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**PARENT ENGAGEMENT IN TWO VERSIONS OF A PREVENTION PROGRAM
OVER TIME**

A Thesis in

Human Development and Family Studies

by

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ABSTRACT

Introduction: Previous research on moderators of prevention/intervention program effects has focused on attendance, among other measures. Although attendance is necessary for curriculum uptake, it is not sufficient; beyond attendance, engagement during each program session is important for each participant to achieve outcomes. We examine whether engagement systematically changes over the course of an intervention and examine the role of parent and family characteristics to predict level and change in engagement over the seven sessions of this intervention. **Methods:** 309 parents provided information on all predictor variables and were randomized to the Strengthening Families Program: For Parents and Youth Ages 10-14 (SFP) and a modified version of the curriculum. Engagement ratings were made by group leaders for each parent at each session he/she attended. **Results:** We find that engagement in SFP begins high, and changes over time with a linear increase and quadratic leveling-off. Parents experiencing different versions of the SFP curriculum demonstrated different linear increases in engagement. Parents with higher levels of family tension responded to higher-than-usual family tension differently than parents with lower levels of family tension. As indicated by the significant random effects, parents varied in their initial levels of engagement, the relation between family tension and engagement was different across parents, groups of parents who participated together varied in initial levels of engagement, and the linear and quadratic change in engagement differed across groups. **Conclusion:** Engagement is a dynamic construct that should be rated at each session for each parent in the context of other interventions in order to capture its dynamics. Future work on engagement should recognize that groups of parents may differ in their engagement trajectories, with parents in the same group having more similar trajectories, and individual parents may differ in their trajectories of engagement. Specific to SFP, efforts to maximize each parents' engagement should focus on reducing family tension during tense sessions for parents whose families experience high levels of tension, and should focus on initial sessions where engagement is lower, on average.

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Chapter 1

Introduction

Group delivery is a commonly utilized mode of implementation for all types of in-person interventions. This has come about for many reasons, including: the cost-efficiency of reaching many participants at once, relative standardized delivery across people within the group, and the opportunity for participants to benefit from a small community of similar individuals who are part of their group as compared to delivering interventions to individuals. However, challenges may arise as a product of this delivery mode, such as increased demand on interventionists; when leading groups, interventionists must ensure a positive, productive group process so that the group benefits each individual and does not become ineffective or iatrogenic, attend to the needs of multiple participants at once, and maximize engagement across all members of the group.

Program evaluation researchers have begun to attend to the questions of how and why a group-delivered curriculum works in addition to focusing on whether it works; so far this has meant an increasing focus on consistent delivery (i.e., implementation fidelity) of programs, especially Dane & Schneider's (1998) adherence and quality dimensions of fidelity (Dusenbury, Brannigan, Falco, & Hansen, 2003). The extensive degree of attention can be highlighted by surveys of the literature on measuring fidelity in randomized trials and other program evaluation research (e.g., Moncher & Prinz, 1991; Scheirer & Rezmovic, 1983), special journal issues focusing on treatment integrity (e.g., see Hagermoser Sanetti, & Kratochwill's, 2009 introduction to a special issue in *School Psychology Review*), and through inclusion of fidelity in recommendations for community uptake and delivery of evidence-based preventive interventions (e.g., Stith, Pruitt, Dees, et al., 2006).

Beyond consistency or fidelity, we see intervention delivery as a process that involves the dyadic and group interaction of everyone in the room: participants and interventionists, with each other and with the curriculum. Under this framework, the current focus on consistent delivery covers

only the interventionist-driven aspect of program success. Little attention has as yet been paid to the other half of program success that is participant-driven: participant engagement.

We define participant engagement as a transactional process of participants' cognitions, affect, and behaviors that are conducive to learning with each aspect of the intervention context, including with group leaders and other participants, with the curriculum content, and with their own practice. Example dimensions of engagement include: participation, interest, interacting positively, practicing skills, self-reflection, and feeling connected to others in the group (Bamberger & Coatsworth, 2013).

Often, measurement of participants' role in program success has been limited to attendance (e.g., Gorman-Smith, Tolan, Henry, et al., 2002; Gross, Garvey, Julion, et al., 2009). Beyond attendance (also studied as, dosage), measures of participant engagement tell researchers and interventionists whether participants are truly cognitively, affectively, and/or behaviorally engaged and likely to learn or whether they are simply physically present. Engagement in the intervention is extremely important for participants to learn from evidence-based interventions, as shown by its connection to improved outcomes (e.g., Newcomb, Rabow, Hernandez, & Monto, 1997; Nix, Bierman, & McMahon, 2009). As such, considering this aspect of implementation is important for researchers in evaluating and facilitating program success. Previous research that has measured and analyzed participant engagement has often done so at one time point during the intervention, leaving open the question of how or whether participant engagement may grow or change across the duration of the intervention, due to group dynamics, curriculum delivery, and other factors.

This will be the first study to address these gaps in the literature, broadening our understanding of the process of participant engagement in group-delivered preventive interventions for families. We will model participant engagement to explore: whether and how parents' participant engagement changes over the course of an intervention, and whether there are differences in level

and slope of engagement that can be predicted by factors such as parent sex, family tension, and curriculum version.

Importance of Understanding Participant Engagement

Participants' engagement in group sessions is important for many evidence-based interventions (EBIs) because the uptake of skills taught in these programs require specific actions, thoughts, and attitudes/feelings of the participants. Although participants may be physically present, they may be not fully "on board" either by being a passive recipient or by actively resisting new skills. When participants do not experience thoughts, feelings, and behaviors conducive to learning, they may be non-responsive to treatment. Thus, researching which participants are likely to be more engaged may be useful in explaining which participants are benefitting most from an intervention and which participants will sustain those benefits in the long term.

Associations between engagement and improved outcomes

Associations between engagement and improved outcomes are a demonstration of the importance of participant engagement in learning curriculum material and incorporating this material into their daily lives. As such, associations between engagement and improved outcomes show that understanding engagement as a construct is relevant and important to effectiveness of interventions. As yet, there has not been a strong focus on participant-driven aspects of intervention success, so, much of the current research exploring relations between engagement and outcomes involves constructs that we view as proxies of engagement—simple, discrete, observable participant behaviors such as attendance.

