Published in final edited form as:

Prev Sci. 2020 November ; 21(8): 1017–1027. doi:10.1007/s11121-020-01142-2.

Effects of Therapeutic Intervention on Parentally Bereaved Children's Emotion Reactivity and Regulation 15 Years Later

Alexander F. Danvers, Ph.D.¹, Brandon G. Scott, Ph.D.², Michelle N. Shiota, Ph.D.³, Jenn-Yun Tein, Ph.D.^{3,4}, Sharlene Wolchik, Ph.D.^{3,4}, Irwin I. Sandler, Ph.D.^{3,4}

¹Department of Psychology, University of Arizona.

²Department of Psychology, Montana State University.

³Department of Psychology, Arizona State University.

⁴REACH Institute, Arizona State University

Abstract

The Family Bereavement Program (FBP) is a family-based intervention for parentally bereaved children and surviving caregivers. Results are reported of a randomized controlled trial, examining intervention effects on emotional reactivity and regulation of young adults who participated in the program 15 years earlier. Participants ($N = 152$) completed four emotion challenge tasks: reactivity to negative images, detached reappraisal while viewing negative images, positive reappraisal while viewing negative images, and re-engagement with positive images. Outcomes included cardiac interbeat interval (IBI), pre-ejection period (PEP), and respiratory sinus arrhythmia (RSA) as well as self-reported emotional experience and regulation effectiveness. Direct intervention effects and effects mediated through improved parenting were estimated. Several significant effects were observed in primary analyses; however none remained significant after correction for familywise Type I error. Parenting mediated FBP effects on IBI during negative reactivity ($b = 15.04$), and on RSA during positive re-engagement ($b = 0.35$); the latter effect was accounted for by changes in breathing. Intervention condition was a direct predictor of self-reported detached reappraisal effectiveness ($b = 1.00$). Intervention and gender interacted in predicting self-reported negative emotion during the negative reactivity ($b = 1.04$) and positive reappraisal tasks ($b = 1.31$) such that men reported more negative emotions during those regulation tasks. Although these findings should be considered preliminary given the limited power of the corrected statistical tests, they suggest long-term effects of family intervention following the death

Terms of use and reuse: academic research for non-commercial purposes, see here for full terms. <http://www.springer.com/gb/open-access/authors-rights/aam-terms-v1>

Correspondence concerning this article should be addressed to Michelle N. Shiota, Department of Psychology, Arizona State University, P.O. Box 871104., Tempe, AZ 85287-1104. iani.shiota@asu.edu.

Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of Arizona State University's Office of Research Integrity and Assurance (IRB approval #1011005778) and with the 1964 Helsinki declaration and its later amendments of comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Publisher's Disclaimer: This Author Accepted Manuscript is a PDF file of a an unedited peer-reviewed manuscript that has been accepted for publication but has not been copyedited or corrected. The official version of record that is published in the journal is kept up to date and so may therefore differ from this version.

of a parent on offspring's emotional reactivity and regulation ability, that should be pursued further in future research.

Keywords

Parental Bereavement; Resilience; Emotion; Emotion Regulation; Coping; Parenting; Cascading Effects

After the death of a parent, both children and their parents/caregivers are at increased risk of developing mental health problems (Jakobsen & Christiansen, 2011; Stroebe, Schut, & Stroebe, 2007; Wilcox et al., 2010). Interventions that target both parents and children following parental bereavement and similar disruptions, such as divorce, can improve outcomes for the whole family (Haine, Sandler, Wolchik, Tein, & Dawson-McClure, 2003; Patterson, DeGarmo, & Forgatch, 2004; Sandler, Wolchik, Ayers, Tein, & Luecken, 2013). These interventions work by strengthening caregiver-child relationships and enhancing skill sets for regulating complex emotions around the disrupting event. Among children, emotion regulation skills can be acquired directly through the intervention, or indirectly, via intervention effects on surviving-caregivers' parenting. Such skills are likely to help parentally bereaved children adjust to the loss in a healthy way, and also to provide the benefits of effective emotion regulation throughout the lifespan (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & John, 2003; Katz & Gottman, 1997). Thus, childhood interventions may have long-term effects on healthy emotional coping.

We present effects of the Family Bereavement Program (FBP; Sandler et al, 2003), a family-centered intervention administered to parentally bereaved children and their caregivers, on the offspring's emotional reactivity and regulation 15 years later. The FBP has been shown to improve mental health outcomes in both children and their caregivers (e.g., Sandler et al., 2003; Sandler et al., 2010; Sandler et al., 2018). In this randomized controlled trial, children were aged 8 to 16 years at the time of intervention, and 23 to 32 years at 15-year follow-up. Reactivity and regulation were assessed using objective physiological measures as well as self-reports of emotional experience during photo-viewing emotion challenge tasks, some with emotion regulation instructions. It was hypothesized that the FBP would improve the profile of young adults' emotional reactivity and regulation, and that this would occur partially through improvements in parenting in the caregivers.

Parental Bereavement and Risk for Psychopathology

Studies have shown that parental bereavement is a risk factor for development of child and adolescent psychopathology. Melhem and colleagues (2008) found a 3-fold increase in risk of depression in bereaved children compared to non-bereaved controls, as well as increased risk of posttraumatic stress disorder. Worden and Silverman (1996) found that parentally bereaved children showed higher levels of anxiety, social withdrawal, and depression than non-bereaved controls, and 21% of bereaved children exhibited serious emotional and behavioral disturbance at two-year follow-up. Another study, which followed bereaved, clinically depressed, and community control children for two years, found that the bereaved group exhibited significantly more symptoms of depression and other disorders than

community controls, but less than the depressed cohort, suggesting sub-clinical levels of psychopathology (Cerel et al., 2006).

