

Parenting Wisely Six Months Later: How Implementation Delivery Impacts Program Effects at Follow-Up

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Abstract We evaluated the effectiveness of the Parenting Wisely (PW) program 6 months post intervention and assessed differences based on delivery format. Using a quasi-experimental design, parents ($N = 311$) participated in the PW program in one of five formats (i.e., parents-only intensive workshop, parents-only 5-week group, parents and adolescents 5-week group, parent and adolescent online, and parent-only online format). An additional 53 parents served as a comparison group. We used the McMaster Family Assessment Device, the Child Behavior Checklist, and the Violent Behavior Checklist to measure family functioning, parenting, and adolescent behavior. Relative to the comparison group, at 6 month follow-up parents who participated in PW reported increases in confidence in their parenting skills, decreases in conflicts with their adolescents, and decreases in adolescent externalizing and violent behavior. Mechanisms of change analyses supported the conceptual model that program effects were related to child behavior changes by influencing positive parenting and decreasing negative family dynamics. PW effectiveness did not vary substantially by delivery format, except for the intensive workshop format, which was less effective than other formats. These findings extend research on PW to include evidence of sustained program effects on adolescent externalizing and violent behaviors in an ethnically diverse, socioeconomically disadvantaged sample. Study findings are relevant to agencies and clinicians who are seeking to implement an evidence-based, flexible parent-training program.

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Introduction

Parent training can be an effective method to prevent youth problem behaviors, such as aggression and delinquency (Fagan & Catalano, 2012; Kumpfer & Alvarado, 2003; Sandler, Schoenfelder, Wolchik, & MacKinnon, 2011; Sandler et al., 2014). Parent training programs have been developed and implemented across all levels of prevention: universal prevention—which targets the general population, selective prevention—which targets sub-groups who are at elevated risk due to their membership in a particular group, and indicated prevention—which targets those who exhibit individual risk factors that place them at risk (Gordon, 1983). The goal of Parenting Wisely (PW), an indicated prevention program, is to increase parenting knowledge and competence, and decrease adolescent problem behaviors (Substance Abuse and Mental Health Services Administration, 2007). Previous evaluations of PW have provided support for the effectiveness of the program (Cefai, Smith, & Pushak, 2010; Cotter, Bacallao, Smokowski, & Robertson, 2013; Kacir & Gordon, 1999; O’Neill & Woodward, 2002).

Despite a significant amount of previous research, few studies have evaluated the effects of PW beyond immediate post-test. Although gains in parenting competence and decreases in problem behaviors immediately following the program are encouraging, longer-term follow-ups are necessary to gauge the extent to which intervention effects are maintained. In addition, although originally developed as a self-guided computer-based program, PW has been implemented in multiple formats, ranging from a traditional self-guided implementation to a small group facilitator-led format in which adolescents participate alongside their parents (Cotter et al., 2013). Research evaluating the effectiveness of these alternative formats beyond immediate post-test is particularly necessary as, to our knowledge, no studies have included a follow-up of these non-traditional PW formats. In order to address this knowledge gap, we sought to evaluate the effectiveness of the PW program 6 months post intervention for the following formats: (a) a parents-only intensive workshop, (b) a parents and adolescents 5-week group, (c) a parents-only 5 week group, (d) a self-paced online format for individual parent-adolescent dyads, and (e) the traditional self-paced online format for individual parents. Our study further contributes to the existing literature by testing Parenting Wisely in a socioeconomically disadvantaged, rural county with high rates of youth violence.

Parent Training Interventions

Parent training is a popular prevention strategy that is designed to address youth problem behavior. The popularity of parent training is in large part due to Patterson’s (1982) family coercion theory, which suggests that children use negative behaviors to gain attention and parents’ coercive responses (e.g., yelling, nagging)

then reinforce the behavior, leading to further negative parental attention (Patterson, 1982). Parent training interventions seek to disrupt this cycle of coercion. Parent training interventions generally use two methodological approaches to disrupt the coercive family cycle: behavior modification and relationship enhancement (Briesmeister & Schaefer, 1998). Whereas behavior modification approaches focus on changing the reciprocal patterns of antecedents and consequences of problem behaviors, relationship enhancement approaches focus on strengthening family bonds and improving family interactions.

Results of meta-analyses indicate that, in general, parent training evaluations have moderate to strong effects (Kaminska, Valle, Filene, & Boyle, 2008; Lundahl, Risser, & Lovejoy, 2006). Although many evaluation studies of parent training interventions focus on changes between pre-test and post-test, Lundahl and colleagues (2006) completed a meta-analysis of studies on the effects of parent training interventions (in both clinical and nonclinical samples) beyond immediate post-test. Results indicated that many of the positive effects that were found at post-test were maintained at follow-up, although the effect sizes were small for child and parent behavior outcomes and moderate for parental perceptions outcomes. Overall, a lack of longer-term follow-up assessments beyond immediate post-test (Kaminska et al., 2008) as well as a lack of comparison groups at follow-up (Lundahl et al., 2006) are weaknesses of many parent training evaluation studies.

Implementation

In addition to the need for longer-term follow-up studies, more work is needed to evaluate differences in effectiveness based on key characteristics of implementation, such as delivery method. According to the Interactive Systems Framework for Dissemination and Implementation, the “prevention delivery system” is a key component of successful translation from research to practice (Wandersman et al., 2008, p. 177). This system refers to the activities required to carry out the intervention, including the individual, organizational, and community factors that have the potential to influence implementation. Intervention or program adaptations are often implemented to address such factors. Castro and colleagues (2004) differentiate between adaptations in modifying program content and form of delivery. In form of delivery modifications, the program content remains the same, but changes are made in terms of who delivers the program or the channel or location of delivery.