Proxies of engagement

Through intervention program evaluation, researchers have shown that many measures of participant behavior that serve as proxies for participant engagement such as youth remembering more sessions (Buckley & Sheehan, 2008) and higher attendance (Prado et al., 2006; Gross, et al., 2009) are indeed related to improved program outcomes. However, other studies do not find effects

of attendance on outcomes (e.g., Ogden & Amlund-Hagan, 2008). As a measure of exposure to content and proxy for engagement, attendance should be a significant predictor of outcomes in evidence-based prevention and intervention programs. However, there are many potential reasons for a lack of significant effect of attendance on outcomes including reasons for participants not learning despite attendance, such as attending sessions that are not relevant or are ineffective or by not engaging in sessions that are attended, and reasons for participants learning despite low attendance, such as participants compensating for absence by actively engaging in other sessions. Proxies for participant engagement show inconsistent effects on outcomes from study to study or program to program most likely because attendance is not the most direct mechanism of learning that can be measured. For example, Nix and colleagues (2009) showed that although attendance did not predict outcomes, engagement did. Inconsistent effects of these proxies indicate that these are not adequate measures of participant behavior or mechanisms of learning for the purpose of predicting program outcomes or improving uptake of intervention-targeted skills.

Behavioral aspects of engagement

Several studies in the prevention and program evaluation literature have given attention to the conceptualization and measurement of engagement beyond attendance. These studies are the notable exceptions to the rule that there has been little focus on participant engagement in the prevention literature; they focus on behavioral aspects of participant engagement, and the engagement-related constructs assessed in these studies are aptly described by these researchers as “quality of participation” or “commitment to intervention.” When relation to outcomes was assessed, it is described below to demonstrate the importance of engagement related to intervention effectiveness.

In Parenting our Children to Excellence (PACE), group leaders rated each parent’s quality of participation with a single item (1-5 scale; Dumas, Nissley-Tsiopinis, & Moreland, 2007). In the evaluation of Fast Track, coordinators rated quality of participation in the parent management

training component using six items (1-4 scale; Orrell-Valente, Pinderhughes, Valente, Laird, & the Conduct Problems Prevention Research Group, 1999). Nix, Bierman, McMahon, and the Conduct Problems Prevention Research Group (2009) build on this research by reporting on the same scale used in the Orrell-Valente et al. paper in addition to a scale that was used in a prior cohort of families. The items used in this study covered the following constructs: amount of participation in the parent group, the amount of participation in parent-child sharing time, the quality of participation in the parent group, the quality of participation in parent-child sharing time, and the completion of between-session homework assignments. In this analysis, engagement was related to better parenting outcomes. In the Chicago Parent Program, participants' levels of paying attention, participating, being supportive of other participants, and other indicators of behavioral engagement were related to improvements in child behavior problems and parent depressive symptoms (Breitenstein, Fogg, Garvey, et al., 2010). In an infant massage intervention with preterm infants and their mothers, mothers' commitment to intervention as rated by interventionists on items such as number of missed appointments, cancelled appointments, compliance with intervention-related "homework," and ratings of involvement during intervention session were all independently related to various outcome measures including sensitive parenting and improved child development (Teti, Killeen, Candelaria, et al., 2008). As can be seen in this summary of existing literature on participant engagement in prevention programs, participant engagement is a potentially useful and important concept in understanding curriculum uptake, as it, and sometimes proxies, are related to better outcomes.

Related, group-therapy literature supports these findings in that similar concepts are being assessed in relation to response to therapy. In this literature, measurement of participant behavior is generally multidimensional therapist ratings, which are based on theoretical models of participant behavior that are specifically relevant to the clinical population that participates in group therapy (e.g., Cunningham & Henggeler, 1999; Macgowan, 1997). Measures of participant behavior in this literature often focus on the participant positively contributing to group process, and willingness to

focus on problems and participate (e.g., Levenson, Macgowan, Morin, & Cotter, 2009; Macgowan, 1997; Tetley, Jinks, Huband, & Howells, 2011). Engagement in group therapy has been found to be associated with outcomes of therapy. For example, in youth residential treatment, youth who are more engaged experience better school attachment as an outcome (Smith, Duffee, Steinke, Huang, & Larkin, 2008).

Change in Participant Engagement

There are many reasons to expect that engagement might fluctuate and develop across the course of an intervention. Among other dimensions of engagement, positive interactions with both leaders and members, learning from the group, participation, and affective connection to the group in particular are dimensions of engagement that are likely to change and develop over time as people and context become more familiar to the participant, and confidence in the relevance and quality of the intervention is built.

Although it is possible that participant engagement grows over time, at least for some participants, we do not know of any previous research examining trajectories in participant engagement over the course of an intervention. Indeed, Fast Track eliminated its weekly ratings of engagement due to interventionists' belief that there was little variability over time (Nix et al., 2009). However, research has suggested that positive and negative alliance and participants' level of leadership in interventions change over time (Coatsworth, Duncan, Pantin, & Szapocznik, 2006). A goal of this study was to examine how participant engagement changes over the course of a group-delivered intervention and how this change might begin to be explained.

Predictors of Parents' Participant Engagement in Family-Based Interventions

Up to this point, research focusing on predictors of engagement has used (between-) parent and (between-) family characteristics to predict levels of engagement only. We are not aware of any studies that have included predictors of change in engagement over the duration of an intervention.

In particular, one between-parent characteristic, mother or father role has been examined in related research on fathers' attendance, motivation to attend, and predictors of attendance in family-based interventions. Although this research is beginning, it is challenging because fathers are less likely to attend family-based interventions compared to mothers (see Gavazzi & Schock, 2004 for two studies examining reasons why fathers do not attend such programming). One area that has not yet been examined well is whether levels and trajectories of engagement are similar or different between mothers and fathers who do attend. That is, the documented sparseness of father involvement in family-based interventions may be attendance-only and once a father attends, he is engaged to a similar degree as mothers, or it may be both attendance and then engagement so that even when a father overcomes barriers to attendance he is also not as engaged as mothers are.

Family system characteristics have not yet been examined for a relation with quality of participant engagement per se. However, they have been used to predict attendance. Family organization and family communication or shared views emerged as significant predictors in one study, such that higher levels of organization and communication predicted more attendance (Perrino et al 2001). The association between family stress and attendance may be more nuanced. As yet, it is unclear whether higher family stress (Prado et al., 2006) and conflict (Connell, Dishion, Yasui, & Kavanagh, 2007) induces attendance or whether lower family stress may facilitate attendance (Spoth, Redmond, Hockaday, & Shin, 1996). Perrino and colleagues (2001) found no significant relation between family stress and attendance. Although family stress can vary between families, with some families more stressed than others, family stress can also vary within a family over time. In this way, changes in family stress over the duration of an intervention may contribute to changes in parents' engagement. This has not yet been examined.