The association of childhood parental bereavement with adult psychopathology is less clear, as most studies have relied on retrospective reports from adults with psychiatric disorders, and utilized inadequate controls (for a review, see Dowdney, 2000). However, a few prospective, population-based studies have found child parental bereavement can predict greater risk for receiving depression treatment in adulthood (e.g., Appel et al., 2013; Berg, Rostila, & Hjern, 2016). Negative outcomes of childhood bereavement are often sub-clinical, suggesting that identifying risk and protective factors is a particularly important future direction (Kaplow, Layne, Pynoos, Cohen, & Lieberman, 2012). Emotion regulation ability may be one such factor. Past theory and research (Chorpita & Barlow, 1998; Pynoos, Steinberg, & Piacentini, 1999) suggest that traumatic and uncontrollable events, such as the death of a parent, may initiate a cascading process that begins with increased bias toward negative appraisals and emotions, and progresses to over-reliance on maladaptive emotion regulation strategies (e.g., avoidance, rumination). These strategies can reduce distress in the short term, but have negative long-term implications for mental health and well-being (e.g., anxiety, depression). Thus, enhancement of healthy emotion regulation and coping skills, especially in the first years after parental death, may buffer against psychopathology development and promote resiliency across the lifespan.

Emotion Regulation, Mental Health, and Well-Being

Emotion regulation can be broadly defined as “the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998, p. 275). The ability to regulate one’s emotions in a healthy way can be conceptualized as a resilience factor, due to its influence on an individual’s reactions to stressful or negative experiences (Troy & Mauss, 2011). Individuals may use a variety of strategies to regulate their emotions, and evidence indicates that some strategies have more desirable implications for health and well-being than others. Frequent reliance on some strategies, such as avoiding unpleasant situations, suppressing emotional feelings and expressions, and distraction through alternate activities, is linked to heightened risk for depression, anxiety, and social isolation in both cross-sectional and prospective analyses (e.g., Aldao et al., 2010; Holahan, Moos, Holahan, Brennan, & Schutte, 2005; Kashdan, Barrios, Forsyth, & Steger, 2006).

In contrast, strategies referred to as “cognitive reappraisal” or “reframing” have been linked to a wide range of benefits for mental health and well-being (e.g., Aldao et al., 2010; Gross & John, 2003). Emotions are determined by one’s perception, or appraisal, of an event’s implications for one’s goals and well-being (Moors, Ellsworth, Scherer, & Frijda, 2013). Reappraisal of a stressor’s meaning – to reduce perceived impact on the self, to perceive positive as well as negative implications, and/or to increase one’s sense of control – is thought to promote resilience (Silk et al., 2007). A meta-analysis of 114 studies found that people who reappraised more often had lower scores on depression, anxiety, and substance abuse measures (Aldao et al., 2010). Reappraisal was also linked to higher well-being in a

study of caregivers of individuals with AIDS, both during caregiving and after their loved one died (Folkman & Moskowitz, 2000).

Parenting plays an important role in the development of children's emotion regulation skills (Eisenberg et al., 2005). Specifically, positive parenting, a construct combining warmth and discipline, has been found to influence children's emotion regulation ability (Gottman, Katz, & Hooven, 1996; Ramsden & Hubbard, 2002) and children's externalizing and internalizing problems (Haine, Wolchik, Sandler, Millsap, & Ayers, 2006; Kwok et al., 2005). A parenting technique known as "emotion coaching" that includes acknowledging, accepting, and actively trying to help children cope with their emotions has been well studied (Gottman et al., 1996). Prior research has linked emotion coaching to fewer problem behaviors and internalizing symptoms in children from preschool age to adolescence (e.g., Katz & Windecker-Nelson, 2006; Stocker, Richmond, Rhoades, & Kiang, 2007), and emotion coaching has been found to promote resilience in children whose parents are experiencing marital distress (Katz & Gottman, 1997).

The Family Bereavement Program

The FBP is a 12-week program for parentally bereaved children and their caregivers (see Sandler et al., 2003; Sandler et al., 2013 for a full description). Components of the program directed toward caregivers aim to improve parenting skills, reduce depression and grief, and help shield children from further stressful events linked to the bereavement. Activities teach parents to express warmth and use praise; to listen actively to their children and express understanding of feelings in conversations about emotion-eliciting situations; to communicate consistent, clear, age-appropriate expectations for behavior; and to plan positive interaction with the child. Thus, the caregiver intervention included elements promoting emotion coaching ability as well as general parenting skill. The child/adolescent components aimed to improve coping skills and beliefs in realistic control; to reduce negative stress appraisals; to reduce the inhibition of emotional expression; and to improve family relationships. Children were taught to be aware of and able to change "hurtful" versus "hopeful" thoughts, and to identify events that are not under their control. In this way, these lessons were promoted reappraisal as a regulation strategy.

The age range of the sample (8–16 years) ensured that assessment materials were developmentally appropriate; separate group sessions were run for children aged 8–11 versus 13–16, with 12-year-olds randomly assigned to age group. Children were recruited in families, so that multiple children in a single family could participate; all statistical analyses are adjusted for this fact. Among participating families were 91 with one child enrolled, 45 with two children, 17 with three children, and 3 with four. Caregivers attended an average of 86% of the 12 2-hour sessions, and children attended 88% of sessions (Sandler et al., 2003). Previously published analyses revealed FBP effects on regulation mechanisms such as control beliefs, appraisals, and reduced inhibition of emotional expression, as well as on internalizing and externalizing problems (Hagan et al., 2012; Sandler et al., 2013). The FBP also improved positive parenting and parent outcomes; these effects continued through six-year follow-up, and were related to improved child outcomes (e.g., Luecken et al., 2014; Sandler et al., 2016; Tein et al., 2006).

The Current Study

In the present study we examine effects of the FBP program on emotional functioning 15 years after program participation, when the offspring were young adults. Parent-child relationships impact psychological adjustment through adolescence and emerging adulthood, suggesting that successful interventions should continue to have effects even at the end of this emerging adulthood phase (e.g. around or after age 25; Arnett, 2000; Hair, Moore, Garrett, Ling, & Cleveland, 2008; Reitman & Asseff, 2010). During the 15-year assessment participants completed four emotion challenge tasks: (1) viewing negative images and allowing feelings to occur; (2) viewing a second set of negative images with instruction to use detached reappraisal; (3) viewing a third set of negative images with instruction to use positive reappraisal; and (4) viewing positive images with instructions to allow feelings to occur (positive re-engagement task). In addition to subjective emotional experience, dependent variables included cardiovascular measures associated with emotion reactivity and regulation. Self-reported reappraisal effectiveness was also assessed after instructed reappraisal trials.