Previous research suggests that form of delivery modifications might impact the effectiveness in parenting programs. For instance, meta-analytic results have indicated that delivery method significantly moderates the effectiveness of parent training programs (Lundahl et al., 2006). Specifically, for economically disadvantaged parents, parent training delivered in an individual format was more effective than training delivered in a group format with regard to child and parent behavior. However, this meta-analysis found no significant differences between face-to-face and self-directed formats. Another study examined the relative effectiveness of three variants of an indicated prevention intervention, the Triple P Positive Parenting Program: the standard individual format that included a trained

practitioner, an enhanced individual format that added a partner support and coping skills component, and a self-directed format in which parents completed workbook exercises on their own (Sanders, Markie-Dadds, Tully, & Bor, 2000). Results of this study indicated that the two practitioner-assisted formats were associated with more positive outcomes related to child behavior, parenting competence, and satisfaction with the program at immediate post-test. At 1 year follow-up, children in all three intervention formats experienced similar changes in observed disruptive behavior, although the standard and enhanced formats yielded greater improvements in parent-observed disruptive child behavior. These studies suggest that differences in the delivery or implementation of a parent training program may influence effectiveness, although differences may depend on outcome measure and time point (e.g., post-test vs. longer follow-up). However, few evaluation studies have considered the impact of differences in implementation.

Parenting Wisely

Parenting Wisely (PW) is a computer-based parent training program that seeks to increase parenting knowledge and competence and decrease adolescent problem behaviors through an interactive computer-based program (Gordon, 2000). PW was designed as a self-instructional program, delivered primarily over the internet, for parents to complete individually; it has also been implemented in group formats in which parents work through program vignettes and quizzes together. The PW program was developed for parents of adolescents with mild to moderate behavior problems, including those at risk for substance abuse and delinquency (Gordon & Stanar, 2003). The program includes 10 video modules, which include vignettes of typical conflictual parent-adolescent interactions. The ten video modules covered in the program are: (1) helping children to do housework; (2) loud music, chores incomplete; (3) helping children do better in school; (4) sharing the computer; (5) curfew; (6) sibling conflict; (7) step-parenting; (8) getting up on time; (9) school, homework and friends; and (10) finding drugs. After viewing each vignette, parents select a response strategy from a list of possible options that represent different levels of parenting effectiveness. Response options tend to reflect authoritarian, authoritative, or permissive parenting styles. For example, following a scenario depicting an adolescent coming in late after breaking a curfew agreement, possible response options are: (a) question the child and threaten her with grounding, (b) meet with the child and work out an agreement concerning expectations and consequences, and (c) firmly set a consequence for coming in late. The selected response option is then portrayed in a second video vignette and critiqued through interactive questions and answers (Kacir & Gordon, 1999). The accompanying PW workbook further reinforces key concepts and parenting strategies.

Evaluation studies of PW have reported mixed findings. O'Neill and Woodward (2002) evaluated PW with parents of young adolescents who were referred to a community agency due to misconduct. Analyses of pre-test and post-test surveys revealed significant decreases in problem behavior and significant increases in parenting knowledge. Another study evaluated the effectiveness of PW with low-income parents in rural Appalachia and included a control group and follow-up

assessments (Kacir & Gordon, 1999). In this study, the majority of participants reported clinical elevations at baseline. Compared to the control group, parents who participated in PW demonstrated significant decreases in perceived adolescent problem behavior and increases in parenting knowledge at both 1 and 4 months post-intervention. However, there were no significant differences between the intervention and control groups on post-test measures of implementation of parenting skills.

Additional studies have evaluated PW based on delivery format. Cefai and colleagues (2010) compared individual and small group formats in a nonclinical sample in Australia. Results revealed that participants in both delivery formats reported significant decreases in child problem behaviors and significant increases in parental sense of competence; however, the gains in competence were maintained at 3 month follow-up only for those who participated in the individual format. Other researchers assessed changes over time with regard to a number of parent and adolescent outcomes for four PW formats in an economically disadvantaged, rural county: (a) a parents-only intensive workshop, (b) a parents and adolescents 5-week group, (c) a parents-only 5-week group, and (d) a self-paced online format for individual parent–adolescent dyads (Cotter et al., 2013). Results indicated significant changes in family problem solving, family roles, family involvement, parenting self-efficacy, parenting sense of competence, and adolescent violent behavior over time across delivery formats, although the 5-week groups generally yielded greater effect sizes than the workshop or individual formats. In addition, greater effect sizes for measures of adolescent behavior (i.e., adolescent violent behavior, externalizing problems, and parent–child conflict) were observed for formats in which adolescents participated.

Overall, previous literature suggests four key conclusions to guide additional research. First, study designs that incorporate comparison groups are necessary, as simply analyzing differences between pre-test and post-test do not account for changes due to maturation, regression to the mean, or testing effects. Further, the counterfactual condition implied by such a design (i.e., that without intervention there would be no change) is problematic. Second, although significant differences between pre-test and post-test constitute one indication of effectiveness, researchers should also focus on the maintenance of intervention effects beyond immediate post-test with follow-up assessments. Third, in light of results indicating differences on effectiveness based on delivery format (e.g., Cefai et al., 2010), researchers should continue to test additional delivery formats of the PW program. Finally, few studies of PW have examined the conceptual model underlying program effects. Although prior researchers have reported effects on parenting knowledge and competence and adolescent problem behaviors, an analysis of mechanisms of change is needed to confirm the pathways for program effects.

Based on the identified gaps in the literature, we sought to assess (a) improvements between pre-test and 6 month follow-up in the intervention relative to the comparison groups; (b) differences in effectiveness between five different intervention formats (i.e., a parents-only intensive workshop, a parents and adolescents 5-week group, a parents-only 5-week group, a self-paced online format for parent and adolescent dyads, and a self-paced online format for parent only); and

(c) the program's conceptual model that enhancing positive parenting and decreasing negative family dynamics leads to reduction of problematic adolescent behavior. We hypothesized that improvements between pre-test and 6 month follow-up would be significantly greater for the intervention groups (analyzed collectively) than the comparison group. We also believed that the program's conceptual model would be supported by a mechanisms of change analysis. Because of the paucity of research on differences based on intervention delivery format, intervention format differences were considered exploratory.