Among group-delivered interventions, and even among family-based group-delivered interventions, there is wide variation in many aspects of delivery, including curriculum content, level of structure to delivery, and group size, all of which may contribute to differences in participant

engagement. Although MSFP is a modification of SFP and the curricula remain similar in content, structure, group size, there are non-shared aspects of the intervention context that could influence engagement, causing different levels and trajectories across curriculum versions. Some contextual factors that might be determined by different curricula and that may influence engagement include: different content topics or emphases, different density of curriculum (i.e., topic-dense/rushed vs. topic-sparse/leisurely), and of the topics that are comparable, timing of covering topics across sessions may be different for each curriculum.

Current Study

The current study had two primary goals. The first was to examine how behavioral engagement changes over seven weeks of two versions of a preventive intervention. We hypothesize that parents' engagement will increase over time. We are interested in the shape of this potential growth, so polynomials of time will be tested. The second goal of the study was to examine whether temporary states, trait-like parent and family characteristics, and intervention context characteristics predict parents' levels and growth in participant engagement in the family-based interventions. We investigated the following predictors: curriculum version, parent sex, and mean levels of-, and differences across time in family tension.

We have the following hypotheses; there will be differences in engagement by curriculum version although it is unclear whether there will be differences in level or trajectory of engagement. Mothers will be more engaged than fathers. It is unclear from previous literature whether families with more tension will have parents who exhibit different levels or slopes of engagement, so a hypothesis is not advanced. Because engagement in both curriculum versions requires focusing on the child, and current experiences parenting that child, we hypothesize that parents will be less engaged on occasions when their family exhibits more tension.

Chapter 2

Methods

Intervention Study

Data used are from *the Strengthening Families in Pennsylvania Project (SFP in PA)*, a randomized control trial implementing and testing the efficacy of (1) the Strengthening Families Program for Parents and Youth Ages 10-14 (SFP), (2) a modified version of the program (MSFP; Coatsworth, Duncan, Greenberg, & Nix, 2010) in which the parent component is enhanced with mindfulness principles and mindful practice, and (3) a home-study/literature control condition. The Strengthening Families Program is a family-based intervention that targets youth substance use initiation (Spoth et al., 2009; Spoth et al., 2004) by teaching parents new skills appropriate for the teen years such as monitoring, how to communicate expectations about risk behaviors, and selecting appropriate consequences, while allowing parents to spend time with their youth and strengthen family relationships (Molgaard, Spoth, & Redmond, 2000). The program teaches youth peer-resistance, friendship and stress management skills, along with information to promote understanding of parents (Molgaard et al., 2000). The program has a separate parent component and youth component where individual skills are taught, discussed, and practiced, and a family component where the youth and parents/caregivers come together to interact and practice skills with the guidance of group leaders. Data will be collected for six cohorts of families at pre-test, post-test, and one-year follow-up in addition to implementation data collected at the intervention sessions of each group.

Participants

Participants in the study were recruited through school and community events. Recruitment strategies included distributing pamphlets directly to parents at events such as parent-teacher conferences and via homeroom teachers and postal mail to reach all eligible families, and to teachers

and guidance counselors who distributed to parents at their discretion. Research and implementation staff also attended back-to-school nights and other school events to provide information about the research study. When needed, phone calls were made to randomly selected families from the entire pool of eligible families who had not replied to pamphlets in order to solicit their interest. Following recruitment, families who were interested and whose schedules allowed participation in weekly groups then registered for the research study and were assigned to one of three conditions described above: SFP, MSFP, or home-study control. All participants in the research study are 6th/7th graders and their parents or caregivers in four school districts in Pennsylvania.

Participants included in these analyses are parents who were assigned to either an SFP or MSFP group in the first four cohorts of the study and subsequently attended their assigned group for at least one session. Families in the control condition were not included here because engagement with the home-study materials was not measured. Demographic characteristics and other descriptors of participants are presented in Table 2-1. Notably, the sample of parents was diverse in terms of income, education, race, and marital status. The participating youths' ages are reflective of the school grades from which the study recruited participants ($M = 11.61$).

Table 2-1: Parents in sample (N=309) reporting descriptive characteristics.

Characteristic	Statistic	
	M	SD
Family income (yearly) ¹	\$85,449.41	\$60,756.95
Work/job hours per week ^a		
Mother/Female caregiver ²	36.06	15.13
Father/Male caregiver ³	45.39	12.28
Attendance (n sessions) ^b	4.35	2.05
Depression (CES-D) ⁴	12.43	9.38
Youth age ⁵	11.61	0.74
	%	
Modified curriculum	51.13	
Father/Male caregiver	38.51	
Son/boy attending ⁶	46.04	
Partnered ⁷	83.68	
Current marital status ⁸		
Single, never married	4.76	
Widowed	0.00	
Divorced	7.69	
Separated	6.23	
Living in a marital-like relationship	9.16	
Married and living with spouse	72.16	
Hispanic ⁹	3.92	
Race ¹⁰		
White	79.86	
Black/African American	11.31	
Asian	4.95	
More than one of listed	2.12	
Other	1.77	
Education ¹¹		
Partial high school	3.19	
High school graduate/GED	23.05	
Partial college or specialized training	26.95	
College graduate	23.76	
Graduate training	23.05	
Working second job		
Mother/Female caregiver ¹²	20.16	
Father/Male caregiver ¹³	7.14	

Notes. No missing data unless otherwise noted.

¹ N = 195, ² N = 129, ³ N = 98, ⁴ N = 276, ⁵ N = 278, ⁶ N = 278, ⁷ N = 282, ⁸ N = 273, ⁹ N = 280, ¹⁰ N = 283, ¹¹ N = 282, ¹² N = 129 ¹³ N = 98

^a Of parents who worked, including hours worked at second job

^b Six person-sessions were attended, but were not rated for engagement.

Measures

Participant engagement

Engagement items are rated by group leaders following each session, are specific to an individual parent in the parent component of the intervention, and were measured in the same way across curriculum versions and for mothers and fathers. Group leaders of the parent component rated the behavioral engagement of each participant using five items, each on a scale from 1 (rarely or never) to 4 (almost always). The items assessed engagement/participation, interest, resistance, positive affect toward leaders, and positive affect toward other parents/group members. This measure was developed for use in the *SFP in PA* trial. Accumulated evidence suggested that the item assessing resistance should not be used in a scale to measure participant engagement: The item lowered Cronbach's alpha considerably (alpha = .756 with the item, .882 without), the item's distribution was not normal and could not be corrected by taking the natural log of the scores, and the loading of this item was substantially lower compared to the loadings of the other four items in a single-factor factor analysis. For these reasons, this item was not used in the current analyses as part of the engagement scale score. The remaining four items had essentially equal factor loadings; thus, for parsimony, the average scores across items at each session rather than factor scores at each session are carried through as the engagement scale score and used in analysis.