Our primary hypothesis was that the FBP intervention would lead to improved emotion regulation skill in young adulthood, indicated by greater reduction in distress-related emotional responding from the negative reactivity task to the two instructed reappraisal tasks, as well as greater increase during reappraisal in respiratory sinus arrhythmia, which has been linked to effortful emotion regulation (Beauchaine, 2015). Competing hypotheses about FBP effects on emotional reactivity are plausible. Participation in the FBP program might have led to overall reduction in negative emotion reactivity, while encouraging positive emotion. Alternatively, FBP participation might have fostered greater tolerance for moderate distress, rather than a tendency toward avoidance. If FBP program participation promoted greater acceptance of feelings, this would lead to heightened emotional responding in both the negative and positive reactivity tasks, in which participants were explicitly instructed to allow feelings to occur.

A second hypothesis is that effects of the FBP on emotion outcomes at 15 years would be mediated by earlier effects on parenting. The FBP was designed to promote youths' resilience by influencing both individual-level processes and family context. The current study focuses on the positive parenting mediating pathway because positive parenting was a significant prospective mediator of program effects on child mental health problems at earlier wave (Tein et al., 2016). These findings from the FBP are consistent with other evidence that improving parenting can reduce later mental health problems in children and parents alike (Barlow, Smailagic, Huband, Roloff, & Bennett, 2012), suggesting the importance of parenting as a possible mechanism of FBP program effects on offspring emotion regulation outcomes. The present analyses estimated a cascading model in which FBP effects on 15-year emotion task outcomes could either be mediated by program effects on positive parenting, significant at the 6-year follow-up, or occur independent of parenting effects. The hypothesized model is illustrated in Figure 1.

Methods

Participants

Participants were young adults who had participated in the FBP intervention 15 years earlier. The original study enrolled 244 children and adolescents aged 8–16 years, predominately (67%) non-Hispanic Caucasian, from 156 families (see Sandler et al., 2003 for full details). At 15-year follow-up assessment, 168 participants completed at least part of a two-day in-person interview. Of these, 14 either refused the emotion challenge tasks; did only the first day of the assessment, and thus missed the tasks; or were interviewed in an environment non-conducive to the tasks (e.g., a hotel lobby). Thus, 152 young adults aged 23–32 years did the tasks reported here, including 86 in the FBP intervention condition (41 female; mean age = 26.74 years) and 66 in the control condition (35 female; mean age = 26.61 years). Usable physiological data could not be collected from 26 participants due to sensor allergy, cardiac arrhythmia, late-stage pregnancy, computer problems, or experimenter error. Thus, 126 young adults provided usable physiological data. Participants included in the 15-year follow-up did not differ significantly from those who could not be included in terms of proportion in the treatment group (included: 58% treatment, excluded: 53% treatment; $\chi^2(1) = 0.48, p = .490$), gender composition (included: 46% female, excluded: 57% female; $\chi^2(1) = 1.46, p = .228$), age (included M: 26.7, excluded M: 26.7; $t(110.84) = 0.15, p = .878$), or 6-year Positive Parenting (included M: 0.21, excluded M: 0.15; $t(190.03) = -0.66, p = .510$). A consort diagram for the follow-up is given in Figure S1 in the online supplemental materials.

The sample provides 80% power to detect effects equivalent to $r = .22$ in the self-report outcomes, and $r = .24$ in the physiological outcomes, prior to correction for multiple tests. These effect sizes fall in the medium range, balancing theoretical and practical significance. Stringent False Discovery Rate (FDR) correction for multiple testing raises these effect sizes to $r = .32$ for self-report and $r = .35$ for physiological outcomes; the $N = 152$ sample provides 21% power to detect effects of $r = .20$. Because this unique sample was limited by attrition, we report uncorrected tests in the results, while noting clearly that no reported effects survive FDR correction. The value of these findings, despite their limitations, is addressed in the discussion.

Procedure

In-person 15-year follow-up assessment interviews were typically carried out over two consecutive days at the location of the participant's choice, typically their home. The emotion challenge tasks took place toward the end of the second day, following questionnaire batteries and diagnostic interview (the CIDI) administered during the first and second day. After attachment of physiology sensors, participants completed four emotion challenge tasks. In each task participants viewed a set of 18 photographs from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997) on a laptop computer screen. Each photo set lasted three minutes and was preceded by a one-minute baseline with an "X" on the computer screen. Participants were asked to try to clear their minds of thoughts, feelings, and memories while the X was on the screen, and to relax. Physiological measures were collected continuously throughout each photo-viewing task.

and the associated baseline. Photos used in the first three tasks were all of moderate-to-strong negative valence, with normative valence ratings in prior research from 1.6 to 3.8 on a scale from 1 (negative) to 9 (positive), in which 5 is neutral. The content of photos was matched across the three sets; for example, each set included a unique picture of a snake, a unique picture of war, an image evoking bereavement, and so forth.

Instructions for these three sets always occurred in the same order. The first photo set (“Just Watch”) was preceded by the instruction “This time, while you are looking at the photographs, please allow yourself to feel any emotions they might elicit. Be aware of your feelings, but do not try to alter or change them.” The second photo set (“Detached Reappraisal”) was preceded by the instruction “please try to adopt a detached and unemotional attitude. As you look at the photographs, please try to think about what you are seeing objectively. Please try to think about what you are seeing in such a way that you feel less negative emotion.” The third photo set (“Positive Reappraisal”) was preceded by the instruction “this time, while you are looking at the photographs, please try to adopt a positive attitude. As you look at the photographs, try to think about positive aspects of what you are seeing. Please try to think about what you are seeing in such a way that you feel less negative emotion.” In the final task (“Positive Reengagement”), participants viewed a series of pleasant photos from the IAPS set, including images of appetizing foods, pleasant social images, exciting sports activities, and other recreational activities. At the end of each photo-viewing task, participants were asked to rate their emotional experience while viewing the photos, using a laptop computer running Blaise questionnaire-administration software. After the two reappraisal tasks, participants were also asked to rate their effectiveness at using the instructed strategy.