Method

Our study was funded by the U.S. Centers for Disease Control and Prevention through a cooperative agreement with the North Carolina Youth Violence Prevention Center (NC-YVPC). The goal of NC-YVPC is to reduce youth violence in a rural, economically disadvantaged, ethnically diverse county in North Carolina through a prevention initiative introduced in the fall of 2011. The target county experienced significant problems with youth violence and juvenile crime, ranking fifth in Juvenile Arrest Rate out of North Carolina's 100 counties. In the target county during the study period, the unemployment rate was over 12% (North Carolina Department of Commerce, 2014) and nearly 45% of children were living in poverty (U.S. Census Bureau, 2014). This context marked by high levels of youth violence and socioeconomic disadvantage presented a test of parenting intervention under extreme circumstances. We obtained IRB approval for all study procedures from the University of North Carolina.

Sample

Our study must be understood in the community context in which it took place. As previously mentioned, community factors are part of the prevention delivery system that have the potential to influence implementation (Wandersman et al., 2008). Participants came from an ethnically diverse, economically disadvantaged, and rural county. Parents of adolescents between the ages of 11 and 15 who resided in the county were eligible to participate. Project staff recruited parents in churches, schools, community centers associated with housing authorities, and social service agencies. We used community referrals and recruitment posters and pamphlets to recruit 367 parents. There was no eligibility criterion that adolescents had to have existing behavior problems. Consequently, we considered this a universal recruitment of interested parents in a community characterized by severe violence and disadvantage. While no parents were turned away, in soliciting referrals from pastors, principals, and agency personnel, we asked for nominations of parents who were experiencing problem behavior in their adolescent children. We invited parents with a teenage child who wished to enhance their child management skills to participate. Nearly all parents who participated reported some type of difficulty with their child, ranging from moodiness to delinquency. Three parents who were recruited decided not to participate in the study, yielding a final sample of 364

parents. After pre-test assessment, parents self-selected into one of five formats: (a) parents-only intensive workshop ($n = 86$); (b) parents and adolescents 5-week group ($n = 71$); (c) parents-only 5-week group ($n = 75$); (d) self-paced online format for parent and adolescent dyads ($n = 44$); and (e) self-paced online format for parent only ($n = 35$). Parents chose their format based on scheduling, interest, and personal preference for how they like to learn (i.e., on their own, in a group, with their child present).

Approximately 80% of the sample was female and the average participant age was 39 years. The diversity of the sample matched that of the surrounding community: 42% identified as African American, 39% as American Indian, 9% as Hispanic, 6% as White, 3% as multiracial, and 1% as “other.” The median household income was \$321 per week. Approximately 80% of the sample reported that their children received free or reduced price lunch. The intervention group included 311 (85.4%) participants, assessed at all three time points (pre-test, post-test, and follow-up at 6 months). A non-randomly assigned comparison group ($n = 53$; 14.6%) was assessed at the pre-test and follow-up time points only.

Measures

We used measures of family functioning, parenting, and adolescent behavior to evaluate the effectiveness of PW. We administered surveys at pre-test (baseline), post-test (5 weeks after baseline), and follow-up (6 months after post-test) for the intervention groups. See Table 1 for details on each scale.

Procedure

Parents in the intervention group received PW in one of the five formats specified above. Parents who participated in the comparison condition did not receive the PW program and completed assessments that corresponded to the intervention condition’s pre-test and follow-up. Parents in the comparison group were provided with the opportunity to complete the PW program after completing their final assessment. Each parent received \$10 in compensation for each survey assessment completed.

In the intensive workshop format, facilitators delivered the PW program to parents during approximately 10 h over 1 or 2 days. Due to difficulty in delivering all program content in a single day, the intensive workshop format typically occurred over 2 days. In this format, parents viewed and discussed the video enactments of family conflicts using a single, large screen. Although the workshop included role-plays and activities, time for discussion, processing, and skills training was limited.

In the parents and adolescents 5-week group, participants worked through the video enactments together on a large screen and participated in role-plays and activities led by a facilitator. This format provided ample time for discussion, processing group concerns, and skills training. The parents-only 5-week group was identical to the parents and adolescents 5-week group, except that adolescents did not participate.

Table 1 Measures

Scale	Scale description	Example items	Scale qualities	Citation
Family functioning: problem solving	The family's ability to resolve problems in ways that maintain effective family functioning	<p>"We resolve most emotional upsets that come up."</p> <p>"We confront problems involving feelings."</p>	<p>5 Items</p> <p>$\alpha = 0.77$</p> <p>4-point Likert Scale</p> <p>(<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein, Baldwin, and Bishop (1983)
Family functioning: family roles	The extent to which tasks are clearly and equitably distributed among family members	<p>"We make sure family members meet their family responsibilities."</p> <p>"We discuss who is to do household jobs."</p>	<p>8 Items</p> <p>$\alpha = 0.68$</p> <p>4-point Likert Scale</p> <p>(<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)
Family functioning: communication	The extent to which verbal messages between family members are clear	<p>"When someone is upset, the others know why."</p> <p>"When we don't like what someone has done, we tell them."</p>	<p>6 Items</p> <p>$\alpha = 0.67$</p> <p>4-point Likert Scale</p> <p>(<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)

Table 1 continued

Scale	Scale description	Example items	Scale qualities	Citation
Family functioning: affective involvement	The extent to which family members are interested in and placed value on each other's activities	<p>"If someone is in trouble, the others become too involved."</p> <p>"We are too self-centered."</p>	<p>7 Items</p> <p>$\alpha = 0.81$</p> <p>4-point Likert Scale (<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)
Family functioning: affective responsiveness	The extent to which family members experience appropriate affect in response to stimuli	<p>"We are reluctant to show our affection for each other."</p> <p>"Some of us just don't respond emotionally."</p>	<p>6 Items</p> <p>$\alpha = 0.73$</p> <p>4-point Likert Scale (<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)
Family functioning: behavior control	The extent to which the family expresses and maintains standards for the behavior of its members	<p>"We don't hold to any rules or standards."</p> <p>"You can easily get away with breaking the rules."</p>	<p>8 Items</p> <p>$\alpha = 0.71$</p> <p>4-point Likert Scale (<i>Strongly Agree</i>, <i>Agree</i>, <i>Disagree</i>, <i>Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)