Family tension

Group leaders rated each family's level of tension based on the family's interaction during the family component of the session. This measure is specific to the family, not the individual, and was rated as a consensus among all three of the group leaders for each session. The item reads, "There appeared to be some **tension** or **disagreement** between family members during the activities" and was rated on a scale from Rarely/Never (0) to Always/Almost always (3). This item was developed for use in the *SFP in PA* trial. The mean score across all parents is 0.286 (SD = 0.664).

Data Preparation

Scaling time

The time variable, session (1-7), was re-scaled so that time is on a scale from 0 to 6. Thus, intercepts and interactions should be interpreted with session 1 as the zero-point. This was done because the original scale of session (1-7) did not have a meaningful zero point. Session 1 was chosen so that slopes would represent growth in engagement from the first session and main effects would represent initial differences in engagement.

Partitioning family tension

Because it is measured each session, family tension is a variable with two components: a family's average level of tension that differs across families, and a value for each session reflecting the deviation of the family's tension that session from their average. Separating these components will allow us to test whether families with higher average tension have parents who are more or less engaged, and also test whether occasions of higher-than-average levels of tension are related to parents being more or less engaged on that occasion. The stable component was calculated for each family as their average level of family tension across all sessions they attended (mean family tension, across persons $M = 0.286$, $SD = 0.268$). To calculate the varying family tension score, each family's mean tension was subtracted from families' scores at each session, and variable for each session was retained (varying family tension, across person-occasions $M = 0.000$, $SD = 0.561$).

Centering

Mean family tension and parent sex variables were person-centered for analyses so that 0 represents the average across persons. Curriculum-version variable was group-centered for analyses so that 0 represents the average across groups.

Data Analytic Plan

A growth curve model will be used to address the goals of this study. This technique is appropriate for these data because it allows for nested data that are crossed over time, which both fits

the data structure and will allow for accurate testing of the hypotheses set forth (Nezlek, 2001; Schwartz & Stone, 2007). In this sample, level 1 is the repeated measure of engagement; there are 1339 level 1 cases with engagement scores. Level 2 is the individual parent; there are 309 level 2 cases. Because families often included only one parent in this sample, family was not used or tested as a level of nesting in these analyses. Level 3 is the group; all parents who met together at the same time and place because of the group-delivery mode of both interventions may be more similar in their engagement scores because of the curriculum delivery and group dynamics experienced together. Thus, group was tested as a level for inclusion in the model; there are 26 groups. An additional level of nesting was considered for community/school district because communities were intentionally selected to have participants with different demographic characteristics; there are four communities. However, this level was not needed, as indicated by a non-significant random intercept variance component, so it was not retained and is not presented hereafter.

Models were fit to the data using SAS 9.3 (proc mixed) with unstructured covariance matrices. First, models without covariates were tested to determine the appropriate curve shape; models with each polynomial of time with the optimal random error structure were considered. To this optimal model, covariates were added. The full model including all possible interactions between included covariates was tested first, and highest-order non-significant interactions were removed. The final model represents all significant interactions and all main effects. Equation 1 describes the final model.

$$\begin{aligned}
 \text{Level 1:} & \quad Y_{jit} = \pi_{ji0} + \pi_{ji1}\text{time} + \pi_{ji2}\text{time}^2 + \pi_{ji3}\text{varfamtension} + e_{jit} \\
 \text{Level 2:} & \quad \pi_{ji0} = \beta_{j00} + \beta_{j10}\text{father} + \beta_{j20}\text{meanfamtension} + v_{ji0} \\
 & \quad \pi_{ji1} = \beta_{j01} \\
 & \quad \pi_{ji2} = \beta_{j02} \\
 & \quad \pi_{ji3} = \beta_{j03} + \beta_{j13}\text{meanfamtension} + v_{ji3} \\
 \text{Level 3:} & \quad \beta_{j00} = \gamma_{000} + \gamma_{100}\text{msfp} + u_{j00} \\
 & \quad \beta_{j10} = \gamma_{010} \\
 & \quad \beta_{j20} = \gamma_{020} \\
 & \quad \beta_{j01} = \gamma_{001} + \gamma_{101}\text{msfp} + u_{j01} \\
 & \quad \beta_{j02} = \gamma_{002} + u_{j02} \\
 & \quad \beta_{j03} = \gamma_{003} \\
 & \quad \beta_{j13} = \gamma_{013}
 \end{aligned} \tag{1}$$

After substitution into a single composite equation, γ_{000} represents the initial level of engagement, γ_{100} represents a difference across curriculum versions in parents' initial level of engagement, γ_{010} represents a difference between mothers and fathers in initial levels of engagement, γ_{020} represents a differences across parents' initial levels of engagement based on level of average tension, γ_{001} represents a linear slope of engagement, γ_{101} represents a difference in linear slope of engagement across curriculum versions, γ_{002} represents a quadratic slope of engagement, γ_{003} represents a difference between days of higher tension compared to days of lower tension in level of parents' engagement, and γ_{013} represents the difference in the relation between varying family tension and engagement between families with high family tension compared to families with low family tension.

Chapter 3

Results

Model 1: Unconditional Means Model

The unconditional means model models the covariance structure of engagement without any independent variables. The results show that multiple levels are needed in order to accurately test the significance of predictors of engagement in this sample because of correlated residuals within-person, and within-group, as described in the *Data Analytic Plan* section, above.

There is substantial within-person variability (56.16%; $\sigma^2_{\epsilon_{jit}} = 0.214$), which is corroborated with the raw data, plotted across time in Figure 3-1. The large degree of within-person variability indicates that, while the growth curve describes an overall shape or trend in the way that engagement changes on average over time, analyzing the fluctuation in engagement from one session to the next will require other techniques that model patterns of variability.

There is substantial variability between parents in engagement, (22.81%; $\sigma^2_{v_{ji0}} = 0.087$), and there is substantial between-group variability (21.03%), and significant correlation of engagement among parents in the same group beyond what is accounted for by similarities between family members ($\sigma^2_{u_{j00}} = 0.080$).

