HHS Public Access

Author manuscript

Child Abuse Negl. Author manuscript; available in PMC 2024 August 11.

Published in final edited form as:

Child Abuse Negl. 2024 August ; 154: 106928. doi:10.1016/j.chiabu.2024.106928.

Evaluation of the Centers for Disease Control and Prevention's Essentials for Parenting Toddlers and Preschoolers on parent behavioral outcomes

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Abstract

Background: The Centers for Disease Control and Prevention's web-based behavioral parent training (BPT) program, Essentials for Parenting Toddlers and Preschoolers (EfP), uses a psychoeducational approach to promote positive parenting and address common parenting challenges. The purpose of this study was to assess the effects of EfP on parenting behavior and whether implementation format impacted behavioral outcomes.

Methods: A sample of 200 parents of 2- to 4-year-old children were recruited via Internet advertising. Using a repeated single subject, multiple baseline design, parents were randomly assigned to guided navigation (GN; $n = 100$) or unguided navigation (UN; $n = 100$) study conditions. Parents were provided secure access to the EfP website and completed 18 weekly

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Disclaimer

The findings and conclusions in this manuscript are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Declaration of competing interest

None to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2024.106928.

surveys. Latent growth curve modeling was used to determine intervention effectiveness on behavioral outcomes.

Results: Latent growth curve modeling indicated both GN and UN study conditions significantly increased use of praise ($\beta = 0.19$, $p = 0.038$) and commands and consequences ($\beta = 0.17$, $p < 0.001$), and decreased corporal punishment use ($\beta = -0.01$, $p = 0.017$) and attitudes promoting corporal punishment ($\beta = -0.01$, $p < 0.001$) over the study period. The UN condition exhibited a significant initial decrease in time-out use that increased over time to match the GN condition.

Conclusions: This study provides evidence for the effectiveness of EfP in promoting non-violent parenting behavior and increasing positive parenting techniques. The format of EfP implementation made no difference in parenting behaviors over time. Digital BPT programs like EfP provide access to evidence-informed parenting resources and can enhance positive parenting.

Keywords

Parents; Caregivers; Toddlers and preschoolers; Evaluation; Digital Behavioral Parent Training

1. Introduction

Child abuse and neglect (CAN) are serious public health problems. CAN involves acts of commission (physical, sexual, and emotional abuse) or omission (neglect) by a parent or caregiver that results in harm, potential for harm, or threat of harm to a child (Leeb et al., 2008). In the United States, at least one in seven children experienced CAN in the past year (Finkelhor et al., 2015). Official reported estimates, which number over 70,000 annually (U.S. Department of Health & Human Services, 2019), are underestimates as many cases of CAN are not reported (Eads, 2013), and millions of children are exposed to CAN that does not meet thresholds for clinical significance, such as harsh criticism or threats (Slep et al., 2011). Nonetheless, there are wide ranging and lasting impacts of clinical and subclinical forms of CAN on child physical and psychological health outcomes including physical illness, neuroendocrine and immune system disruptions, suicide, depression, anxiety and aggression (Angelakis et al., 2020; Gardner et al., 2019; Mills et al., 2013; Norman et al., 2012; Repetti et al., 2002; Taillieu et al., 2016). The total lifetime economic burden associated with CAN was estimated to be $592 billion in 2018 (Klika et al., 2020).

Toddler and preschool aged children are at elevated risk for physical and emotional parent-child aggression, such as the threat and use of physical punishment, verbal intimidation, and withholding affection (Lorber & Slep, 2015; Straus & Field, 2003; Straus & Stewart, 1999). Parental aggression typically occurs in the context of parent-child conflict, which shows a normative increase in the toddler and preschool years and occurs as often as several times per hour (Huang et al., 2007; Klimes-Dougan & Kopp, 1999). This increase in conflict is likely driven by normative increases in externalizing behaviors in this age range (e.g., aggression, defiance, and tantrums) (Hay et al., 2011). Further contributing to parent-child conflict during this period are normative increases in parents' beliefs that their children's behavior is intentional and controllable (Del Vecchio & O'Leary, 2008). Accordingly, behavioral parent training (BPT) programs help navigate this challenging phase of child

development through positive parenting practices and effective discipline techniques have been used for preventing CAN (Fortson et al., 2016).

Digital BPTs may be an effective prevention strategy (Morgan et al., 2023). Multiple benefits are reported for a large number of programs – including the Incredible Years, Parent-Child Interaction Therapy, Triple P, and Helping the Noncompliant Child – that emphasize the use of behavioral parent training skills to promote healthy child development (Fortson et al., 2016; Webster-Stratton & Taylor, 2001). Meta-analyses identified parent training as the treatment of choice for children's externalizing behavior (Kaminski et al., 2008; Michelson et al., 2013). In addition to a well-established track record of improving parenting practices (e.g., increasing praise; reducing harsh discipline), BPT was shown to be effective in preventing the occurrence and recurrence of physical abuse (Chaffin et al., 2011; Oveisi et al., 2010; Prinz et al., 2009). BPT is cited as an evidence-based strategy for CAN prevention in the Centers for Disease Control and Prevention's *Child Abuse and Neglect Prevention Resource for Action* (Fortson et al., 2016); and recent evidence suggests BPTs may also be a cost effective strategy to prevent child abuse and neglect long-term (Sampaio et al., 2024).

Although initially designed for clinical and at-risk populations, broader implementation of BPT programs yielded impressive results, including reducing the prevalence of CAN and child externalizing behavior among populations not considered at-risk for CAN (Oveisi et al., 2010; Sanders et al., 2008). BPT programs typically focus on parent-child relationship enhancement, teaching positive parenting skills, and modification of parenting behaviors (Cotter et al., 2013; Forehand et al., 2014). These programs are effective in a wide variety of delivery methods, including in-person individual and group formats, web-based platforms, and self-directed reading (Sanders et al., 2014; Webster-Stratton & Reid, 2018). Evidence supports BPT's favorable benefit-to-cost ratios, as this prevention strategy can reduce public spending on social and health services (O'Neill et al., 2013).