Table 1 continued

Scale	Scale description	Example items	Scale qualities	Citation
Family functioning: general functioning	The overall health of the family unit	<p>“There are lots of bad feelings in the family.”</p> <p>“We feel accepted for what we are.”</p>	<p>12 Items</p> <p>$\alpha = 0.86$</p> <p>4-point Likert Scale</p> <p>(<i>Strongly Agree, Agree, Disagree, Strongly Disagree</i>)</p>	McMaster Family Assessment Device; Epstein et al. (1983)
Familism	The degree of family unity and trust within a family unit	<p>“We share similar values and beliefs as a family.”</p> <p>“Family members respect one another.”</p>	<p>7 Items</p> <p>$\alpha = 0.86$</p> <p>4-point Likert Scale</p> <p>(<i>Strongly Agree, Agree, Disagree, Strongly Disagree</i>)</p>	Gil, Wagner, and Vega (2000)
Parenting sense of competence	The degree of parenting efficacy and satisfaction	<p>“Being a parent makes me feel tense and anxious.”</p> <p>“I meet my own personal expectations for expertise in caring for my child.”</p>	<p>17 Items</p> <p>$\alpha = 0.80$</p> <p>6-point Likert Scale</p> <p>(<i>Strongly Agree, Agree, Somewhat Agree, Somewhat Disagree, Disagree, Strongly Disagree</i>)</p>	Gibaud-Wallston, and Wandersman (1978) and Johnston and Mash (1989)

Table 1 continued

Scale	Scale description	Example items	Scale qualities	Citation
Parenting self-efficacy	The degree of parents' confidence in implementing specific skills emphasized in the PW program	<p>"I am able to give my adolescent clear expectations about a task or responsibility."</p> <p>"I am able to provide good supervision when my adolescent is with her/his friends."</p> <p>"My child and I have big arguments over little things."</p> <p>"My child thinks my opinions don't count."</p>	<p>10 Items</p> <p>$\alpha = 0.80$</p> <p>5-point Likert Scale</p> <p>(<i>Never, Not Very Often, Sometimes, Most of the Time, All the Time</i>)</p>	Gordon (2011)
Parent-adolescent conflict	Degree of parent-adolescent conflict	<p>"In the past 6 months how often has your child:</p> <p>"Hit or kicked someone."</p> <p>"Beat someone up."</p>	<p>25 Items</p> <p>$\alpha = 0.89$</p> <p><i>True/False</i></p>	Conflict Behavior Questionnaire; Prinz, Foster, Kent, and O'Leary (1979)
Adolescent violent behavior	Degree of adolescent violent behavior	<p>"Argues a lot."</p> <p>"Disobedient at school."</p>	<p>10 Items</p> <p>$\alpha = 0.80$</p> <p>4-point Likert Scale</p> <p>(<i>Never, Once, Sometimes, Often</i>)</p>	Violent Behavior Checklist; Dahlberg, Toal, Swahn, and Behrens (2005) and Nadel, Spellmann, Alvarez-Canino, Latusell-Bryant, and Landsberg (1996)
Adolescent externalizing behavior	Degree of adolescent externalizing behavior		<p>29 Items</p> <p>$\alpha = 0.93$</p> <p>4-point Likert Scale</p> <p>(<i>Not True, Somewhat/Sometimes True, Very True, Often True</i>)</p>	Child Behavior Checklist; Achenbach and Rescorla (2001)

The self-paced online format for parents only represented the traditional PW implementation method in which parents complete the online curriculum that includes video vignettes, prompts for parenting solutions, and feedback on choices without any facilitation. The self-paced online format for parent and adolescent dyads was a slight variation of the traditional implementation method in which individual dyads of parents and adolescents work together without any facilitation to complete the program.

Parents across the intervention groups received identical lesson content, which included video vignettes designed by the program developers and questions related to these vignettes. In addition, all parents completed the 10 sessions that constitute the PW curriculum. Implementation staff put great effort into having full implementation of lesson content, with reminder phone calls before groups, scheduling group make up sessions, providing food at group sessions, and exceptional attention paid to forming relationships with participants. In the online formats, parents' progress was also tracked and participants successfully completed all program contact. This was achieved by bringing laptops with program materials to participants' homes for those parents that did not have access to personal computers and were unable to visit the office to use project computers, meeting in the community where it was convenient, and having encouraging phone contacts. Phone contacts occurred the week prior to each of the 10 group sessions.

The critical differences between the study conditions involved whether (a) participants completed the program by themselves (online) or in a group setting; (b) participants' adolescents also participated in the program; (c) the group met for two longer, intense sessions or for shorter sessions over 5 weeks; and (d) the implementation was enhanced with role-playing, activities, and discussion.

Statistical Analyses

Unconditional Difference-in-Difference

In order to compare differences between pre-test and follow-up for the five intervention formats and the comparison groups, we used an unconditional difference-in-difference method (DD_U). First, we calculated the difference between the follow-up (Y_F) and pre-test (Y_P) for each member of the intervention ($TX = 1$) and comparison ($TX = 0$) conditions, and we then calculated the difference between these differences:

$$DD_U = (Y_F - Y_P)_{TX=1} - (Y_F - Y_P)_{TX=0} \quad (1)$$

We then used paired sample t tests to assess for significant differences (a) between the overall intervention and comparison groups, (b) between each intervention format and the comparison group, and (c) between each intervention format.

Difference-in-Difference Regression

We estimated a conditional difference-in-difference (DD_C) regression for each outcome. The DD_C allows us to isolate the change within the intervention group from potential confounders comprising both (1) time-invariant differences between the groups, and (2) change over time that is common to both groups. This is a very rigorous design because it addresses the two most significant confounders of the intervention effect from the intervention effect estimate: factors that are related to selection bias (non-random assignment to the intervention group on pre-intervention characteristics) and factors that are common to both groups that affect change over time. The first of these includes any characteristics measured or unmeasured that may affect the trend in the outcomes over time. The second includes any changes that may occur over time that are independent of the intervention, such as typical changes in parenting knowledge that parents may undergo as they become more experienced with communication and disciplinary approaches. Both of these confounders are tested, providing a statistical test of the differences between groups at baseline.