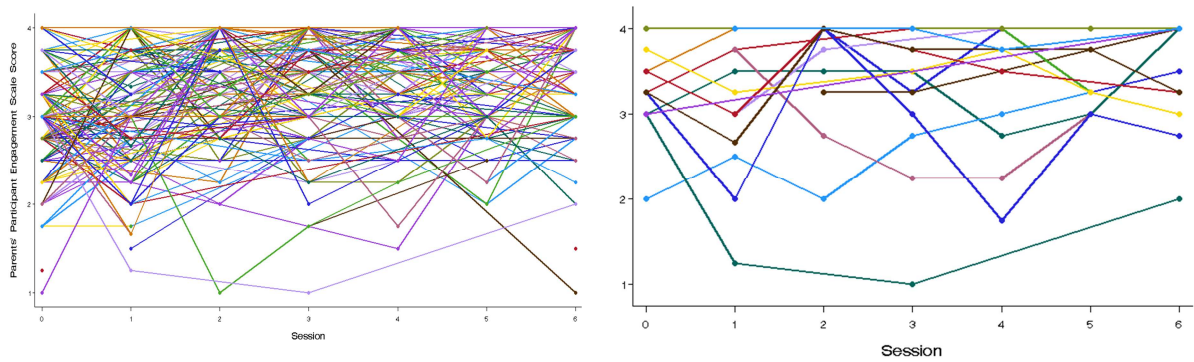


Figure 3-1: Raw Engagement Data: The left panel depicts engagement scale scores over seven weeks of intervention sessions for the full sample and shows overall trends and variability. The right panel depicts the same data for a subset of 20 randomly selected parents and shows individuals' trajectories.

Model 2: Growth Curve Model

The standard growth curve is presented in the left column of Table 3-1. This model shows the average growth of engagement over the seven sessions among all participants in the sample using time (session) as a predictor. Cubic and quartic models did not have significant fixed effects for these highest-order polynomials, so a quadratic model was selected. Initial levels of engagement were high ($\gamma_{000} = 3.227$). There is a significant modest increase in engagement by 0.153 units with each subsequent session (γ_{001}). There is a significant effect of time² ($\gamma_{002} = -0.014$), which shows that the change in engagement is non-linear; specifically, there is a slight leveling-off of the linear increase in engagement in the later sessions. The model that is presented represents the best-fitting error structure of all quadratic models, ensuring accurate significance testing of the fixed effects. Specifically, unstructured random error structures of each combination of intercept, time, and time-squared components were tested in levels two and three. The final model includes a random effect of

intercept (σ^2_{vj0}) at level 2, indicating that there are between-person differences in initial level of engagement but no differences in slope. Intercept (σ^2_{uj00}), time (σ^2_{uj01}), and time-squared (σ^2_{uj02}) are significant random effects at level 3, indicating that there are between-group differences in initial level of engagement and in linear and quadratic increases in engagement.

Table 3-1: Models predicting parent engagement.

	Model 2: Growth curve model		Model 3: Growth curve model with predictors	
	Estimate	SE	Estimate	SE
Fixed effects^a				
Intercept, γ_{000}	3.227*	0.092	3.233*	0.093
Time, γ_{001}	0.153*	0.043	0.155*	0.043
Time ² , γ_{002}	-0.014*	0.006	-0.015*	0.006
Varying family tension, γ_{003}			-0.030	0.036
Father, γ_{010}			-0.058	0.045
Curriculum Version, γ_{100}			0.033	0.129
Mean-level family tension, γ_{020}			-0.127	0.085
Time*Curriculum, γ_{101}			-0.050*	0.022
Mean-level*Varying family tension, γ_{013}			-0.240*	0.097
Random effects				
Level 2 (person)				
Variance intercept, σ^2_{vj0}	0.090*	0.012	0.090*	0.012
Covariance intercept, varying family tension, $\sigma_{vj0\ vj3}$			-0.002	0.010
Variance varying family tension, σ^2_{vj3}			0.015*	0.008
Level 3 (group)				
Variance intercept, σ^2_{uj00}	0.191*	0.062	0.196*	0.064
Covariance intercept, time, $\sigma_{uj00\ uj01}$	-0.062*	0.025	-0.064*	0.026
Variance time, σ^2_{uj01}	0.036*	0.014	0.037*	0.014
Covariance intercept, time ² , $\sigma_{uj00\ uj02}$	0.007*	0.003	0.007*	0.003
Covariance time, time ² , $\sigma_{uj01\ uj02}$	-0.004*	0.002	-0.005*	0.002
Variance time ² , σ^2_{uj02}	0.001*	0.000	0.001*	0.000
Residual variance, $\sigma^2_{\epsilon jit}$	0.157*	0.007	0.151*	0.007
-2LL	1840.5		1829.2	
AIC	1856.5		1849.2	

Note. Unstandardized estimates and standard errors. Effects are scaled in units of engagement scale scores (1-4) per session. Model based on up to 7 occasions nested within 309 participants for a total of 1477 observations. -2LL = -2 Log Likelihood; AIC = Akaike Information Criterion, relative model fit statistics. Model 3 has higher variance in some parameters compared to Model 2 because of difference in centering caused by interaction terms in Model 3.

^a Positive effects should be interpreted for fathers, MSFP curriculum, higher-than-average tension, families with higher tension, and later sessions. Intercept represents session 1 for the average participant.

* $p < .05$

Model 3: Predictors

To Model 2, independent variables were added to predict remaining variability in engagement, a between-person random effect of varying family tension was added, and highest-order non-significant interactions were trimmed. The resulting model, Model 3, is presented in the right column of Table 3-1. Intercept (γ_{000}) and effects of time (γ_{001} and γ_{002}) were similar to those in Model 2. Cumulative effects of significant predictive terms in Model 3 can be seen in Figure 3-2, where the predicted scores for each individual and the prototypical curves are presented. Based on the results of Model 3, there is not a significant main effect of varying family tension on parent engagement. The significant interaction of mean family tension with varying family tension (γ_{013}) indicates that on occasions when low-tension families experienced higher-than-average tension, parents showed higher engagement, whereas on occasions when high-tension families experienced higher-than-average tension, parents showed lower engagement. This difference in the effect of varying family tension on engagement for parents with high family tension versus low family tension is shown in Figure 3-3. The significant random effect of varying family tension ($\sigma^2_{\nu_{j13}}$) shows that the association between family tension and engagement appeared to be different among parents, even after accounting for the significant interaction with mean family tension. This indicates that fluctuations in family tension may impact some parents more or less than others; the bivariate associations for individual parents are depicted in Figure 3-4.

There was not a significant effect on initial levels of engagement based on parent sex, curriculum or mean-level of family tension. There was a significant interaction between time and curriculum such that parents experiencing the MSFP curriculum demonstrated a smaller linear increase in engagement over time compared to parents experiencing the SFP curriculum ($\gamma_{101} = -0.050$). This effect is highlighted in Figure 3-2.