Measures

Positive Parenting—Positive Parenting, carried forward to the 6-year follow-up assessment, was examined as a possible mechanism of FBP effects on participants’ emotion regulation outcomes at 15-year follow-up. Positive parenting has been operationalized in prior work using multiple indices of warmth, acceptance, and effective discipline (Kwok et al., 2005; Hagan et al., 2012). A Positive Parenting composite was formed from several measures administered to child and caregiver participants; the measurement model had adequate fit ($CFI = .93$; $RMSEA = .062$, $SRMR = .063$). A complete description of this composite including psychometric properties can be found in a report by Kwok and colleagues (2005).

Physiological measures—Physiological measures were assessed continuously throughout the emotion challenge tasks as objective indices of reactivity and regulation. For all measures, averages were calculated for the last 30 seconds of the baseline (participants are typically recovering from the arousal of talking with the experimenter during the first 30 seconds) as well as one-minute epochs of the 3-minute photo-viewing period, subsequently combined into a single trial average. For each measure in each task, trial averages were regressed onto the corresponding baseline averages, and the residuals saved to produce standardized baseline-to-trial change scores, used in all subsequent analyses. Additional

detail regarding the physiological measures (e.g., sensor placement, data processing) is available in supplementary materials.

Cardiac Interbeat Interval (IBI) is the average number of milliseconds between heartbeats. Like heart rate (of which IBI is the inverse), cardiac IBI is modulated by both sympathetic and parasympathetic nervous system influences on the heart. In emotion research, shorter IBI is commonly used as an overall index of emotional engagement with stimuli, as the heart tends to speed up during most strong positive and negative emotions (Kreibig, 2010).

Cardiac Pre-Ejection Period (PEP) is the time in milliseconds from ventricular contraction onset to opening of the aortic valve, allowing blood to exit the heart. Shorter PEP indicates greater influence of the sympathetic nervous system on the heart. While commonly referred to as a “fight-flight” response, heightened sympathetic activation can also indicate activated positive engagement in response to pleasant/positive stimuli (Kreibig, 2010).

Respiratory Sinus Arrhythmia (RSA) is a measure of the fluctuation in heart rate associated with breathing, and serves as an index of parasympathetic nervous system influence on the heart. Prior research has linked higher resting RSA to individual differences in emotion regulation ability (Beauchaine, 2015), and observed baseline-to-trial increase in RSA during instructed reappraisal tasks in particular (Butler et al., 2006; Denson, Grisham, & Moulds, 2011). Beauchaine (2015) has argued that RSA may serve as a peripheral marker of effortful cognitive reappraisal. There is debate in the literature regarding the circumstances in which analyses of RSA should (Grossman & Taylor, 2007) or should not (Porges, 2007) control for aspects of respiration that often covary with RSA. We present all RSA analyses both with and without correction for corresponding changes in respiration rate (derived from the impedance signal used to calculate cardiac PEP), and consider implications of any differences in the discussion section.

Reliability of these measures was high, with correlations between the Just Watch and Detached Reappraisal baselines at $r = .935$ for IBI, $r = .931$ for PEP, and $r = .768$ for RSA.

Self-report measures—At the end of each task, participants rated their subjective experience of emotions while viewing the preceding photo set, on a laptop computer running Blaise software. Measures were closely adapted from those used in previously published studies of emotion regulation with similar tasks (e.g., Shiota & Levenson, 2009), and included valence (0 = very negative, 8 = very positive) and intensity (0 = no emotion at all, 8 = strongest emotion ever felt), as well as how much they felt each of several specific emotions (0 = none; 8 = most intense experience ever): amusement/humor, anger, serenity/contentment, love/compassion, disgust, enthusiasm/excitement, fear-anxiety, curiosity/interest, and sadness. Exploratory factor analyses (EFA) indicated the nine specific emotion items could best be represented by two factors - positive and negative emotion - so these sets of items were averaged and used as the primary measures of subjective emotional experience. The RMSE of the residuals for the EFA models were between 0.03 and 0.04. The reliabilities of these composite scales were acceptable: for positive emotions, they ranged between $\alpha = 0.62$ – 0.77 across emotion regulation conditions; for negative emotions, they ranged between $\alpha = 0.60$ – 0.77 across emotion regulation conditions. At the end of each

reappraisal task, participants were also asked to rate their own effectiveness at using the instructed strategy to control their thoughts during the last set of photos. Ratings were made on a Likert scale ranging from 0 (not at all effective) to 4 (very effective).

Analyses

All results presented here are estimates from cascading models of FBP intervention effects on 6-year positive parenting and 15-year emotion outcomes, using Mplus 7.0. Cascading models examine the extent to which intervention effects are carried forward from each wave of assessment to the next. Estimates of the effects of the intervention on positive parenting, and estimates of the stability of positive parenting through subsequent time points, were the same in all models, and have already been reported in earlier research (Luecken et al., 2014). We therefore present only the final step of the cascading model: the way that the treatment influenced each outcome, both directly and indirectly via positive parenting, with each pathway adjusted for the other. Full output, including coefficients for the first part of the cascade, is available in the Supplementary Materials. Age, gender, and the interactions of age and gender with intervention group were included in all models. Gender was dummy coded (female = 0; male = 1). The intraclass correlation (ICC) for Positive Parenting was high among siblings (0.55 – 0.72); analyses used the “complex” option to account for this family-level similarity. Missing variable data were handled by using the MLR estimator, which can provide better estimates of effects and standard errors than listwise deletion in cases where data are non-normally distributed and there are missing values (Muthén & Asparouhov, 2002).

Separate models were run to examine each outcome measure in each of the four tasks. Outcomes included: the self-report positive and negative emotion composites and regulation effectiveness; and cardiac IBI, PEP, and RSA. Tasks included: Just Watch reactivity; Detached Reappraisal; Positive Reappraisal; and Positive Re-engagement. In modeling physiological outcomes in reappraisal tasks, the corresponding baseline-to-trial residuals from the Just Watch task were included as covariates to isolate effects of effortful reappraisal. We conducted a full suite of analyses to comprehensively address the influence of the FBP intervention on emotion reactivity and regulation in these unique data. Using six outcome measures and four tasks means that we included 24 models. No adjustments to alpha levels were made in the analyses reported below; however, p-values after correction for False Discovery Rate (FDR) are included in Supplementary Materials. None of the reported effects remain significant after false discovery rate (FDR) correction for multiple testing – an issue we address in the Discussion.