However, the DD_C has two weaknesses. First, with only two data points, reliability and regression to the mean may affect our conclusions. Similar to a change score model, a DD model can be unreliable if measurement error is larger than true change, resulting in larger standard errors (Angrist & Pischke, 2009; Willett, 1989). Second, because the two groups were assigned non-randomly, there may still be concomitant changes within the intervention group over time that are not related to the intervention. The use of a conditional model reduces the risk of bias from the second weakness by including time-invariant characteristics that may explain these changes. With each participant observed at two measurement occasions, we used multilevel modeling to accommodate the correlation between observations over time. The DD_C was obtained from the following regression model:

$$Y_{it} = \pi_{00} + \pi_{10}T_t + \pi_{01}PW_i + \pi_{11}PW_iT_t + \pi_{02}X_i + e_{it} + u_i \quad (2)$$

PW_i = participant i assignment to Parenting Wisely (comparison = 0); T_t = wave {0 = pre-test, 1 = follow-up}. The vector X_i includes time-invariant participant characteristics. The coefficients π_{10} and π_{01} absorb the changes common to both groups that occur over time, and the unobserved differences between intervention groups at baseline, respectively. The remaining differences between the two groups over time constitute the intervention effect DD_C . From this model, $DD_C = \pi_{11}$. That is, the conditional DD obtained from the interaction term and the test of this interaction term is the hypothesis test that the intervention effect is non-zero. The error terms e_{it} and u_i were assumed to be multivariate normal with mean zero. To address the multiple testing (with 13 outcomes), a Benjamini–Hochberg false discovery rate adjustment was applied (see Table 2). The p values from each of the 13 models were ordered from smallest to largest with each having rank r_k . Significance was found where $p_k < (r_k/13) \times 0.05$.

Table 2 Benjamini–Hochberg false discovery rate adjustment

	Ordered p value	Criterion for significance
Parent–Child conflict	0.001	0.004
Externalizing behavior	0.001	0.008
Parenting self-efficacy	0.004	0.012
Violent behavior	0.008	0.015
Problem solving	0.015	0.019
Family roles	0.025	0.023
Parenting competence	0.086	0.027
Affective involvement	0.15	0.031
Familism	0.237	0.035
Affective responsiveness	0.266	0.038
General functioning	0.562	0.042
Behavior control	0.756	0.046
Communication	0.842	0.050

Mechanisms of Change Analysis

In order to test the mechanisms of change in our study, we completed a multi-stage analysis that involved: (a) assessing the association between intervention and mechanism, (b) assessing the amount of shared variance between the intervention and mechanism, and (c) testing the relationships between the intervention, higher “doses” of the mechanism, and better values on the outcomes (Kazdin, 2007). First, we examined the conditional associations of the intervention with the presumed mechanisms (i.e., scales of family dynamics and parenting efficacy, specifically parent child conflict, problem solving, family roles, affective involvement, parenting sense of competence, parenting self-efficacy, and familism¹). Second, using unconditional models, we estimated the proportion of variance explained by the mechanisms. Third, we estimated the total and direct effects of intervention, the association of the intervention with the mechanism, the association of the mechanism with the outcome, and the indirect effect.

Missing Data

Multiple imputation was used to minimize the potential for bias from missing values (Schafer, 1997; Graham, 2009). There was a missing value trend related to the wave of data collection. At the pretest wave (intervention and comparison), the number of non-responses ranged from 2 to 4. A much higher number of participants did not respond at the follow-up (both conditions), with missing values ranging from 140 to 145. The number of missing values on the demographic variables ranged up to 43 for income, though all of the other demographic variables had less than 10 missing

¹ Familism refers to strong attachment and identification within the family unit (see Sabogal et al., 1987).

values. An analysis of missing information and efficiency statistics indicated that 15 imputed data sets was appropriate. These statistics tended to stabilize and not improve further after the selected number of imputed data sets.

Results

Unconditional Difference-in-Difference

Mean scores on all outcome variables for each group are provided in Table 3. Results of the unconditional difference-in-difference indicated significant differences in changes from pre-test to follow-up between the overall intervention groups and the comparison group for problem solving ($p < .05$), family roles ($p < .05$), violent behavior ($p < .01$), parenting efficacy ($p < .01$), parent–child conflict ($p < .01$), and externalizing symptoms ($p < .01$). A similar pattern of significance was observed for four out of the five formats (i.e., parents and adolescents group, parents-only group, online format for parent and adolescent dyads, and online format for parent only) relative to the comparison group, with the exception of problem solving (which was only significant for the online format for parent and adolescent dyads) and family roles (which was not significant for either online format). The intensive workshop format, on the other hand, showed significant results relative to the comparison group for problem solving ($p < .05$) and parent–child conflict ($p < .05$) only. There were few significant differences between intervention formats. First, the difference between pre-test and follow-up for parenting self-efficacy was greater for the online format for parent and adolescent dyads than for the group and workshop formats. Second, the difference between pre-test and follow-up for familism and externalizing symptoms was lower for the workshop format than for the online format for parent only ($p < .05$) and the parents and adolescents group ($p < .05$), respectively. Finally, the difference between pre-test and follow-up for behavior control was significantly greater for the workshop format than for the parents and adolescents group ($p < .05$). A table displaying the above results is available upon request.