BPT programs have potentially far-reaching impacts to improve public health. However, many programs are privately owned and offered at considerable expense to public health agencies, communities, practitioners, and clients including parents of toddlers and preschool children. To access evidence-based BPTs, many parents must find a credentialed service provider, become a participant in a research study evaluating the effectiveness of a parenting program, or find and select for themselves an empirically supported parenting book or Internet site. These barriers undermine widespread dissemination. The public health challenge is how to make the content of evidence-based BPTs which largely focus on the same parenting skills and approaches accessible to as many parents as possible.

To address dissemination barriers and to leverage the strength of BPT as a broadly disseminated prevention tool, the U.S. Centers for Disease Control and Prevention (CDC) developed *Essentials for Parenting Toddlers and Preschoolers* (EfP) (Centers for Disease Control and Prevention [CDC], 2023). EfP is a web-based BPT that is free for parents and can be accessed through any device with access to the Internet, including computers, tablets, and Smartphones. EfP includes information on the behavioral parenting skills often taught in

effective BPT programs and uses a psychoeducational approach, including modeling through videos and practice through activities.

The purpose of this study was to evaluate the effectiveness of EfP on positive parenting behavioral outcomes using a single-subject, repeated measures design. EfP was administered using unguided navigation (UN; parents provided open access to all program modules to complete in the order they desired) and guided navigation (GN; parents provided access to only one module at a time in a specific order). The following three research questions were addressed: (1) Are there EfP intervention effects on parent behavioral outcomes overall? (2) Are there differential EfP intervention effects based on implementation condition, UN compared to GN? (3) Are there differences in intervention dosage between UN and GN?

2. Methods

2.1. Participants

The study sample included 200 parents of 2- to 4-year-old children. Inclusion criteria were: (1) parent between the ages of 18 and 45 years; (2) biological, adoptive, or stepparent of at least one child, the oldest of whom was between the ages of 2 and 4 years; (3) Internet access at home; (4) willing to commit to participating in EfP and completing assessments; and (5) ability to speak and read English. Among the 200 parents, 33 (16.5 %) identified as Hispanic/Latino of any race, 119 (59.5 %) identified as non-Hispanic white, 21 (10.5 %) identified as non-Hispanic black, 20 (10 %) identified as mixed race, and 7 (3.5 %) identified as Asian. The median annual family income was $70,000 (inter-quartile range [IQR] = $40,000 to $113,750), and 74.0 % had an undergraduate college degree or more education. The study was granted an exemption by the MASKED Institutional Review Board as it involved program evaluation.

Recruitment was conducted entirely through digital outreach via paid advertising such as Facebook and outreach through parent-oriented blogs and message boards between September and December 2015. All forms of outreach directed traffic to an online recruitment and screening website that contained information about the study and a set of screening questions that, upon completion, informed participants if they were eligible for the study. Eligible parents were offered the opportunity to sign up to be contacted by study staff for enrollment by providing their telephone, email, and mailing address. Eligible parents were provided a toll-free telephone number for the study and informed they could call the study directly to enroll if they wished to do so. Two hundred eligible parents agreeing to participate in the study were selected, prioritizing sufficient representation of target demographics, and randomly assigned to the UN or GN EfP condition. Given EfP was available freely online before the beginning of this study, we utilized a single subject, repeated measures design with participants as their own controls. Remaining eligible parents were waitlisted to receive EfP after completion of the study and were not included as controls in this study.

After completing recruitment screening and a verbal consent procedure, participation lasted 18 weeks for each parent. Four assessments were conducted prior to beginning the intervention (baseline) and four assessments were completed following the 10-week

intervention window (follow-up). Parents completed weekly online assessments throughout the 18 weeks. After completing the fourth assessment, parents gained access to the intervention via GN or UN. Within the GN condition, block randomization was used to assign parents into 10 groups of 10 who began the intervention within a given 1-week window. Within each of the 10 blocks, 5 different sequences of intervention modules were randomly assigned (two parents per sequence) with order determined using a 5 × 5 Latin square (Reese, 1997). The Latin square technique is a way to avoid condition-ordering confounds in repeated-measures designs when administering every possible order is impossible.

The UN condition was self-paced, but participants were encouraged to complete as many activities on the study website as they were interested in within the 10-week study period. All participants were permitted to explore the website content. For the purposes of the study, EfP was delivered to participants via a restricted Internet site that was created specifically for the study. An automated management system provided parents access to their assigned website content and delivered weekly assessments through the website. All study participants received up to $250 as an incentive for completing all assessments within the assigned windows.

In the GN condition, participants were given access to one module at a time for two weeks per module. Mobile device text messaging and email were used to cue GN participants to complete assessments and EfP intervention content. In the UN condition, participants only received assessment reminders. EfP content was identical in both study conditions.

2.2. Intervention

EfP includes the behavior skills training often observed in effective BPT programs and uses a psychoeducational approach, including modeling through videos and practice through activities. EfP incorporates content that covers five topics: (1) communicating with your child; (2) creating structure and rules; (3) giving directions; (4) using consequences; and (5) using time-out. Module content was based on a cognitive-behavioral approach shared in common with several evidence-based BPTs (e.g., Incredible Years (Webster-Stratton et al., 2001) and Triple P (Sanders et al., 2014)). Content on communication focuses on the importance of developing a positive parent-child relationship including the use of praise, imitation, and active listening. Creating structure and rules is presented as a strategy for preventing challenging child behaviors because there are clear expectations, and the roles and responsibilities of family members are clearly defined. Content on giving directions focuses on the importance of directions in setting limits on children’s behavior and letting children know how they are expected to behave. Content on using consequences assists parents in understanding how their behavior affects whether the child repeats or stops behaviors. Information on rewards and praise, ignoring, and removal/delay of privileges are included in this content area. The final content area focuses on time-out as a specific discipline strategy.