These cascading models inherently address a mediation hypothesis: that the FBP increased positive parenting during childhood and adolescence, and the parenting effects carried forward to influence emotional reactivity and regulation in young adulthood.¹ Because the

¹Based upon a reviewer comment, we also ran exploratory models allowing the possibility of moderated mediation, i.e., whether the effect of the mediating variable on the DV differs across experimental conditions. Two significant Condition x Positive Parenting interactions were observed: (1) the Parenting → Perceived Positive Reappraisal Effectiveness effect was stronger in the FBP treatment condition, and (2) the Parenting → Positive Reengagement RSA effect was stronger in the Control condition. In the former analysis, the main effect of Positive Parenting → greater Positive Reappraisal Effectiveness also reaches significance. See Supplemental Materials for detailed results.

adjustments to standard errors required to address dependencies between children from the same family precluded a bootstrapping approach, we used joint significance – the significance of both the IV-mediator and mediator-outcome paths in the overall model – as the test of mediation. The joint significance test has been shown to be comparable to bootstrapping methods in power and controlling for Type I error in three-path mediation models (Taylor, MacKinnon, & Tein, 2008).

Results

As in previously published results from this sample, effects of the FBP on post-intervention Positive Parenting, as well as the effects of Parenting from each assessment wave to the next, were significant in all models. Thus, we do not present cascading FBP intervention effects on Positive Parenting here, but instead address the extent to which Positive Parenting at the preceding time point (6-year follow-up) predicts emotion reactivity and regulation outcomes in young adulthood. A significant effect of 6-year Positive Parenting on a 15-year emotion outcome provides evidence for statistical mediation of FBP condition effects via Positive Parenting. Tables with complete results for all models are available in Supplementary Materials.

“Just Watch” Negative Reactivity Task

Self-reported negative emotion—Neither the main effect of Intervention Condition, nor the effect of 6-year Positive Parenting, were significant. However, Intervention Condition interacted significantly with Gender ($b = 1.24$, $Z = 2.39$, $p = .017$). The effect of the intervention among women was not significant ($b = -0.21$, $Z = -0.598$, $p = .550$), while among men negative emotion was higher in the intervention condition ($b = 1.04$, $Z = 2.432$, $p = .015$). The main effect of Gender was also significant ($b = -1.83$, $Z = -4.94$, $p < .001$), with women reporting more negative emotion than men. No other main effects or interactions were significant.

Self-reported positive emotion—No main effects or interactions were significant.

Cardiac IBI—Positive Parenting had a significant effect on baseline-to-trial changes in Cardiac IBI ($b = 15.04$, $Z = 2.57$, $p = .010$); the more Positive Parenting a participant experienced 6 years post-intervention, the lower that participant's heart rate was while viewing negative images after controlling for baseline values (longer IBI values indicate lower heart rate).

Cardiac PEP and RSA—No main effects or interactions were significant.

Detached Reappraisal Task

Detached reappraisal effectiveness—Controlling for Positive Parenting, the main effect of Intervention Condition was significant ($b = 1.00$, $Z = 2.29$, $p = .022$); individuals who had received the FBP reported greater effectiveness at implementing detached reappraisal than did those in the control group. There was also a significant main effect of Gender ($b = 1.01$, $Z = 1.98$, $p = .048$), such that men reported higher detached reappraisal

effectiveness than did women overall. Positive Parenting did not have a significant effect on detached reappraisal effectiveness.

Self-reported negative emotion—Neither the main effect of Intervention Condition, the main effect of Positive Parenting, nor the interactions of Intervention Condition with Gender or Age, were significant. There was a significant main effect of Gender ($b = -1.38$, $Z = -3.70$, $p < .001$); women reported more negative emotion during Detached Reappraisal than did men.

Self-reported positive emotion—No main effects or interactions were significant.

Cardiac IBI, Cardiac PEP, and RSA—No main effects or interactions were significant.

Positive Reappraisal Task

Positive reappraisal effectiveness—No main effects or interactions were significant.

Self-reported negative emotion—The effect of Positive Parenting was not significant. However, the interaction of Intervention Condition with Gender was significant ($b = 1.31$, $Z = 2.63$, $p = .009$). The effect of intervention among women was not significant ($b = -0.52$, $Z = -1.480$, $p = .139$), whereas men in the intervention condition reported significantly greater negative emotion than did controls ($b = 0.80$, $Z = 2.38$, $p = .017$). The main effect of Gender was also significant ($b = -1.41$, $Z = 3.99$, $p < .001$), such that women reported more negative emotion during the positive reappraisal task than did men.

Self-reported positive emotion—No main effects or interactions were significant.

Cardiac IBI, Cardiac PEP, and RSA—No main effects or interactions were significant.

Positive Re-engagement Task

Self-reported negative emotion—Neither the main effect of Intervention Condition, nor that of Positive Parenting, was significant. Age had a significant main effect ($b = -0.07$, $Z = -2.13$, $p = .033$), such that older participants reported less negative emotion during this task.

Self-reported positive emotion—Neither the main effect of Intervention Condition, nor the effect of Positive Parenting, was significant. Women reported more positive emotion overall in this task ($b = -1.03$, $Z = -2.61$, $p = .009$).

Cardiac IBI—No main effects or interactions were significant.

Cardiac PEP—Neither the main effect of Intervention Condition, nor the effect of Positive Parenting, was significant. However, there was a significant interaction between Intervention Condition and Age ($b = -0.45$, $Z = -1.99$, $p = .046$). The intervention was associated with less intense sympathetically-mediated cardiac responses to positive images, compared to control, among children who received it earlier in life.

RSA—The effect of Positive Parenting was significant ($b = 0.35$, $Z = 2.27$, $p = .024$), such that those receiving more positive parenting at the 6-year follow-up assessment showed greater increases in RSA while viewing the positive re-engagement photos. The effect did not remain significant after controlling for the corresponding changes in respiration rate, suggesting that it may be at least partly accounted for by breathing patterns.