Conditional Difference-in-Difference Regression Models

The findings for the conditional models indicated that PW promoted improved outcomes in parent–child conflict ($p < .01$), externalizing behavior ($p < .01$), parenting efficacy ($p < .01$), violent behavior ($p < .01$), and problem solving ($p < .05$). Results are displayed in Table 4. Although it is not straightforward to calculate effect sizes for these interaction terms, some understanding of the size of effects can be obtained by comparing them to the change in the comparison group, which we would consider typical change. For parent–child conflict, families in the intervention group experienced a decrease of 3.6 points relative to those in the comparison group, who experienced no significant increase. For externalizing behavior, the intervention group was 0.17 points larger than the comparison group; for parenting efficacy, the intervention group was 0.39 points larger; and for violent

Table 3 Means and standard deviations of outcome scales by format

	Total sample <i>M (SD)</i>	Workshop <i>M (SD)</i>	PA group <i>M (SD)</i>	P group <i>M (SD)</i>	PA online <i>M (SD)</i>	P online <i>M (SD)</i>	Comp. <i>M (SD)</i>
Problem solving							
Pretest	3.15 (.48)	3.08 (.38)	3.21 (.53)	3.21 (.45)	3.08 (.42)	3.02 (.70)	3.21 (.43)
6 month follow-up	3.26 (.41)	3.26 (.42)	3.33 (.42)	3.33 (.44)	3.26 (.35)	3.17 (.32)	3.08 (.46)
Communication							
Pretest	2.89 (.44)	2.79 (.42)	2.90 (.38)	2.97 (.42)	2.99 (.38)	2.95 (.62)	2.81 (.43)
6 month follow-up	2.91 (.36)	2.91 (.36)	2.87 (.37)	2.93 (.38)	2.96 (.35)	3.00 (.42)	2.80 (.29)
Family roles							
Pretest	2.43 (.41)	2.39 (.36)	2.35 (.33)	2.40 (.42)	2.43 (.43)	2.52 (.54)	2.60 (.44)
6 month follow-up	2.64 (.40)	2.56 (.30)	2.68 (.33)	2.70 (.54)	2.65 (.50)	2.68 (.39)	2.67 (.34)
Affective responsiveness							
Pretest	2.91 (.54)	2.78 (.54)	3.01 (.48)	2.82 (.59)	2.99 (.56)	2.97 (.55)	3.02 (.46)
6 month follow-up	3.00 (.47)	2.90 (.41)	2.99 (.51)	3.06 (.52)	3.15 (.49)	3.00 (.50)	3.01 (.39)
Affective involvement							
Pretest	2.75 (.56)	2.62 (.52)	2.79 (.50)	2.65 (.61)	2.85 (.57)	2.78 (.61)	2.91 (.56)
6 month follow-up	2.87 (.51)	2.86 (.54)	2.86 (.47)	2.85 (.67)	2.90 (.44)	2.94 (.43)	2.84 (.47)
Behavior control							
Pretest	3.18 (.44)	3.10 (.45)	3.13 (.42)	3.22 (.40)	3.32 (.49)	3.19 (.47)	3.21 (.39)
6 month follow-up	3.24 (.46)	3.31 (.42)	3.07 (.48)	3.30 (.60)	3.28 (.46)	3.31 (.37)	3.19 (.37)
General functioning							
Pretest	3.11 (.47)	3.03 (.40)	3.12 (.48)	3.15 (.44)	3.08 (.50)	3.09 (.59)	3.17 (.47)
6 month follow-up	3.18 (.44)	3.12 (.43)	3.17 (.45)	3.30 (.51)	3.17 (.44)	3.27 (.41)	3.17 (.31)
Violent behavior							
Pretest	0.45 (.44)	0.45 (.42)	0.47 (.44)	0.54 (.48)	0.46 (.35)	0.46 (.48)	0.24 (.36)
6 month follow-up	0.23 (.35)	0.23 (.25)	0.24 (.26)	0.37 (.67)	0.18 (.21)	0.16 (.26)	0.17 (.24)

Table 3 continued

	Total sample <i>M (SD)</i>	Workshop <i>M (SD)</i>	PA group <i>M (SD)</i>	P group <i>M (SD)</i>	PA online <i>M (SD)</i>	P online <i>M (SD)</i>	Comp. <i>M (SD)</i>
Parenting competence							
Pretest	4.10 (.71)	4.09 (.71)	3.96 (.61)	4.05 (.64)	4.07 (.64)	4.09 (.87)	4.42 (.81)
6 month follow-up	4.44 (.66)	4.56 (.65)	4.25 (.66)	4.46 (.64)	4.51 (.65)	4.33 (.80)	4.44 (.57)
Parenting efficacy							
Pretest	3.53 (.65)	3.57 (.50)	3.48 (.70)	3.50 (.56)	3.13 (.84)	3.60 (.72)	3.82 (.51)
6 month follow-up	3.89 (.57)	3.81 (.64)	3.95 (.56)	3.85 (.57)	3.93 (.52)	4.08 (.53)	3.82 (.46)
Familiasm							
Pretest	3.28 (.59)	3.30 (.47)	3.27 (.73)	3.26 (.58)	3.20 (.56)	3.15 (.52)	3.39 (.62)
6 month follow-up	3.44 (.44)	3.38 (.43)	3.44 (.49)	3.56 (.47)	3.39 (.46)	3.52 (.35)	3.43 (.37)
Parent-child conflict							
Pretest	6.98 (6.18)	6.47 (5.42)	8.04 (5.78)	7.65 (5.82)	7.50 (6.36)	8.94 (9.33)	3.74 (4.30)
6 month follow-up	4.75 (5.36)	4.68 (5.43)	4.81 (4.72)	5.15 (6.29)	3.87 (4.56)	5.67 (7.26)	4.96 (4.86)
Externalizing behavior							
Pretest	0.42 (.35)	0.40 (.38)	0.49 (.35)	0.46 (.35)	0.44 (.26)	0.49 (.33)	0.22 (.27)
6 month follow-up	0.25 (.24)	0.25 (.21)	0.26 (.23)	0.33 (.40)	0.21 (.20)	0.26 (.20)	0.20 (.16)

P Online parent online (Alone), PA Online parent online with adolescent, P Group parents-only 5-week group, PA Group parents and adolescents 5-week group, Workshop intensive workshop, Comp. No intervention comparison group