2.3. Measures

Measures were administered on varying schedules to balance the needs to precisely measure EfP-related change and minimize assessment burden. Measures were aggregated into four groups that reflect what is assessed and when: (1) core assessment, administered weekly; (2) content knowledge and usefulness assessment (not the focus of this paper); (3) detailed assessment, administered at the beginning and end of the study; and (4) rotating assessment, which administered subsets of measures in the detailed assessment in a rotating fashion as part of a planned missingness design. Screening assessments included demographics such as parental and (target) child age, sex, race and ethnicity, geographical region of residence, household size and income, and ability to access the Internet from home. At the week 1 (baseline) assessment, we administered the remaining demographic questions that were not already asked during the initial screening process including parent marital status and if the parent lives with a partner. Self-administered intervention dose was operationalized as the percentage of EfP modules each participant visited as recorded within the web-based intervention platform.

2.4. Baseline parent and family characteristics

2.4.1. Parenting quality factors—Exploratory factor analyses (EFA) of the 10 parenting behavior variables measured at week 1 were conducted in the Mplus structural equation modeling environment (Muthén & Muthén, 2007). Parenting behavior was measured using 10 variables that focused on positive parenting, child-directed play, praise, time-out use, time-out quality, lax discipline, overreactive discipline, corporal punishment, routines, and commands and consequences. A three-factor model was suggested: *structure* (top indicators: commands and consequences, routines, time-out quality, and lax discipline [negative loading]), *harshness* (top indicators: overreactive discipline, corporal punishment, time-out use, and positive parenting [negative loading]), and *positivity* (top indicators: praise, play, and positive parenting). A cross-loading of positive parenting on the harshness and positivity factors and several significant associations among the factors suggested the possibility of a second-order parenting quality factor. The results of confirmatory factor analyses (CFA), using the three factor scores from the above EFA as indicators of a latent parent quality factor, were consistent with this possibility. The standardized factor loadings were 0.87 (structure), −0.52 (harshness), and 0.50 (positivity). Parenting factor scores from the CFA were saved and used in subsequent analyses.

2.4.2. Parent maladjustment—Parents completed four-item depression (e.g., “I felt depressed.”; Cronbach $\alpha = 0.88$) and anxiety (e.g., “My worries overwhelmed me.”; $\alpha = 0.87$) short forms from the NIH PROMIS version 1.0 item bank (Pilkonis et al., 2011). Parents also completed the four-item Perceived Stress Scale (PSS; e.g., “In the last month, how often have you felt that you were unable to control the important things in your life?”; $\alpha = 0.80$; (Cohen, 1988; Cohen et al., 1983). The PSS is a widely used subjective measure of stress and has been repeatedly validated in several studies and countries (Monroe, 2008). Each measure was scored via item average, each score was standardized, and a mean was calculated across the three z-scores ($\alpha = 0.84$).

2.5. Primary outcomes measured at weeks 1 (baseline) and 18 (post-intervention)

2.5.1. Child externalizing behavior—Parents completed the 36-item Eyberg Child Behavior Inventory (ECBI; (Boggs et al., 1990), a validated measure of externalizing behavior (e.g., "Acts defiant when told to do something.") for children as young as 2 years with demonstrated sensitivity in assessing changes in child behavior during parent training sessions (Schuhmann et al., 1998). For each externalizing behavior, parents were asked to rate its frequency (referred to by the test developers as "intensity") from 1 = *never* to 7 = *always*, and whether they considered the behavior to be a current problem (*yes*/*no*; 1/0); items in the intensity subscale are summed for an overall intensity score, and items in the problem subscale rated as *yes* were summed for an overall problem score. Separate item averages were computed for the intensity and problem ratings; median α*'s* = 0.92 for both subscales. Results are report online supplemental table S3.

2.5.2. Positive parenting—Parents completed the 10-item supportive/engaged subscale (e.g., "I hold or touch my child in an affectionate way.") of the Parent Behavior Inventory (PBI; Lovejoy et al., 1999). PBI supportive/engaged subscale scores are associated with observations of positive parenting and parent-reported measures of child externalizing behavior and demonstrate significant test-retest reliability (Lovejoy et al., 1999). Parents were asked to rate their use of positive parenting practices with responses ranging from 0 = *not at all true (I do not do this)* to 5 = *very true (I often do this)*. An item average was computed; median α = *0*.87. Results are report online supplemental table S3.

2.6. Secondary outcomes measured weekly from weeks 1 through 18

The five EfP modules cover a wide range of parenting skills, and well-validated parenting measures only tap some of the skills targeted by EfP. Considering these measures have too many items to be practical for weekly administration, we assessed five types of parenting behaviors that covered the skills emphasized in each of the EfP modules.

2.6.1. Praise—A three-item praise measure was drawn from Webster-Stratton et al. (2001; e.g., "When my child behaved well or did a good job at something, I praised or complimented her/him."). The measure corresponded to skills emphasized in the Communicating with Your Child module. Answer choices reflected the frequency of each behavior in the past seven days, ranging from 0 = *never* to 5 = *many times each day*. An item average was computed; median α = *0*.77.

2.6.2. Child-directed play—A three-item child-directed play measure was derived from Strayhorn's Parenting Practices Scale (PPS; ((Strayhorn & Weidman, 1988); e.g., "How many days last week did you have a special playtime with just you and your child?"). This measure has not been formally validated; however, it directly taps skills emphasized in the Communicating with Your Child module (e.g., using tracking and verbal labeling during child-directed play). Answer choices reflected the frequency of each behavior in the past seven days, ranging from 0 = *never* to 5 = *many times each day*. An item average was computed; median α = 88.