Discussion

The present study examined effects of participation in a program for parentally bereaved children on emotion reactivity and regulation in young adulthood, 15 years after the intervention. These data are, to our knowledge, unique. No other randomized controlled trial of therapy for parentally bereaved children has been presented in the literature; the present findings represent the only long-term follow-up of this population that assesses intervention impact on emotion regulation skills in adulthood. Moreover, emotional regulation skills were assessed using gold-standard emotion challenge tasks and physiological as well as self-report measures of emotional responding during these tasks. The size of observed effects was modest, and when corrected for multiple testing, none of these results are significant at the $p < .05$ level – an issue addressed in further detail below. As a result, these findings should be considered tentative rather than definitive. We consider here the full set of results, however, with an emphasis on patterns of findings that highlight processes to examine in future research.

Our central hypothesis was that participation in the FBP would lead to improved effortful emotion regulation skills, mediated by program effects on positive parenting. We did not observe strong support for this hypothesis, at least not during tasks involving reappraisal instruction. In a main effect, participants in the treatment condition reported greater perceived effectiveness of detached reappraisal than controls. We did not, however, see signs of this in physiological responding or emotional experience during these tasks. We also had competing hypotheses regarding FBP program effects on reactivity to emotional photo stimuli: it might reduce negative and increase positive emotional reactivity via automatic, uninstructed emotion regulation skills; or it might increase tolerance for moderate-situation appropriate emotional responding regardless of valence. We observed some evidence supporting each of these, with one effect mediated by positive parenting and the other reflecting direct effects of the FBP treatment.

Two observed effects of positive parenting support the “uninstructed regulation” hypothesis: positive parenting was found to predict lower heart rate reactivity during the “just watch” negative stimulus task; as well as increased RSA during the positive re-engagement task. Joint significance of pathways from FBP intervention to 6-year parenting, and from 6-year parenting to these outcomes, indicates parenting-mediated effects. The first of these effects suggests a less-intense distress response during the “just watch” task, and heightened calm attention to the stimuli. Increases in positive parenting are a plausible mechanism of this effect (Gottman et al., 1996; Ramsden & Hubbard, 2002). Prior research has linked RSA to effortful emotion regulation (Beauchaine, 2015). Given that Positive Reengagement took place after three tasks with unpleasant stimuli, heightened RSA may indicate heightened ability to disengage attention and affect from the preceding tasks, and focus on the more

enjoyable new situation. The RSA effect was eliminated after controlling for corresponding changes in respiration rate. There is controversy in the literature about whether and when to control versus not control for breathing in assessing RSA reactivity (for detail see Porges, 2007). However, a plausible interpretation of the present finding is that intentional or automatic changes in breathing accompanied participants' regulatory response to relief from the unpleasant tasks – a literal “whew” that had measurable consequences for parasympathetic influence on the heart.

In contrast, direct, unmediated effects of FBP were consistent with the “heightened distress tolerance” prediction, particularly among males. Men in the treatment group reported higher levels of negative emotion in both the just watch and positive reappraisal tasks, relative to controls. In main effects of gender, women overall reported higher levels of negative emotion during these tasks than did men. Much prior research suggests that men are more likely than women to suppress reporting and/or expressing sadness and fear (e.g., Fischer, Rodriguez Mosquera, van Vianen, & Manstead, 2004), emotions pulled by our stimuli. This suggests that men who had received the FBP intervention were more allowing of, in touch with, and/or willing to report situation-appropriate levels of emotional distress – an aim of the FBP intervention.

Strong existing evidence links more frequent use of cognitive reappraisal, measured via self-report questionnaires, with better psychological well-being, particularly reduced risk of internalizing disorders (Aldao et al., 2010; Compas et al., 2017).² A few studies have observed associations of RSA reactivity during stress challenge tasks with disorder symptoms, although these findings have been less consistent, and it's not yet clear what profile of resting and challenge-evoked RSA best reflects psychological health (Aldao, Gee, De Los Reyes, & Seager, 2016). Additional work is needed to understand how the FBP and similar programs impact not only emotion regulation ability under pressure, but also psychological health broadly speaking.

Strengths and Limitations

The present study has a number of important strengths. The 15-year assessment is a distinctive example of the use of real-time challenge tasks in evaluating long-term intervention effects on emotional processes, rather than relying exclusively on self-report trait measures. Dependent variables included three measures of physiological reactivity to the challenge tasks, which allowed us to distinguish to some extent between emotional intensity (subjective negative affect, cardiac IBI, cardiac PEP) and regulation processes (subjective reappraisal effectiveness, RSA). This distinction proved important, as each showed effects of participation in the FBP but in different directions and by different paths (i.e., direct vs. parenting-mediated).

The study also has important limitations. Analyses addressed six effects in four tasks, and none of our results remained significant after correcting for the number of models tested. We

²Exploratory analyses in these data, requested by a reviewer, revealed only positive correlations of baseline negative affect with internalizing ($r = .27, p < .01$) and externalizing symptoms ($r = .29, p < .01$); a negative association of positive change in RSA during detached reappraisal with internalizing symptoms ($r = .21, p < .05$); and an association of PEP shortening during positive reengagement with externalizing symptoms ($r = -.21, p < .05$).

think it important to disseminate these results, both to help inform future research on mechanisms by which family-based psychosocial interventions in childhood/adolescence may affect emotion in adulthood, and because effect sizes from individual studies become part of the larger body of work that should be examined for drawing lasting conclusions (e.g., via meta-analysis; Ioannidis, 2005). Individual differences in emotion are highly multi-determined, and after 15 years effect sizes associated with FBP were likely to be modest. Our final sample was small due to attrition, especially for analyses involving physiological variables, compromising statistical power. Given these concerns, we consider it important to balance risks of Type I and Type II error by reporting both uncorrected and corrected significance tests. The present results provide valuable insight into potential long-term effects of the FBP on emotion regulation skills, and suggest target mechanisms to emphasize in future research on the long-term effects of preventative interventions on emotional regulation. However, they should be interpreted cautiously and as needing confirmation in other samples before being treated as definitive.

Conclusion

The present study offers preliminary support for effects of the FBP on responses to an emotional challenge task 15 years later, when participants were young adults. Although these effects should be considered tentative, they represent the first available data on long-term effects of family bereavement intervention on real-time, evoked emotional reactivity and instructed emotion regulation. Observed direct effects of the intervention suggest increased confidence in detached reappraisal ability (though effects were not seen in objective measures of reappraisal performance), as well as heightened tolerance for or reporting of situationally appropriate distress among men. In contrast, effects of the intervention mediated through improvements in parenting suggest increases in automatic, uninstructed regulation. Overall, these results suggest that early therapeutic interventions to prevent the development of children's psychological problems after a traumatic experience may have lasting effects on emotion in adulthood.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported by a grant from the National Institute of Mental Health (NIH-NIMH; 3R01MH49155; [Clinicaltrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01008189) identifier: NCT01008189). The authors have no conflicts of interest to declare.