Table 4 Conditional difference-in-difference model

	Problem solving		Communication		Family roles		Affective responsiveness		Affective involvement		Behavior control	
	Est.	t	Est.	t	Est.	t	Est.	t	Est.	t	Est.	t
Covariates												
Intercept	3.46	22.46***	2.73	17.95***	2.55	16.11***	2.89	15.44***	2.7	14.09***	2.88	17.19***
African American	0.13	1.80	0.02	0.27	0.03	0.39	-0.11	-1.32	-0.12	-1.36	0.01	0.17
Native American	0.03	0.48	-0.02	-0.24	0.02	0.25	-0.13	-1.54	-0.1	-1.2	-0.05	-0.74
Male	0.01	0.27	0.06	1.3	0.07	1.25	0.13	2.18*	0.04	0.65	0.03	0.48
Household income (per week)	0.00	-0.48	0.00	1.99*	0.00	2.11*	0.00	1.08	0.00	2.49*	0.00	1.42
English spoken at home	-0.29	-2.10*	0.00	0.00	-0.04	-0.27	0.06	0.35	0.15	0.89	0.29	1.88
Spanish spoken at home	0.05	0.31	-0.04	-0.25	0.08	0.52	0.08	0.42	0.22	1.16	-0.07	-0.36
Married	-0.02	-0.47	-0.04	-0.88	-0.08	-1.91	0.02	0.40	0.03	0.45	0.01	0.26
Unmarried committed relationship	0.14	0.77	0.24	1.44	-0.43	-2.39*	0.46	2.12*	-0.21	-0.96	0.43	2.38*
Difference-in-difference (DD)												
Follow-up period	-0.05	-0.63	0.04	0.39	0.09	1.38	-0.02	-0.23	-0.04	-0.36	0.02	0.18
Assigned to PW intervention group	-0.13	-2.01*	0.11	1.71	-0.19	-3.06**	-0.11	-1.44	-0.16	-1.97*	-0.01	-0.10
DD: intervention by period	0.21	2.43*	-0.02	-0.2	0.16	2.26*	0.12	1.12	0.16	1.45	0.03	0.31
Random effects												
Residual	0.15		0.12		0.09		0.15		0.20		0.15	
Intercept id	0.04		0.05		0.08		0.1		0.08		0.05	

Table 4 continued

	General functioning		Violent behavior		Parenting competence		Parenting efficacy		Familism		Parent-child conflict		Externalizing behavior	
	Est.	t	Est.	t	Est.	t	Est.	t	Est.	t	Est.	t	Est.	t
Covariates														
Intercept	3.11	18.30***	0.54	3.89***	4.29	16.21***	3.90	18.90***	3.60	19.79***	7.55	3.16**	0.34	3.08**
African American	0.03	0.37	-0.05	-0.75	0.26	2.19*	0.14	1.57	0.12	1.42	-2.87	-3.01**	-0.07	-1.41
Native American	-0.08	-1.05	0.03	0.44	0.08	0.68	-0.12	-1.40	0.05	0.64	-2.11	-2.15*	-0.05	-1.08
Male	0.07	1.25	-0.05	-1.06	-0.05	-0.57	-0.04	-0.58	0.01	0.17	0.36	0.48	0.00	0.02
Household income (week)	0.00	1.80	0.00	-2.47*	0.00	2.01*	0.00	-0.92	0.00	0.73	0.00	-1.62	0.00	-2.61**
English spoken at home	-0.01	-0.08	-0.17	-1.37	0.03	0.13	0.04	0.21	-0.31	-1.89	-1.55	-0.71	0.00	0.01
Spanish spoken at home	0.03	0.17	-0.38	-2.91**	-0.03	-0.12	-0.02	-0.09	0.07	0.40	-4.87	-1.88	-0.14	-1.37
Married	-0.01	-0.21	-0.03	-0.84	-0.07	-1.04	0.00	0.01	-0.01	-0.11	0.11	0.18	-0.02	-0.80
Committed relationship	-0.02	-0.11	0.55	3.56***	-0.23	-0.80	-0.42	-1.80	0.20	0.91	5.61	2.28*	0.40	3.11**
Difference-in-difference														
Follow-up period	0.03	0.36	-0.06	-0.88	0.17	1.28	0.06	0.50	0.07	0.76	1.09	1.08	-0.02	-0.36
PW intervention group	-0.09	-1.25	0.23	4.03***	-0.41	-3.87***	-0.42	-4.65***	-0.18	-2.22*	3.86	4.39***	0.21	4.80***
DD: intervention by period	0.06	0.58	-0.18	-2.69**	0.22	1.72	0.39	2.89**	0.12	1.19	-3.61	-3.41***	-0.17	-3.44***
Random effects														
Residual	Est.	0.13	Est.	0.08	Est.	0.29	Est.	0.30	Est.	0.18	Est.	18.99	Est.	0.04

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

behavior, the intervention group was 0.18 points larger. For problem solving, families in the intervention group experienced an improvement of 0.21 points whereas the comparison group experienced a non-significant decrease. Family roles was not significant after the false discovery rate adjustment was applied (see Table 2). The two groups were generally not equivalent at baseline as demonstrated by the marginal effect for the intervention variable, which absorbed the time-invariant confounding effect of these differences on intervention. Roles, affective involvement, problem solving, familism, parenting competence, and parenting efficacy all showed differences, in which the PW group had lower scores; and parent–child conflict and externalizing showed differences at baseline as well, in which the PW group had higher scores. The impact of these differences in confounding the intervention effect was addressed using the Difference-in-Difference regression method, unless these manifested themselves as time-by-intervention effects, which Difference-in-Difference cannot address. However, these variables were included in the regression in order to control for any remaining confoundedness.

A sensitivity test comparing the relative fit of the conditional models with the unconditional models confirmed that most models had improved fit following conditioning. Only communication, roles, and general functioning did not show improvement. A subsequent sensitivity test confirmed that similar conclusions would have been reached without adjusting for correlated errors of the repeated measures design (allowing for minor differences in the coefficient values and the anticipated differences in the standard errors). Further tests indicated that these findings were robust to the selection of covariates.