2.6.3. Commands and consequences—A three-item commands and consequences measure was derived from the PPS ((Strayhorn & Weidman, 1988); e.g., “I used a consequence if my child refused to comply with a command.”) that directly taps skills emphasized in the Giving Directions and Using Discipline and Consequences modules. Answer choices reflected the frequency of each behavior in the past seven days, ranging from 0 = *never (0 % of the time)* to 5 = *always (100 % of the time)*. An item average was computed; median $\alpha = 0.71$.

2.6.4. Routines—A three-item routines measure was derived from the PPS (Strayhorn & Weidman, 1988), a formally validated measure that has demonstrated sensitivity in assessing changes in parenting practices during parent training (McMahon et al., 1999). PPS has three items that tap the regularity of children’s schedules (e.g., “How many days a week does your child go to bed at one particular time, known as his or her official bedtime?”), a behavior emphasized in the Creating Structure and Rules module. Answer choices reflected the number of days per week of each behavior, ranging from 0 = *never* to 5 = *all the time, 7 days a week*. An item average was computed; median $\alpha = 0.52$.

2.6.5. Time-out—Time-out use was measured with a single item (“How many times did you use a time-out with your child in the past 7 days?”), ranging from 0 = *never* to 5 = *many times each day*. Among parents who used time-out in a given week, time-out quality was measured with three items reflecting parental adherence to EfP’s time-out guidelines (e.g., “You avoided talking to, touching, and making eye contact with the child while s/he was in time out.”). Answer choices reflected the frequency of each behavior in the past seven days, rated from *never, 0 % of the time* to *always, 100 % of the time*. An item average was computed for time-out quality; median $\alpha = 0.68$.

2.7. Secondary outcomes measured six times

The following seven measures were administered at weeks 1 and 18, and four additional times on a rotating schedule.[1]

2.7.1. Overreactive and lax discipline—Parents completed the overreactivity (10 items; e.g., “I get so frustrated or angry that my child can see that I’m upset.”) and laxness (11 items; e.g., “When I say my child can’t do something, I let my child do it anyway.”) subscales of the Parenting Scale (PS; (Arnold et al., 1993). The PS is a reliable (Lorber et al., 2014) measure that responds to parenting interventions (Sanders et al., 2000). Response choices range from 1 to 7, with varying anchors per item. An item average was computed for each subscale; median $\alpha = 0.73$ (overreactivity subscale) and 0.80 (laxness subscale).

2.7.2. Corporal punishment—Parents completed the six-item corporal punishment subscale (e.g., “Have you spanked him/her on the bottom with your bare hand?”) of the Parent-Child Conflict Tactics Scale (PC-CTS; (Straus et al., 1998). The PC-CTS corporal

[1]Rotating assessments were administered during weeks 2–17. The measures were grouped together in four blocks of 9 to 11 items as follows: (1) the PS overreactivity and laxness subscales, (2) CTS-PC corporal punishment and Fragile Families Parenting Aggravation subscales, (3) Positive Attitudes toward Corporal Punishment Scale and Parental Sense of Competence Scale efficacy subscale, and (4) the Parent Cognition Scale child responsible subscale. The order of administration was counterbalanced with a 4 × 4 Latin square to ensure an equal number of administrations of each measure block with no order confounding.

punishment scale has established reliability and concurrent and predictive validity (Lorber et al., 2018; Lorber & Slep, 2015; Mahoney et al., 2000). Response choices range from 0 = *never* to 6 = *>20 times*. An item average was computed; α is not reported as this index score does not assume internal consistency (Streiner, 2003).

2.7.3. Parental burden—A key aspect of the parenting stress construct, parental burden (e.g., "I feel trapped by my responsibilities as a parent.") was tapped by four items from the Fragile Families Study Parenting Aggravation scale (Mackenzie et al., 2011). The scale has acceptable internal consistency and stability and predicts physically aggressive parenting (Mackenzie et al., 2011; Wilson et al., 2014). Response choices range from 1 = *strongly disagree* to 4 = *strongly agree*. An item average was computed; median α = *0*.77.

2.7.4. Attitudes promoting corporal punishment—The four-item Attitudes Toward Corporal Punishment Scale (Lorber et al., 2011) taps the extent to which parents believe spanking and slapping are justified and efficacious responses to misbehavior (e.g., "Is it justified for a mother to spank her child on the bottom with a bare hand?"). It is internally consistent and associated with parent-child physical aggression (Lorber et al., 2011; Slep & O'Leary, 2007). Response choices ranged from 1 = *never* to 5 = *almost always*. An item average was computed; median α = 0.91.

2.7.5. Parental self-efficacy—Parents completed the seven-item self-efficacy subscale (e.g., "I honestly believe I have all the skills necessary to be a good parent.") of the Parental Sense of Competence Scale (Johnston & Mash, 1989). The scale has replicable factorial validity, convergent validity with other measures, is associated with parenting style, and parenting interventions (Coleman & Karraker, 2000; Ohan et al., 2000; Sanders et al., 2000). Response options ranged from 1 = *strongly disagree* to 5 = *strongly agree*. An item average was computed; median α = *0*.90.

2.7.6. Dysfunctional child-centered causal attributions—The nine-item child responsible subscale of the Parent Cognition Scale (PCS; (Snarr et al., 2009) reflects parental beliefs that their children's negative behaviors are intentional and done with hostile intent (e.g., "My child tries to get my goat or push my buttons."). The child-responsible subscale has strong test-retest reliability and associations with overreactive parenting (Snarr et al., 2009). Response options ranged from 1 = *never true* to 6 = *always true*. An item average was computed; median α = *0*.86.