Model 3 indicates that many of the fixed effects were significant, contributing to knowledge about how these predictors relate to engagement over time. To determine how well Model 3 predicts engagement scores, the predicted scores of Model 3 ($M = 3.492$, $SD = 0.176$) were compared to the observed engagement scale scores ($M = 3.489$, $SD = 0.603$). The correlation between these two variables (r) is 0.302, $p < .01$, which indicates that model has made a prediction that is related to the observed scores.

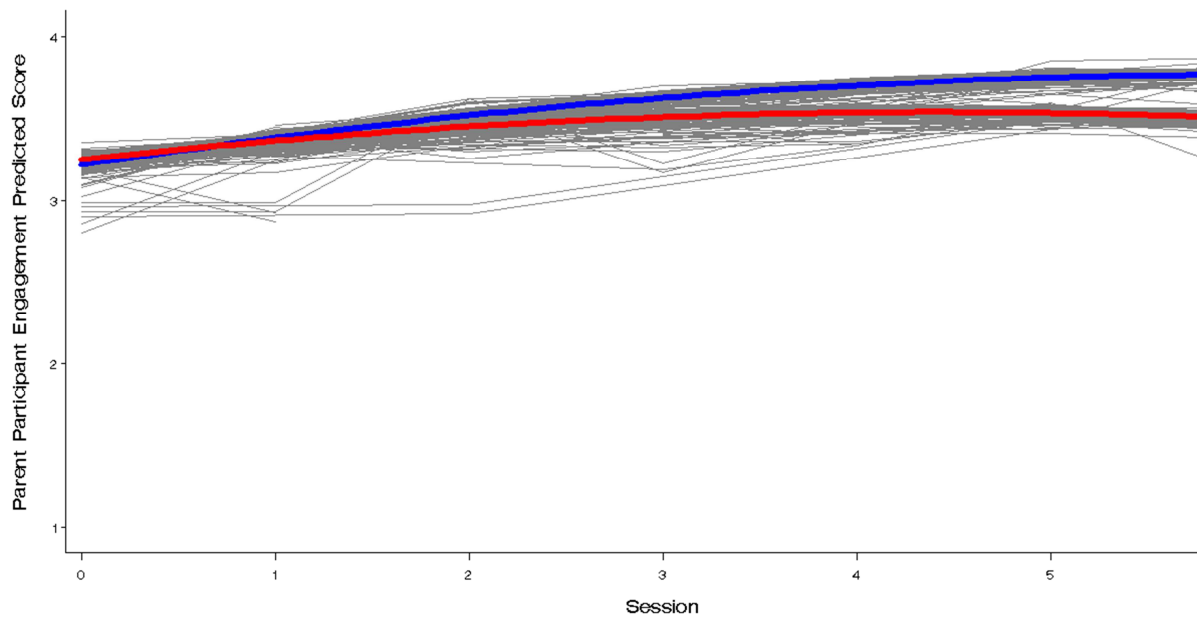


Figure 3-2: Effect of Curriculum Version on Increase in Engagement: Colored lines represent the curriculum by time interaction parameter predicting engagement factor scores, plotted by SFP (blue) and MSFP (red) when all variables are set to values of 0. Gray lines are individual predicted scores.

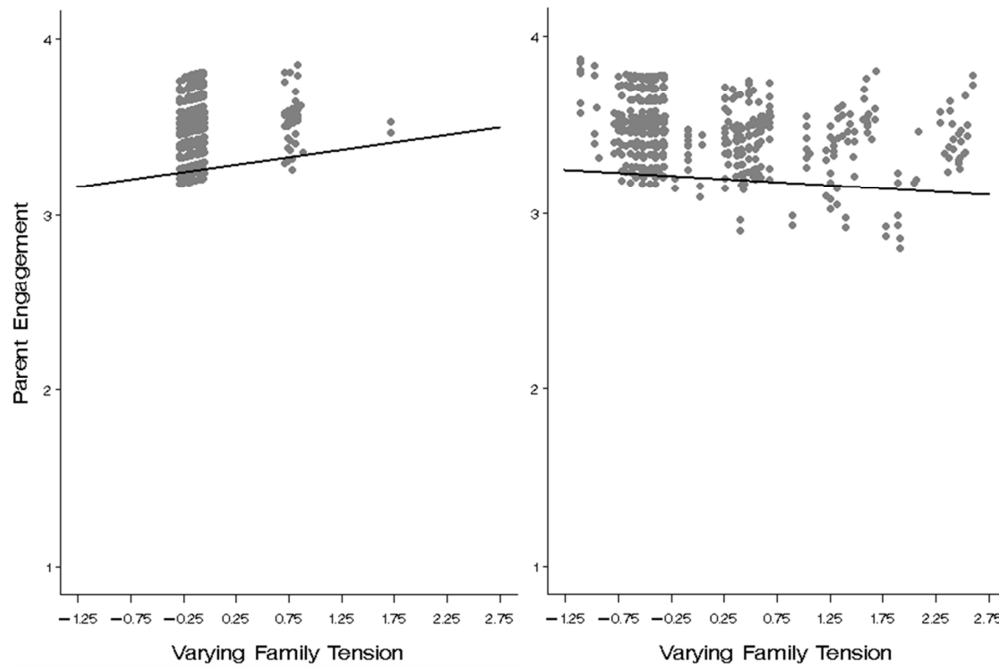


Figure 3-3: Effect of Varying Family Tension by Mean Family Tension on Engagement: The left panel depicts the effect of varying family tension on engagement for families with low mean family tension (< 0). The line in this panel represents the parameter for the minimum mean family tension score. The right panel depicts the same effect for families with high mean family tension (> 0). The line in this panel represents the parameter for +1SD mean family tension. Each dot represents a parent's predicted engagement score for a session, plotted by that parent's family tension score on the same session.