Mechanisms of Change Analysis Results

Mechanisms of change analysis results indicated that several associations between intervention and mechanism were significant (i.e., parent–child conflict, problem solving, family roles, and parenting self-efficacy). Standardized effect sizes were 0.30, 0.24, 0.19, and 0.30, respectively. With regard to the second stage of the analysis in which we assessed the amount of shared variance between intervention and mechanism, we found that for externalizing behavior, parent–child conflict explained 40%, parenting sense of competence explained 18%, familism explained 14%, problem solving explained 8%, and parenting self-efficacy explained 4% of the total variance. For violent behavior, parent–child conflict explained 23% of the variance. In the third stage, in which we estimated mechanism-to-outcome effects (in addition to treatment-to-mechanism effects already tested), we found significant relationships on all outcomes. Consequently, the following models yielded significant results on all effects: problem solving on externalizing behavior ($b = -0.15$), parenting sense of competence on externalizing behavior ($b = -0.16$), and parenting self-efficacy on externalizing behavior ($b = -0.08$). Overall, these findings provide support for several of the hypothesized mechanisms of change (i.e., problem solving, parenting sense of competence, and parenting self-efficacy). Additional information on the mechanisms of change analysis is available from the corresponding author upon request.

Discussion

Regarding our first research aim (i.e., to assess improvements between pre-test and 6 month follow-up in the intervention groups relative to the comparison group), results indicated some significant improvements in the domains of family functioning, parenting, and adolescent behavior. Relative to parents in the comparison group, parents who participated in PW perceived greater increases in the efficacy of their parenting abilities and greater decreases in their conflicts with their adolescents. Parents participating in the PW program also reported greater improvements in both adolescent violent and externalizing behavior. PW was designed to increase parenting knowledge and competence and to decrease adolescent problem behaviors (Gordon, 2000). The content provided by the PW program specifically addresses positive parenting skills for situations in which adolescents exhibit problem behaviors, such as substance use, conflict, and problems at school, but does not specifically address other dynamics within the family unit.

A mechanisms of change analysis supports the assertion that the changes in parent and child outcomes were attributable to the PW program. Findings suggest that several of the hypothesized mechanisms of change (i.e., problem solving, parenting sense of competence, and parenting self-efficacy) were robust. These findings constitute a significant contribution to the literature by extending previous work (Cefai et al., 2010; Kacir & Gordon, 1999; O'Neill & Woodward, 2002), which has focused mostly on problem behavior and parenting knowledge, to include evidence of decreases in adolescent externalizing behavior and violence, increases in parents' confidence in their ability to effectively parent, and improvements in the family unit's ability to collectively solve problems that arise. The maintenance of these effects 6 months after receiving the PW program is also encouraging. The sustained effects of programs are often of utmost importance to practitioners and agencies interested in providing parenting interventions.

With regard to differences in effectiveness among the five different intervention formats, our findings provide some evidence that the parents-only intensive workshop format was less effective in several outcomes across family functioning, parenting, and adolescent behavior categories. The intensive workshop differed from both the group and online formats. First, the 5-week group formats allowed sufficient time for facilitator-led role plays and interactive activities, whereas time restrictions associated with the workshop format did not allow for these enhancements. Second, both the 5-week group and online formats afforded participating parents the opportunity to practice their newly gained skills at home and then return to process any challenges they encountered. In the 5-week group formats, parents could share their experiences with new parenting strategies with other parents and the facilitator. Those who participated in the online formats also had the opportunity to practice new skills and return to program content. It is possible that these program differences accounted for the relative ineffectiveness of the workshop format. For instance, results of previous research have suggested that programs that require parents to practice new skills during the training session are

more effective than those that do not (Kaminska et al., 2008; Smokowski & Bacallao, 2009).

As there is little empirical evidence to guide practitioner's decisions related to intervention format, our study can provide guidance to agencies that administer parent-training interventions. Many factors affect decisions regarding the format in which an intervention will be delivered, including parent availability and staff workloads. Our study's results suggest that effectiveness does not vary substantially by delivery format, except for the intensive workshop. Thus, agencies can choose to implement PW in facilitated groups or online and with or without adolescents based on the agency's and parent's preferences, without concern that its effectiveness may be compromised.

Limitations

The results of our study should be considered in light of the study's limitations, one of which is external validity. Our results should be generalized to other communities with caution. The parents who participated in this study were members of a low-income, ethnically diverse, rural community in the Southeastern United States.

Selection bias is also a significant limitation. As parents volunteered to participate in the PW program, the sample of PW participants may not be representative of the larger community. For instance, parents who volunteer to participate in a parent training program may be motivated to improve their parenting skills. Further, rather than utilizing random assignment, we assigned parents to the different PW formats based on their preferences and availabilities, which could have resulted in unmeasured differences between formats. Those parent-child relationships of parents who participated with their adolescent may have been different from those who did not participate with them. This self-selection into PW formats introduces the possibility that parents' preferences, rather than intervention format, could have played a role in differences in outcomes.

Given limitations in the study dataset, we were unable to adjust for differences based on nested data (i.e., the potential for differences based on small-group membership). Finally, our study relied solely on parent-reports of adolescent behavior. Future studies would benefit from supplementing parent-reports with adolescent self-reports on their behavior

That said, our study had several strengths. The study design included a 6 month follow-up assessment and inclusion of a no-intervention comparison group. In addition, the mechanisms of change analysis provided further insight into the way in which the PW program impacted family and adolescent behavior outcomes. Finally, we compared the relative effectiveness of the PW program across five delivery formats, which has implications regarding the implementation of parenting programs.

Conclusion

Our study contributes significantly to the PW literature. Between the pre-test and 6 month follow-up, parents who participated in PW reported increases in confidence in their parenting skills and decreases in conflicts with their adolescents, as well as decreases in adolescent externalizing and violent behaviors. The PW program also showed some positive effects on family functioning, another novel finding which contributes to the literature on PW. The program's conceptual model of affecting youth behavior problems by enhancing positive parenting and decreasing negative family dynamics was confirmed by a mechanisms of change analysis. Because Parenting Wisely effectiveness did not vary substantially by delivery format, except for the intensive workshop format, we recommend that practitioners implement the program with adequate time, activities, and interactions with staff to allow for new skills to develop.

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Compliance With Ethical Standards

Conflict of Interest The authors declare they have no conflicts of interest.

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