2.8. Analytic strategy

Data analysis primarily involved a combination of structural equation modeling (SEM) and multilevel modeling (MLM) using Mplus (Muthén & Muthén, 2007). The robust maximum likelihood estimator (MLR) was used to accommodate nonnormality and missing data. Despite the intensive assessment schedule, we had very little missing data (2.4 % of core measurement weekly data were missing). Baseline group differences were evaluated in a single path model simultaneously regressing 16 variables on EfP condition (UN vs. GN): parenting quality factor score, parental adjustment factor score, burden in the parenting role, attitudes toward corporal punishment, parental self-efficacy, dysfunctional child-centered

causal attributions, ECBI intensity and problem scores, child age (in months) and sex, parent age (in years) and sex, the ratio of household income to household size, the presence of siblings, and parental partnership and marital status. EfP intervention dose was regressed on condition (UN vs. GN) and the baseline parenting quality factor score.

Child externalizing behavior (ECBI intensity and problem scores) and positive parenting outcomes were assessed at weeks 1 and 18 only. To evaluate overall intervention effects, MLMs were estimated, regressing each outcome on time (1 vs. 2) at Level 1. A significant mean effect of time at Level 2 would indicate significant pre-post change. To test condition effects, MLMs were estimated, regressing each outcome on Time at Level 1, Condition (coded 1 = UN; 2 = GN) at Level 2, and the Time × Condition interaction.

The five constructs measured at each of the 18 weekly assessments (i.e., parental use of praise, child-directed play, commands and consequences, routines, and time-out use and quality) were analyzed with the same approach. Latent growth curve (LGC; (Duncan et al., 2006) SEM models were estimated and evaluated by standard fit criteria (Kline, 2016). We first identified the best-fitting unconditional (i.e., predictorless) LGC models for each outcome. A two-part LGC strategy was used: initial values (i.e., intercepts) and change (i.e., slopes) were estimated separately for the 4-week baseline period and the 14-week intervention/follow-up period. Each model included, at minimum, intercept and linear slope (i.e., week-over-week change) factors for each part, as illustrated in online supplement Fig. S1. All intercept loadings were set to 1. Slope loadings were structured to set the intercepts at the beginning of the baseline and intervention/follow-up periods by setting these loadings to 0. We then tested a sequence of models. The baseline model was identical for each model tested, with only an intercept and linear slope. The initial EfP intervention/follow-up model included only intercept and linear slope factors; the next model added a quadratic slope factor; and the final model added a cubic slope factor. Given the use of MLR estimation, the Satorra and Bentler (2001) $\chi 2$ difference test ($\chi 2\Delta$) was used to compare the change in model fit as each additional growth factor was added. The best-fitting model was selected for hypothesis testing.

The overall main effects of EfP intervention were evaluated by comparing the EfP intervention/follow-up vs. baseline linear slopes using model constraints. For each outcome, a pair of LGC models were estimated: one with the two linear slopes freely estimated (as above), and the other with the linear slopes constrained to be equal. The change in fit from the freely estimated vs. constrained models was evaluated with the Satorra-Bentler $\chi 2\Delta$. A significant $\chi 2\Delta$ would indicate a difference in mean linear change during the intervention/follow-up versus baseline periods, respectively (i.e., that the intervention deflected the outcome's existing trajectory). The main effects of group were evaluated by regressing Part 2 slope factors on condition, as well as three controls: the baseline intercept and slope, and the baseline parenting quality factor score.

A slightly different two-part LGC strategy was used to analyze the eight constructs assessed on six rotating occasions including overreactive and lax discipline, corporal punishment, parenting burden, attitudes toward corporal punishment, parental self-efficacy, and dysfunctional child-centered attribution outcomes. Each construct was assessed only

twice in the baseline period; thus, we were unable to model their slope and intercept as latent variables. Instead, we used (a) week 1 scores in place of baseline intercept factors, and (b) directly calculated baseline slope scores (i.e., least-squares linear slope estimates per; (Rogosa et al., 1982)). Additionally, given variable assessment occasions, we used individually varying times of observation for the slope factor loadings. The overall main effect of intervention and the main effect of condition (UN and GN) were modeled as described above.

3. Results

Study participants were adult parents of children aged 2 to 4 years (child age range 24 to 59 months; $M = 39.71$, $SD = 10.24$); 45 % of the children were female (see Table 1). Mean parent age was 32.24 years ($SD = 5.67$) and 54.5 % of parents were female. The UN and GN study conditions differed significantly on one baseline variable (see Table S1 in the online supplement): the parenting quality factor was significantly higher among parents in GN than UN (adjusted $B = 0.19$, SE = 0.086, $p = 0.028$, 95 % confidence interval [CI]: 0.02 to 0.36). All contrasts by study condition adjusted for parenting quality as a covariate.

Significant decreases (i.e., non-zero mean slopes) were observed for ECBI Intensity (adjusted $B = -0.197$, SE = 0.047, $p = 0.001$, 95 % CI: −0.289 to −0.106) and ECBI Problem (adjusted $B = -0.05$, SE = 0.015, $p = 0.001$, 95 % CI: −0.078 to −0.021) scores, measured pre and post intervention (weeks 1 and 18), but there was no significant change in Positive Parenting scores (adjusted $B = 0.043$, SE = 0.028, $p = 0.123$, 95 % CI: −0.012 to 0.097). The main effects of condition on ECBI Intensity (adjusted $B = 0.04$, SE = 0.05, $p = 0.506$, 95 % CI: −0.07 to 0.14), ECBI Problem (adjusted $B = 0.01$, SE = 0.02, $p = 0.615$, 95 % CI: −0.02 to 0.048), and Positive Parenting (adjusted $B = 0.00$, SE = 0.03, $p = 0.993$, 95 % CI: −0.06 to 0.06) slopes were not significant between pre and post intervention. Thus, the main study outcomes did not differ according to intervention delivery format, UN compared to GN. See online supplement Table S3 for the full set of coefficients.