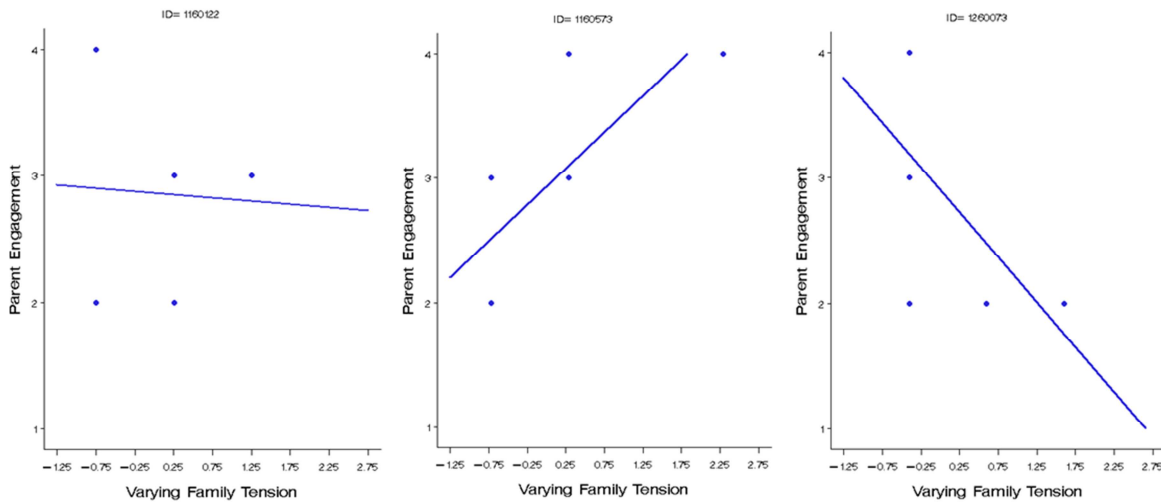


Figure 3-4: Bivariate pairing of varying family tension and engagement by participant. Panel 1 depicts a participant with a strong positive pairing: for sessions when family tension is higher than average, the parent’s engagement is high. Panel 2 depicts a participant with a weak pairing of family tension and engagement: for sessions when family tension is higher than average, engagement may be high or low, and vice versa. Panel 3 depicts a participant with a strong negative pairing: for sessions when family tension is higher than average, the parent’s engagement is low.

Follow-Up T-Test Analyses

To explore the interaction of time and curriculum type found in Model 3, item-level t-tests were conducted. The purpose of these analyses was to gain further insight into which aspects of engagement may have contributed to the significant interaction. Each item was tested for mean differences between the two curriculum versions, $p < .01$ was used. Participation was not significantly different between curriculum versions, $t(1298.7) = -2.07$, $M_{\text{SFP}} = 3.26$ (0.88); $M_{\text{MSFP}} = 3.36$ (0.80), nor was interest, $t(1327) = 1.49$, $M_{\text{SFP}} = 3.60$ (0.60); $M_{\text{MSFP}} = 3.54$ (0.64), nor positivity to leaders, $t(1333) = 0.61$, $M_{\text{SFP}} = 3.59$ (0.63); $M_{\text{MSFP}} = 3.57$ (0.63). However, positivity to others was significantly different between the curriculum versions, $t(1316.7) = 4.25$, $M_{\text{SFP}} = 3.58$ (0.63);

$M_{\text{MSFP}} = 3.43 (0.70)$. Parents in MSFP groups had lower mean levels of positivity than parents in SFP groups. Thus, it is possible that the difference in increase in engagement (γ_{101}) was primarily due to less increase in positivity toward other parents for parents who attended MSFP groups compared to SFP groups.

Chapter 4

Discussion

Conclusions

This study investigated the nature of change in parents' engagement across the duration of a seven-week intervention. This is the first study that statistically examines engagement as a dynamic construct, acknowledging that change in engagement may be a product of within-parent, between-parent, between-family, and between-group factors. Three main findings emerged from our analyses.

First, there was significant growth in engagement across the seven weeks of these interventions. As we examined and the results demonstrate, participant engagement is not a static trait-like construct, as it has been treated in previous research (e.g., Baydar et al., 2003; Dumas et al., 2007; Nix et al., 2009; Orrell-Valente et al., 1999; Teti et al., 2008) but a level of interaction with curriculum delivery that may change over time, from session to session. This corroborates Coatsworth, Duncan, Pantin, & Szapocznik's (2006) finding that implementation process measures such as positive and negative alliance and participant leadership change over time. These findings have meaningful implications for the field of implementation science. Random effects in Models 2 and 3 indicated that slopes of engagement differed across groups. In other words, the same intervention delivered to the same standard may be received by and therefore affect groups of participants differently. Building on previous research that found association between high engagement and better outcomes, participants who have increasing rather than decreasing engagement may be more able to learn intervention content and more able to integrate this content and practice into their daily lives. Thus, participants' engagement appears to be an important factor that could contribute to intervention effectiveness, in addition to and beyond group leaders' delivery.

Like Perrino and colleagues (2001) who found that family stress was not related to attendance, we found no significant relation between mean-level family tension and both level and

slope of engagement. Our second main finding, however, potentially illuminates the complex and currently unclear relation between family stress and engagement. This is that session differences in family tension scores predicted parents' engagement differently depending on the family's average level of tension, such that on sessions when a family's observed level of tension was higher than the family's average across sessions, parents in low-tension families showed higher engagement, whereas parents in high-tension families showed lower engagement.

There are meaningful implications of this finding for implementation science: day-to-day experiences and parents' current states may influence parents' ability to receive and learn from a particular intervention session. And, these day-to-day experiences may influence different groups of parents differently based on factors like average level of family tension. Further, day-to-day experiences may influence individual parents differently in ways not predicted by this model. Group delivery may need to be modified in order to respond to parents' fluctuating needs and ensure optimum engagement for each parents and for subgroups of parents.

Third, growth in engagement differed by curriculum version, with MSFP parents' engagement increasing less over time compared to parents who attended SFP sessions. Although SFP and MSFP parent sessions are very similar in overall focus and both pair with the same youth and family components, there are a variety of differences between them, including some topics and activities that are not shared and different timing of shared topics across the seven sessions. Furthermore, we are aware that the MSFP curriculum is more topic-dense in that it contains additional information and activities not included in the original SFP curriculum, which may lead to group leaders feeling rushed to cover all topics, and to parents feeling a lack of time to participate and to connect with other parents and the group leader. Because MSFP is more topic-dense, parents may have a hard time comprehending topics at the fast pace of curriculum delivery.

There are important implications for implementation science that follow this finding of differential trajectories. Given that these curricula are (exceedingly) similar and engagement was

measured with the same scale across both, the trajectories are directly comparable aside from possible differences between group leaders of the two curricula. However, the trajectory found here will likely not extend to other group-delivered interventions. In order to advance this line of research generally, research groups must examine the engagement trajectories of their own samples with other intervention curricula.

In terms of practical relevance to the field, research on participant engagement has much to contribute by illuminating the factors that influence engagement, and how engagement is likely to change. Armed with this knowledge, interventionists may be able to maximize participant engagement, which is of import because participants who are more engaged are likely to benefit more from interventions. When the time comes, designing interventions to maximize engagement in evidence-based family interventions may be an efficient way to improve intervention effectiveness.