Much appreciation is extended to Dr. James Gross, who provided consultation on emotion regulation assessment, and to the anonymous reviewers of this manuscript.

References

- Aldao A, Gee DG, De Los Reyes A, & Seager I (2016). Emotion regulation as a transdiagnostic factor in the development of internalizing and externalizing psychopathology: Current and future directions. *Development and Psychopathology*, 28, 927–946. [PubMed: 27739387]

- Aldao A, Nolen-Hoeksema S, & Schweizer S (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30(2), 217–237. [PubMed: 20015584]
- Appel CW, Johansen C, Deltour I, Frederiksen K, Hjalgrim H, Dalton SO, ... Rix BA (2013). Early parental death and risk of hospitalization for affective disorder in adulthood. *Epidemiology*, 24(4), 608–615. [PubMed: 23676260]
- Barlow J, Smailagic N, Huband N, Roloff V, & Bennett C (2012). Group-based parent training programmes for improving parental psychosocial health. *Cochrane Database of Systematic Reviews*, 6(10.1002), 14651858.
- Beauchaine TP (2015). Respiratory sinus arrhythmia: A transdiagnostic biomarker of emotion dysregulation and psychopathology. *Current Opinion in Psychology*, 3, 43–47. [PubMed: 25866835]
- Berg L, Rostila M, & Hjern A (2016). Parental death during childhood and depression in young adults—a national cohort study. *Journal of Child Psychology and Psychiatry*, 57(9), 1092–1098. [PubMed: 27058980]
- Butler EA, Wilhelm FH, & Gross JJ (2006). Respiratory sinus arrhythmia, emotion, and emotion regulation during social interaction. *Psychophysiology*, 43(6), 612–622. [PubMed: 17076818]
- Cerel J, Fristad MA, Verducci J, Weller RA, & Weller EB (2006). Childhood bereavement: psychopathology in the 2 years postparental death. *Journal of the American Academy of Child & Adolescent Psychiatry*, 45(6), 681–690. [PubMed: 16721318]
- Chorpita BF, & Barlow DH (1998). The development of anxiety: the role of control in the early environment. *Psychological Bulletin*, 124(1), 3. [PubMed: 9670819]
- Compas BE, Jaser SS, Bettis AH, Watson KH, Gruhn MA, Dunbar JP, ... & Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A meta-analysis and narrative review. *Psychological Bulletin*, 143(9), 939–991. [PubMed: 28616996]
- Denson TF, Grisham JR, & Moulds ML (2011). Cognitive reappraisal increases heart rate variability in response to an anger provocation. *Motivation and Emotion*, 35(1), 14–22.
- Dowdney L (2000). Annotation: Childhood Bereavement Following Parental Death. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41(7), 819–830.
- Eisenberg N, Zhou Q, Spinrad TL, Valiente C, Fabes RA, & Liew J (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, 76(5), 1055–1071. [PubMed: 16150002]
- Fischer AH, Rodriguez Mosquera PM, Van Vianen AE, & Manstead AS (2004). Gender and culture differences in emotion. *Emotion*, 4(1), 87–94. [PubMed: 15053728]
- Gottman JM, Katz LF, & Hooven C (1996). Parental meta-emotion philosophy and the emotional life of families: Theoretical models and preliminary data. *Journal of Family Psychology*, 10(3), 243.
- Gross JJ (1998). The emerging field of emotion regulation: an integrative review. *Review of General Psychology*, 2(3), 271.
- Gross JJ, & John OP (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348. [PubMed: 12916575]
- Grossman P, & Taylor EW (2007). Toward understanding respiratory sinus arrhythmia: relations to cardiac vagal tone, evolution and biobehavioral functions. *Biological Psychology*, 74(2), 263–285. [PubMed: 17081672]
- Hagan MJ, Tein J-Y, Sandler IN, Wolchik SA, Ayers TS, & Luecken LJ (2012). Strengthening effective parenting practices over the long term: Effects of a preventive intervention for parentally bereaved families. *Journal of Clinical Child & Adolescent Psychology*, 41(2), 177–188. [PubMed: 22417191]
- Haine RA, Sandler IN, Wolchik SA, Tein J-Y, & Dawson-McClure SR (2003). Changing the legacy of divorce: Evidence from prevention programs and future directions. *Family Relations*, 52(4), 397–405.
- Haine RA, Wolchik SA, Sandler IN, Millsap RE, & Ayers TS (2006). Positive parenting as a protective resource for parentally bereaved children. *Death Studies*, 30(1), 1–28. [PubMed: 16296557]