As reported in Table 2, intervention/follow-up linear slopes differed from baseline for Praise ($\chi 2\Delta$ (1) = 4.32, $p = 0.038$) and Commands and Consequences ($\chi 2\Delta$ (1) = 60.84, $p < 0.001$). Praise demonstrated a slight, though nonsignificant, mean decline during the baseline period and then significantly increased during the intervention/follow-up period. Commands and Consequences slightly increased during the baseline period, but then significantly increased during the intervention/follow up period. As indicated by linear slopes in Table 2, corporal punishment and positive attitudes toward corporal punishment use decreased at a faster rate in the baseline period than during the intervention/follow-up period, and observed mean decline was only significant during the baseline phase. Change in parental self-efficacy changed course from a significant mean increase during the baseline period to a significant mean decrease during the intervention/follow-up period (Table 2).

Significant study condition effects were only found for time-out use (Table 3). In contrast to parents assigned to UN, those assigned to GN exhibited a larger initial increase in time-out use at the beginning of the intervention period at week 5 (adjusted $B = 1.58$, SE = 0.66, $p = 0.016$, 95 % CI: 0.30 to 2.86) and then a slower decrease in time-out use thereafter (adjusted

$B = -2.86$, SE = 1.22, $p = 0.019$, 95 % CI: −5.24 to −0.47; see also online supplement Fig. S2). Parents assigned to UN exhibited a decline in time-out use from weeks 6 to 10 and then a gradual increase in time-out use after the end of the intervention period (week 11) that plateaued at week 15, toward the end of the follow-up period.

When cued by text messages in the GN condition, parents accessed an average of 33 % of EfP content. When parents did not receive cues (e.g., UN condition), they accessed an average of 17 % of EfP content. Comparing the percentage of self-administered EfP modules each parent visited and completed on the website by study condition, those receiving GN reported a significantly higher dose of intervention content than parents receiving UN (adjusted $B = 17.09$, SE = 3.77, $p < 0.001$, 95 % CI: 10.89 to 26.80).

4. Discussion

Evidence-based BPT programs have been identified as a promising strategy for the prevention of CAN and harsh parenting (Fortson et al., 2016). Findings from this study provide preliminary evidence on the feasibility and effectiveness of EfP to decrease potentially harmful parenting behaviors (e.g., use of corporal punishment) and increase positive parenting techniques such as use of praise and commands with consequences. Overall, all parents participating in this study reported significant increases from baseline through the intervention/follow-up period on their use of praise to communicate with their child, and their provision of directions and structure to their child through effective commands and consequences. Further, as a result of participating in EfP, parents in both study conditions reported significant reductions in child externalizing behaviors, use of corporal punishment, and positive attitudes toward corporal punishment as a method of discipline. These findings are promising and consistent with other evidence-based BPTs (Webster-Stratton et al., 2001; Webster-Stratton & Reid, 2018).

It is interesting to note that use of corporal punishment and positive attitudes toward use of corporal punishment decreased significantly during the 4-week baseline study period, which may have been due to response bias during the multiple assessments on parenting issues. During the intervention/follow up period there was still a slight decrease that was not statistically significant. It is possible that EfP intervention content provided parents with pertinent information and answers to common questions specific to corporal punishment use that may have resulted in declines beyond the baseline assessments though not statistically significant. Positive attitudes toward corporal punishment decreased more than use of corporal punishment, which may indicate that EfP was less effective in modifying parental behaviors than parental attitudes and beliefs regarding corporal punishment use among toddlers and preschoolers. However, shifting attitudes and beliefs may be a precursor to behavior change (Fleming & Borrego, 2019).

Further, changes in parental self-efficacy, including a significant increase during baseline and significant decrease during the intervention/follow-up period, may have also resulted from response bias. For example, during the baseline period, parents may have felt confident in their parenting skills but as they learned how to build positive relationships with their child, they may have questioned their ability to use the skills covered in EfP. Of importance,

however, is the fact that although parental self-efficacy decreased during the intervention period, ratings of child externalizing behavior problems decreased. Additional research is needed to evaluate whether EfP module content changes parent perceptions and self-reported parenting behaviors.

Next, this study examined whether EfP implementation format, either unguided or guided navigation, produced differential intervention effects. The only outcome impacted by implementation format was use of time-out. Parents receiving no navigation advice or guidance on use of the EfP website content exhibited a significant initial decrease in time-out use relative to those receiving guided navigation, but these differences were not sustained over time. A potential explanation may be that parents in the UN study condition opted to engage with the time-out module before other EfP content, leading to an initial decrease in time-out use while they learned new techniques for time-out use. There were no other significant differences on parental behavior outcomes between the unguided and guided study conditions. These results are informative as the intent of a web-based platform is to allow parents the freedom to select relevant intervention content to meet their needs so they can become a confident parent and enjoy helping their child grow. Parents do not have to be guided through the intervention content for EfP to produce positive behavioral outcomes. However, as anticipated, intervention dosage was significantly greater among parents receiving GN than those receiving UN. Taken together, these findings suggest prescriptive guidance and instruction on how to navigate the EfP website will produce somewhat greater exposure to intervention content, however, such exposure does not enhance parenting outcomes.

The EfP web-based resource addresses challenges associated with broad dissemination of evidence-based BPTs, including barriers of access and cost (Morgan et al., 2023). EfP is an online resource that parents can access free of charge and at their convenience on CDC's website. The online platform minimizes the burden of time, travel, and other requirements typically asked of parents who desire or need access to BPTs. Further, most parents do not seek out support from a professional for problematic behaviors among their toddlers and preschoolers (Rooke et al., 2004). However, many parents do experience stress associated with common parenting challenges and seek readily available resources containing evidence-based strategies to help them navigate such challenges (Centers for Disease Control and Prevention [CDC], 2023; Forehand et al., 2011). EfP provides information to parents on effective communication, creating structure and rules, giving directions, using consequences, and using time-out. EfP also provides advice on common parenting challenges from experts, includes videos and interactive activities so parents can practice their positive parenting skills, and offers tips on common parenting questions (see: https://www.cdc.gov/parents/essentials/toddlersandpreschoolers/index.html). However, best avenues for disseminating information about EfP may also need to be considered.