Limitations

Several limitations of this study warrant discussion. First and foremost, multi-level growth curve models use FIML so that cases missing predictor variables are excluded from analyses, but cases missing the outcome variable are used in the analyses and assigned a predicted score. The implication of this procedure for the current study is that the model does not account for the qualitative difference between 1. Parents who attend at least one session ($N = 297$) versus parents who never attend ($n = 12$) and 2. Occasions when parents attend and have observed engagement scores ($N = 1339$), occasions when parents attend and do not have observed engagement scores ($N = 6$), and occasions when parents do not attend ($N = 686$). By extension, parents who attend but then stop attending are assumed to be the same as parents who attend sporadically and the same as parents who attend consistently. For some barriers to attendance, this assumption may be sound (e.g., birthday party, unexpected event), but for other barriers, this assumption is likely not sound (e.g., parents who did not like the sessions, parents who work sporadic hours, family disorganization).

In the final model presented, the significant quadratic effect of time may have indicated a ceiling effect in the measurement of engagement instead of indicating a true leveling-off of engagement. Additionally, although the four-item measure of engagement that was used in this study is a reasonable way to begin measuring engagement in group-delivered interventions and is commensurate with the current state of measurement of this construct, these four items do not capture all of the ways that parents could and should engage with interventions. Therefore, it is possible that parents experiencing the MSFP curriculum were engaged in ways that were not assessed using the current measure. In order to overcome both of these limitations, it will be necessary to measure more dimensions of engagement such as those proposed by Bamberger and Coatsworth (2013) with finer-grained scales to capture the full variation in engagement within and between parents.

Some alternate explanations for the curriculum difference in engagement trajectories found in Model 3 reflect potential limitations of the current study and surround differences in group leaders for the two curricula. In addition to naturally-occurring differences between the two small samples of group leaders, MSFP leaders being one sample and SFP leaders being another, MSFP group leaders are required to have ongoing experience with at least one of a variety of contemplative practices. Thus, chance and intentional differences between facilitators may contribute to reporter differences—differences in parents' engagement ratings that are not truly differences in the parents' engagement, but instead differences in the observer who reports on this measure, different expectations of parents, different levels of attunement to positive or negative engagement-related behaviors. These group leader differences may also contribute to differences in delivery style. For example, if MSFP group leaders feel more rushed, their ratings of parents' engagement may be biased because of their own feelings about how the curriculum limits discussion during delivery. If MSFP group leaders must remain very focused to deliver the full curriculum content within the allotted time, their ratings may be relatively uninformed because they are unable to notice

engagement that occurs. These explanations would be most plausible if the MSFP-curriculum became more topic-dense over the course of the seven sessions or if MSFP facilitators began to feel more rushed as the sessions went on. These limitations were a necessary component of the study design, but should be considered when interpreting the curriculum difference in slope of engagement.

Future Directions

Other predictors of attendance, dosage and/or static level of engagement have been examined. Between-parent predictors such as demographic characteristics and parenting quality have been examined across many studies (e.g., Baydar, Reid, & Webster-Stratton, 2003; Dumas et al., 2007; Haggerty, MacKenzie, Skinner, Harachi, & Catalano, 2006; Nix et al., 2009; Teti et al., 2008). Studies have also included between-family predictors such as parent-child relationship quality and demographic characteristics (e.g., Kazdin & Mazurik, 1994; Kazdin, Mazurik & Bass, 1993; Perrino et al., 2001; Prado et al., 2006; Spoth, Redmond, Hockaday, & Shin, 1996). Finally, studies have also examined between-child characteristics to predict parent attendance and engagement (e.g., Orrell-Valente et al., 1999; Connell et al., 2007; Haggerty, Fleming, Lonczak, et al., 2002; Spoth, Redmond, Kahn, & Shin, 1997). This literature should be integrated into future models examining dynamic engagement, including between-parent, -family, and -child characteristics as predictors at the appropriate levels of analysis as part of a strategy to explain variance at all levels of a multilevel growth curve model.

In addition to parent and family characteristics, which have the potential to explain variance at the parent and family levels of multilevel growth curve models predicting engagement, future research should also include characteristics of the intervention context, which have the potential to explain variance at the group level of the model. Explanatory variables at this level are needed, as indicated by the significant correlation of residuals for parents within intervention groups (level 4 of

Model 1). That engagement scores for parents in the same group are similar beyond what is accounted for by similarity of parents in the same family is evidence that group dynamics or other aspects of the group-specific intervention context may influence parents' engagement. Thus, future studies should go beyond previous studies' inclusion of parent and family characteristics and beyond the current study's inclusion of curriculum version as predictors of engagement to use measures of intervention context such as group dynamics, interventionist characteristics, and delivery quality as predictors of engagement.

Finally, repeated measures of parent, family, and child behaviors and parents' daily experiences throughout the intervention can contribute time-varying components, which have the potential to explain variance at the time level of the model.

Future studies should attend to the crossed and nested structure of parents' engagement across time in group-delivered interventions by utilizing multi-level models and including predictors at each level, such as those suggested above, whenever possible. Parents' engagement in intervention over time is a measure of their commitment to learning from the intervention content and group. Change in this engagement, along with levels of engagement, may predict parents' uptake of intervention content and eventual intervention-targeted outcomes. Because we found significant slopes in parents' engagement in this study, future research might seek to explore similar models of engagement in other family-based interventions. At a minimum, collecting frequent data on parents' engagement in family-based interventions should be considered because this study demonstrates that there is a potential for engagement to change over a short period of seven weekly sessions; it remains to be seen whether changes in engagement level off for participants in interventions lasting longer than seven weeks.

In summary, our results indicate that more research is needed on participant engagement, including research to extend our finding that engagement is indeed dynamic by exploring trajectories of change in engagement across a variety of interventions. Additionally, more research is needed to

extend our finding that group differences and within-person differences across time can predict both time-specific levels and trajectories of engagement, including models that are inclusive of predictors at all levels to bridge sparse studies on between-person and between-family predictors of levels and trajectories of engagement. Novel studies will examine aspects of the intervention context as predictors of engagement.

Appendix: Engagement Measure

Parent Session Participant Attendance and Engagement

Site

Facilitator:

Date / /

Session #:

Family Member Names	RESEARCH USE (leave blank)	ATTENDANCE	Engagement Measure				Parent appeared positive and warm in interactions with group leader	Parent appeared positive and warm in interactions with other parents
			Parent was actively engaged and readily participated in parent session group discussion/activities	Parent seemed to understand and be interested in material presented in group	Parent seemed resistant to new ideas and reluctant to try new ways of doing things	Parent appeared positive and warm in interactions with group leader		
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4
		00 01	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4	N 1 2 3 4

Attendance: 0 = Absent; 1 = Present (If absent, do not rate engagement)
Engagement: N = No rating (Could not rate); 1 = Rarely or Never; 2 = Sometimes; 3 = Often; 4 = Always or almost always

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