- Holahan CJ, Moos RH, Holahan CK, Brennan PL, & Schutte KK (2005). Stress generation, avoidance coping, and depressive symptoms: a 10-year model. *Journal of Consulting and Clinical Psychology*, 73(4), 658. [PubMed: 16173853]
- Jakobsen IS, & Christiansen E (2011). Young people's risk of suicide attempts in relation to parental death: a population based register study. *Journal of Child Psychology and Psychiatry*, 52(2), 176–183. [PubMed: 21039482]
- Kaplow JB, Layne CM, Pynoos RS, Cohen JA, & Lieberman A (2012). DSM-V diagnostic criteria for bereavement-related disorders in children and adolescents: Developmental considerations. *Psychiatry: Interpersonal & Biological Processes*, 75(3), 243–266.
- Kashdan TB, Barrios V, Forsyth JP, & Steger MF (2006). Experiential avoidance as a generalized psychological vulnerability: Comparisons with coping and emotion regulation strategies. *Behaviour Research and Therapy*, 44(9), 1301–1320. [PubMed: 16321362]
- Katz LF, & Gottman JM (1997). Buffering children from marital conflict and dissolution. *Journal of Clinical Child Psychology*, 26(2), 157–171. [PubMed: 9169376]
- Katz LF, & Windecker-Nelson B (2006). Domestic violence, emotion coaching, and child adjustment. *Journal of Family Psychology*, 20(1), 56. [PubMed: 16569090]
- Kreibig SD (2010). Autonomic nervous system activity in emotion: A review. *Biological Psychology*, 84(3), 394–421. [PubMed: 20371374]
- Kwok O, Haine RA, Sandler IN, Ayers TS, Wolchik SA, & Tein J-Y (2005). Positive Parenting as a Mediator of the Relations Between Parental Psychological Distress and Mental Health Problems of Parentally Bereaved Children. *Journal of Clinical Child & Adolescent Psychology*, 34(2), 260–271. 10.1207/s15374424jccp3402_5 [PubMed: 15901226]
- Lang PJ, Bradley MM, & Cuthbert BN (1997). International affective picture system (IAPS): Technical manual and affective ratings. NIMH Center for the Study of Emotion and Attention, 39–58.
- Luecken LJ, Hagan MJ, Sandler IN, Tein J-Y, Ayers TS, & Wolchik SA (2014). Longitudinal mediators of a randomized prevention program effect on cortisol for youth from parentally bereaved families. *Prevention Science*, 15(2), 224–232. [PubMed: 23529870]
- Melhem NM, Walker M, Moritz G, & Brent DA (2008). Antecedents and sequelae of sudden parental death in offspring and surviving caregivers. *Archives of Pediatrics & Adolescent Medicine*, 162(5), 403–410. [PubMed: 18458185]
- Moors A, Ellsworth PC, Scherer KR, & Frijda NH (2013). Appraisal theories of emotion: State of the art and future development. *Emotion Review*, 5(2), 119–124.
- Muthén B, & Asparouhov T (2002). Latent variable analysis with categorical outcomes: Multiple-group and growth modeling in Mplus. Mplus web notes, 4(5), 1–22.
- Patterson GR, DeGarmo D, & Forgatch MS (2004). Systematic changes in families following prevention trials. *Journal of Abnormal Child Psychology*, 32(6), 621–633. [PubMed: 15648529]
- Porges SW (2007). A phylogenetic journey through the vague and ambiguous Xth cranial nerve: A commentary on contemporary heart rate variability research. *Biological Psychology*, 74(2), 301–307. [PubMed: 17055142]
- Pynoos RS, Steinberg AM, & Piacentini JC (1999). A developmental psychopathology model of childhood traumatic stress and intersection with anxiety disorders. *Biological Psychiatry*, 46(11), 1542–1554. [PubMed: 10599482]
- Ramsden SR, & Hubbard JA (2002). Family expressiveness and parental emotion coaching: Their role in children's emotion regulation and aggression. *Journal of Abnormal Child Psychology*, 30(6), 657–667. [PubMed: 12481978]
- Sandler IN, Ayers TS, Wolchik SA, Tein J-Y, Kwok O-M, Haine RA, ... Padgett-Jones S (2003). The family bereavement program: efficacy evaluation of a theory-based prevention program for parentally bereaved children and adolescents. *Journal of Consulting and Clinical Psychology*, 71(3), 587. [PubMed: 12795581]
- Sandler I, Ayers TS, Tein JY, Wolchik S, Millsap R, Khoo ST, Kaplan D, Ma Y, Luecken L, Schoenfelder E, & Cox S (2010). Six-year follow-up of a preventive intervention for parentally bereaved youth: A randomized controlled trial. *Archives of Pediatrics and Adolescent Medicine*, 164, 907–914. [PubMed: 20921347]

- Sandler I, Gunn H, Mazza G, Tein JY, Wolchik S, Kim H, Ayers T, & Porter M (2018). Three perspectives on mental health problems of young adults and their parents at a 15-year follow-up of the Family Bereavement Program. *Journal of Consulting and Clinical Psychology*, 86(10), 845–855. [PubMed: 30265043]
- Sandler I, Tein JY, Cham H, Wolchik S, & Ayers T (2016). Long-term effects of the Family Bereavement Program on spousally bereaved parents: Grief, mental health problems, alcohol problems, and coping efficacy. *Development and Psychopathology*, 28(3), 801–818. [PubMed: 27427807]
- Sandler IN, Wolchik SA, Ayers TS, Tein J-Y, & Luecken L (2013). Family Bereavement Program (FBP) approach to promoting resilience following the death of a parent. *Family Science*, 4(1), 87–94.
- Shiota MN (2006). Silver linings and candles in the dark: Differences among positive coping strategies in predicting subjective well-being. *Emotion*, 6(2), 335–339. [PubMed: 16768566]
- Shiota MN, & Levenson RW (2009). Effects of Aging on Experimentally Instructed Detached Reappraisal, Positive Reappraisal, and Emotional Behavior Suppression. *Psychology and Aging*, 24(4), 890–900. [PubMed: 20025404]
- Silk JS, Vanderbilt-Adriance E, Shaw DS, Forbes EE, Whalen DJ, Ryan ND, & Dahl RE (2007). Resilience among children and adolescents at risk for depression: Mediation and moderation across social and neurobiological contexts. *Development and Psychopathology*, 19(3), 841–865. [PubMed: 17705905]
- Stocker CM, Richmond MK, Rhoades GK, & Kiang L (2007). Family emotional processes and adolescents' adjustment. *Social Development*, 16(2), 310–325.
- Stroebe M, Schut H, & Stroebe W (2007). Health outcomes of bereavement. *The Lancet*, 370(9603), 1960–1973.
- Taylor AB, MacKinnon D, & Tein J-Y (2008) Test of the three path mediated effect. *Organization Research Methods*. 11, 241–269. doi:10.1177/1094428107300344
- Tein J-Y, Sandler IN, Ayers T & Wolchik SA (2006). Mediation of the Effects of the Family Bereavement Program on Mental Health Problems of Bereaved Children and Adolescents. *Prevention Science*, 7, 179–195. DOI:10.1007/s11121-006-0037-2 [PubMed: 16775760]
- Troy AS, & Mauss IB (2011). Resilience in the face of stress: emotion regulation as a protective factor. *Resilience and Mental Health: Challenges across the Lifespan*, 1(2), 30–44.
- Worden JW, & Silverman PR (1996). Parental death and the adjustment of school-age children. *OMEGA-Journal of Death and Dying*, 33(2), 91–102.

Figure 1:
Cascading Effects Model