4.1. Limitations

In the study design (a single subject, repeated measures design), participants served as their own controls (via their baseline period and matching specific changes to the specific content covered in that period). The large number of participants served as replications, affording

the potential for hypothesis testing. Single subject, repeated measures experimental designs are commonly used in implementation science research (Byiers et al., 2012; Miller et al., 2020), and this design allowed for comparisons between the two study conditions (UN vs. GN), which was a primary aim of this study. However, a limitation of a single subject design is that it cannot establish the effectiveness of EfP relative to other digital BPT programs, or no intervention, as there was no true control group included in this study. In addition, single subject designs provide limited support for the conclusions regarding the entire population of interest. At the same time, however, positive findings for some of the outcomes of interest suggest that the invention may be effective, but we cannot be sure for what proportion of the population this holds true or the size of the benefit for the population. There may also be the possibility of response bias due to the study's high number of repeated self-reported measures and the unintended effects of active research participation (MacNeill et al., 2016). Further, parents enrolled in this study accessed limited intervention content under typical conditions. It is possible that greater interaction with the EfP web-based content could have produced additional parent behavioral outcomes. Parent engagement has been identified as a challenge of self-directed BPTs in general (Baker et al., 2017; Piotrowska et al., 2020; Tully et al., 2017). This limitation can be overcome through future research, as no self-directed parenting intervention will improve public health if we cannot sufficiently engage parents in its content.

5. Conclusion

In this evaluation, we found the EfP online resource produced significant short-term effects across time (18 weeks) on positive parenting practices (e.g., parent's use of praise, commands and consequences, and reduced corporal punishment) regardless of guided or unguided navigation. Additionally, parent-reported ECBI scores measuring child externalizing behaviors also significantly decreased for both UN and GN during the intervention period with no significant difference observed between conditions. Thus, EfP has potential to impact downstream effects on the prevention of CAN regardless of whether the resource is presented in a prescriptive format or allows parents and caregivers to navigate the resource's content freely. These evaluation findings should be replicated through additional research using a comparison group, and future research is needed to determine EfP's long-term impacts on positive parenting practices and prevention of CAN. CAN is a serious public health issue that is preventable, and strategies and approach, including behavioral parent training, are available in the Centers for Disease Control and Prevention's *Child Abuse and Neglect Prevention Resource for Action* to create the context for healthy children and families and promote safe, stable, nurturing relationships and environments where every child can thrive (Fortson et al., 2016).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding

This study was supported by research contract "Research on the Efficacy and Feasibility of Essentials for Parenting Toddlers and Preschoolers" awarded to Westat Inc. (contract #200-2014-59973) from the Centers for Disease

Control and Prevention. Data collection and analysis was approved by the Office of Management and Budget (OMB), control number 0920-1086 on 26 October 2015.

Data availability

The authors do not have permission to share data.

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Table 1

Characteristics of participants enrolled in Essentials for Parenting Toddlers and Preschoolers (EfP) evaluation study.

		EfP Study Condition		
Characteristic	**Total (*n* = 200)**	**Unguided Navigation (*n* = 100)**	**Guided Navigation (*n* = 100)**	***p*-value**
Parent age (in years), mean (SD)	32 (6)	32 (6)	32 (5)	0.87
Child age (in months), mean (SD)	40 (10)	39 (10)	40 (10)	0.67
Family income (ratio to poverty threshold), mean (SD)	3.81 (2.72)	3.87 (2.69)	3.75 (2.77)	0.75
Child sex, N (%)				0.39
Male	110 (55.0 %)	52 (52.0 %)	58 (58.0 %)	
Female	90 (45.0 %)	48 (48.0 %)	42 (42.0 %)	
Any other children in family, N (%)				0.32
No	87 (43.5 %)	47 (47.0 %)	40 (40.0 %)	
Yes	113 (56.5 %)	53 (53.0 %)	60 (60.0 %)	
Parent sex, N (%)				0.67
Male	91 (45.5 %)	44 (44.0 %)	47 (47.0 %)	
Female	109 (54.5 %)	56 (56.0 %)	53 (53.0 %)	
Parent marital status, N (%)				0.63
Single, never married	13 (6.5 %)	8 (8.0 %)	5 (5.0 %)	
Married	166 (83.0 %)	80 (80.0 %)	86 (86.0 %)	
Divorced/separated	6 (3.0 %)	4 (4.0 %)	2 (2.0 %)	
Living with a partner	14 (7.0 %)	7 (7.0 %)	7 (7.0 %)	
Registered civil commitment or union	1 (0.5 %)	1 (1.0 %)	0 (0.0 %)	
Parent lives with partner, N (%)				0.23
No	19 (9.5 %)	12 (12.0 %)	7 (7.0 %)	
Yes	181 (90.5 %)	88 (88.0 %)	93 (93.0 %)	

Note: Two sample *t*-test used to compare mean and SD; Pearson's chi-square test used to compare percentages reported in contingency tables. Income expressed as a ratio to poverty such that our mean family income was slightly greater than three times the poverty line.

Table 2

Latent Growth Curve Parameters for Baseline and Intervention/Follow-up Periods: Essentials for Parenting Preschoolers and Toddlers (EfP) Evaluation.

