378	.705	0.057	0.054
Eugene	-0.284	0.086	-3.283	.001**	0.112	0.101	-0.282	0.088	-3.193	.001**	0.184	0.156
Pittsburgh	0.719	0.166	4.337	<.001***	0.01	0.01	0.717	0.166	4.311	<.001***	0.015	0.015
Black/AA	-0.023	0.164	-0.139	.889	0.007	0.007	-0.018	0.165	-0.11	.912	0.011	0.011
Hispanic/Latinx	-0.103	0.161	-0.64	.522	0.008	0.008	-0.103	0.161	-0.64	.522	0.009	0.009
Other	0.142	0.212	0.668	.504	0.009	0.009	0.138	0.212	0.651	.515	0.009	0.009
HS Education	-0.333	0.259	-1.285	.199	0.005	0.005	-0.339	0.26	-1.302	.193	0.007	0.007
Greater than HS	0.135	0.165	0.818	.413	0.006	0.006	0.139	0.166	0.837	.403	0.01	0.01
Income	0.421	0.18	2.341	.019*	0.009	0.009	0.426	0.18	2.365	.018*	0.009	0.009
Depression	<0.001	<0.001	1.694	.090	0.032	0.031	<0.001	<0.001	1.651	.099	0.047	0.045
Daily Hassles	0.013	0.006	2.054	.040*	0.015	0.015	0.012	0.006	1.948	.051	0.06	0.056
Ext Behavior	0.003	0.007	0.431	.667	0.007	0.007	0.003	0.008	0.428	.669	0.008	0.008
Rec SS	0.011	0.009	1.222	.222	0.01	0.01	0.011	0.009	1.212	.226	0.009	0.009
Year x Rec SS	0.022	0.057	0.389	.698	0.144	0.126	0.021	0.059	0.362	.718	0.246	0.198

Note. All estimates are based on 100 imputed data sets.

AA = African American; Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; HS = High school diploma/GED; Ext = Externalizing; Rec SS = Received social support; SE = Standard error; RIV = Relative increase in variance; FMI = Fraction of missing information

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 25 Random Effects Estimates for Multilevel Poisson Regression Models for Received Social Support and Follow-up Sessions: Ages 2-5

Random Effect	Non-transformed				Transformed			
	s^2	Correlations			s^2	Correlations		
		1	2	3		1	2	3
Participant								
1. Intercept	3.853	-			3.857	-		
2. Received SS	0.708	-.986	-		0.684	-.967	-	
3. Year	0.291	-.644	-.027	-	0.291	-.656	-.018	-

Note. All estimates are based on 100 imputed data sets.

SS = Social support

Table 26 Estimates of Negative Binomial Model for Received Social Support on Follow-up Treatment Sessions: Ages 7.5-10.5

Variable	Estimate	*SE*	*z*	*p*
(Intercept)	0.631	0.596	1.059	.289
Eugene	0.708	0.242	2.921	.003**
Pittsburgh	1.003	0.222	4.523	<.001***
Black/African American	-0.144	0.214	-0.672	.502
Hispanic/Latinx	-1.028	0.375	-2.743	.006**
Other	-0.361	0.336	-1.073	.283
High school/GED	0.148	0.236	0.626	.531
Greater than high school/GED	0.514	0.253	2.031	.042*
Income	0.007	0.009	0.834	.404
Depression	0.030	0.008	3.626	<.001***
Daily hassles	-0.008	0.01	-0.811	.417
Externalizing behavior	0.006	0.012	0.496	.620
Received social support (Age 5)	0.086	0.149	0.575	.566

Note. This model used unimputed data.

Other= Pacific Islander, Native American, Asian, Bi-Racial, "Other"; SE = Standard error; Income = Income in thousands of dollars

*$p < .05$ ** $p < .01$ *** $p < .001$

Table 27 Estimates of Negative Binomial Model for Received Social Support on Follow-up Treatment Sessions: Ages 2-10.5

Variable	Estimate	*SE*	*z*	*p*
(Intercept)	1.07	0.422	2.522	.012
Eugene	0.676	0.162	4.172	<.001***
Pittsburgh	0.462	0.155	2.972	.003**
Black/African American	-0.142	0.154	-0.921	.357
Hispanic/Latinx	-0.15	0.209	-0.719	.472
Other	-0.28	0.267	-1.049	.294
High school/GED	0.281	0.161	1.743	.081
Greater than high school/GED	0.529	0.176	3.014	.003**
Income	0.007	0.006	1.122	.262
Depression	0.024	0.006	3.977	<.001***
Daily hassles	<0.001	0.007	0.006	.995
Externalizing behavior	0.004	0.008	0.511	.609
Received social support (Age 2)	0.387	0.118	3.291	<.001***

Note. This model used unimputed data.

Other = Pacific Islander, Native American, Asian, Bi-Racial, "Other"; SE = Standard error; Income = Income in thousands of dollars

*$p < .05$ ** $p < .01$ *** $p < .001$

Appendix B Item Questions and Response Options for Social Support Variables

Social support satisfaction and received social support variables were taken from the General Life Satisfaction scale (GLS; Crnic, Greenberg, Rogozin, Robinson, & Basham, 1983). Social support satisfaction was comprised of 5-items assessing the level of satisfaction regarding specific received and perceived sources of social support using a 4-point scale with a fifth option of "other", which was treated as a missing response. The satisfaction variable was also comprised of 2-items assessing the general level of satisfaction with two social domains using a 7-point scale. Received social support was comprised of 3-items, all with different response options that varied from 3- to 5-point scales. Again, "other" was treated as a missing response.

Table 28 Specific Social Support Satisfaction

Support area	Question	Response	Value
Are there any organized groups that are a source of support for you?	How satisfied are you with this situation?		
Think of a typical week. About how many times did you talk on the phone with your friends or family?	How satisfied are you with this amount of phone visiting?		
In the last week, how many times have you visited your friends?	How satisfied are you with this amount of visiting?	Very dissatisfied Somewhat dissatisfied Somewhat satisfied Very satisfied Other	1 2 3 4 5
If you were to become upset or angry, would you have someone to talk honestly to, who is not involved? How many people?	How satisfied are you with this?		
When you are happy, is there someone you can share it with - someone who will be happy just because you are?	How satisfied are you with this situation?		

Table 29 General Social Support Satisfaction

Question	Response	Value
How much satisfaction do you get from family life?	None	1
	A little	2
	Some	3
How much satisfaction do you get from your friendships?	A fair Amount	4
	Quite a bit	5
	A great deal	6
	A very great deal	7

Table 30 Received Social Support

Question	Response	Value
Are there any organized groups that are a source of support for you?	None	1
	Some	2
	Many	3
	Other	4
Think of a typical week. About how many times did you talk on the phone with your friends or family?	No talks	1
	1 talk	2
	2-3 talks	3
	4-7 talks	4
	More than 7 talks	5
	Other	6
In the last week, how many times have you visited your friends?	Never	1
	1 or 2 times	2
	3 to 4 times	3
	5 to 6 times	4
	7 or more times	5

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