	Baseline (weeks 1 to 4)			EfP Intervention/Follow-up (weeks 5 to 18)			Linear Slope Difference Tests	
		95 % CI			95 % CI			
	M	Low	High	*M*	Low	High	χ^2_Δ (1)	*p*
Praise								
Intercept	3.80	3.71	3.90	3.83	3.72	3.93		
Linear slope	−0.14	−0.42	0.14	0.19	0.02	0.37	4.32	0.038
Quadratic slope				−0.07	−0.20	0.06		
Child-directed play								
Intercept	2.80	2.67	2.92	2.97	2.84	3.09		
Linear slope	0.33	−0.02	0.68	0.45	0.01	0.88	0.17	0.678
Quadratic slope				−0.38	−1.15	0.38		
Cubic slope				0.12	−0.25	0.49		
Commands and consequences								
Intercept	2.28	2.20	2.37	2.77	2.68	2.87		
Linear slope	1.09	0.83	1.34	0.17	0.11	0.23	60.84	<0.001
Routines								
Intercept	3.91	3.80	4.02	3.97	3.86	4.08		
Linear slope	0.23	0.001	0.46	0.26	0.11	0.40	0.05	0.821
Quadratic slope				−0.15	−0.25	−0.05		
Time-out								
Intercept	1.57	1.42	1.72	1.58	1.42	1.74		
Linear slope	−0.32	−0.79	0.16	−0.72	−1.40	−0.05	0.89	0.345
Quadratic slope				1.05	−0.19	2.28		
Cubic slope				−0.49	−1.10	0.13		
Time-out quality								
Intercept	3.29	3.17	3.40	3.42	3.29	3.54		
Linear slope	0.17	−0.21	0.54	0.57	0.30	0.84	12.68	0.123
Quadratic slope				−0.29	−0.46	−0.12		
Overreactive discipline								
Intercept	0.27	0.26	0.29	2.67	2.21	3.12		
Linear slope	−0.01	−0.07	0.04	−0.03	−0.10	0.05	0.37	0.545
Quadratic slope				0.001	−0.002	0.004		
Lax discipline								
Intercept	2.48	2.35	2.61	2.42	2.25	2.59		
Linear slope	−0.05	−0.10	0.000	−0.01	−0.02	−0.01	2.18	0.140
Corporal punishment								
Intercept	0.66	0.56	0.76	0.63	0.51	0.75		
Linear slope	−0.04	−0.07	−0.004	−0.01	−0.01	0.000	5.69	0.017

	Baseline (weeks 1 to 4)			EfP Intervention/Follow-up (weeks 5 to 18)			Linear Slope Difference Tests	
		95 % CI			95 % CI			
	M	**Low**	**High**	***M***	**Low**	**High**	χ^2_Δ **(1)**	***p***
Parental burden								
Intercept	2.37	2.28	2.46	2.31	2.19	2.43		
Linear slope	−0.02	−0.06	0.02	−0.003	−0.01	0.003	0.83	0.363
Positive attitude toward corporal punishment								
Intercept	2.26	2.13	2.39	2.08	1.94	2.22		
Linear slope	−0.07	−0.11	−0.03	−0.01	−0.01	0.001	15.06	0.000
Parental self-efficacy								
Intercept	4.18	4.05	4.31	4.99	4.51	5.47		
Linear slope	0.11	0.06	0.17	−0.10	−0.18	−0.02	10.22	0.001
Quadratic slope				0.004	0.001	0.008		
Child responsible attributions								
Intercept	3.35	3.24	3.46	3.34	3.20	3.47		
Linear slope	0.02	−0.03	0.07	−0.01	−0.02	−0.002	1.50	0.220

Note: M = mean, 95 % CI = 95 % confidence interval, χ^2_Δ is Satorra-Bentler scaled χ^2 (chi-square) difference test; *p*-value based on comparison of model with slopes equated versus fixed.

Table 3

Study Condition (UN vs. GN) Effects on Parent Outcomes Measured Eighteen Times.

				95 % CI	
Construct/dependent variable	***B***	***SE***	***p***	**Low**	**High**
Praise					
Linear slope	−0.02	0.19	0.936	−0.40	0.37
Quadratic slope	−0.09	0.15	0.554	−0.38	0.20
Child-directed play					
Linear slope	−0.04	0.51	0.938	−1.03	0.96
Quadratic slope	0.50	0.88	0.570	−1.23	2.23
Cubic slope	−0.43	0.43	0.320	−1.28	0.42
Commands and consequences use					
Linear slope	−0.06	0.07	0.375	−0.19	0.07
Routines					
Linear slope	−0.13	0.15	0.383	−0.41	0.16
Quadratic slope	0.08	0.10	0.420	−0.12	0.28
Time-out					
Linear slope	1.58	0.66	0.016	0.30	2.86
Quadratic slope	−2.86	1.22	0.019	−5.24	−0.47
Cubic slope	1.30	0.61	0.034	0.10	2.49
Time-out quality					
Linear slope	−0.01	0.38	0.982	−0.75	0.74
Quadratic slope	−0.07	0.25	0.788	−0.56	0.42
Overreactive discipline					
Linear slope	−0.02	0.75	0.984	−1.48	1.45
Quadratic slope	0.03	0.29	0.909	−0.53	0.60
Lax discipline					
Linear slope	0.01	0.01	0.232	−0.01	0.03
Corporal punishment					
Linear slope	0.001	0.06	0.983	−0.12	0.12
Parental burden					
Linear slope	0.01	0.01	0.100	−0.002	0.02
Attitude toward corporal punishment					
Linear slope	−0.01	0.01	0.376	−0.02	0.01
Parental self-efficacy					
Linear slope	−0.67	0.83	0.419	−2.29	0.95
Quadratic slope	0.23	0.32	0.470	−0.40	0.86
Child-centered attributions					
Linear slope	−0.004	0.01	0.589	−0.02	0.01

Note: B = unstandardized coefficient (adjusted for baseline intercepts, slopes, and baseline parenting quality, SE = standard error, CI = confidence interval. Linear, quadratic, and cubic slopes refer to intervention/follow-up period. See Table S2 for full set of coefficients.