


# Impacts of healthy marriage and relationship education for expectant and new mothers

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## Abstract

**Objective:** To build the evidence base on healthy marriage and relationship education (HMRE) programs serving individual adults, this study examined the 1-year impacts of the MotherWise program, which serves women with low incomes who are pregnant or have just had a baby.

**Background:** Despite the increasing prevalence of HMRE programs serving individual adults, few studies have rigorously examined their effectiveness.

**Method:** Women were randomly assigned to either (a) an intervention group offered MotherWise ( $n = 512$ ), or (b) a control group not offered MotherWise ( $n = 437$ ). Women's relationship skills, attitudes, and outcomes were measured by a 1-year follow-up survey.

**Results:** MotherWise improved women's relationship skills and attitudes, and reduced the likelihood of unintended pregnancy. MotherWise did not affect levels of intimate partner violence, coparenting quality, and emotional well-being. Among women in a relationship with their baby's father, MotherWise improved the quality of that relationship.

**Conclusion:** MotherWise met its immediate goal of helping women develop the skills and attitudes to make informed, healthy decisions about relationships. The program's impact on unintended pregnancy suggests the program encouraged women to make more deliberate decisions about family planning.

**Implications:** Programs like MotherWise can improve certain outcomes of new and expectant mothers with low incomes by offering them HMRE services and other supports.

## KEYWORDS

healthy relationships, marriage education, randomized controlled trial, relationship skills and attitudes, Within My Reach

Decades of research have revealed that stable, low-conflict families support the well-being of parents and children (Waldfogel et al., 2010). Healthy family environments can be a buffer against the negative effects of poverty and other stressful life events (Amato, 2005). However, maintaining healthy relationships can be a challenge for parents. This is particularly true for parents with low incomes, who may experience economic and other stressors that make it difficult to achieve stable, low-conflict relationships (Conger et al., 2010).

Healthy relationships are particularly important for new and expectant mothers. Many women experience psychological distress during pregnancy and after the birth of their child (Gavin et al., 2005). Access to social and relationship supports (O'hara & Swain, 1996) and positive relationship behaviors (Khaled et al., 2020) during the perinatal period have been linked to improved maternal well-being. In contrast, exposure to destructive conflict behaviors during and shortly after pregnancy, such as intimate partner violence, is linked to worsened maternal mental and physical health (Malta et al., 2012; Sharps et al., 2007). More broadly, research reveals that healthy relationships between mothers and fathers can reduce maternal stress and support maternal well-being (Bloch et al., 2010), which can in turn influence children's developmental trajectories (Crnic et al., 2005).

Healthy marriage and relationship education (HMRE) programs, including those serving new and expectant parents, have emerged as an approach to help people build the skills needed to develop and sustain healthy relationships (Stanley et al., 2020). The federal government funds many HMRE programs through grants that are administered by the U.S. Department of Health and Human Services, Administration for Children and Families, Office of Family Assistance (OFA, n.d.). Many HMRE programs serve individual adults (rather than couples) and aim to help participants form and maintain romantic relationships and avoid unhealthy relationships, regardless of their relationship status (Stanley et al., 2020; Stanley & Rhoades, 2009). These programs cover topics such as how to choose a partner wisely, how to improve communication skills, how relationship choices can affect many aspects of life, and how to recognize unhealthy relationships and leave them safely (Rhoades & Stanley, 2011; Visvanathan et al., 2015).

There are an increasing number of HMRE programs for individual adults, as indicated by the current list of HMRE grants awarded by OFA (OFA, n.d.), yet there is limited rigorous evidence on their effectiveness (Stanley et al., 2020; Visvanathan et al., 2015). A handful of mainly quasi-experimental studies have examined the impacts of HMRE programs for individual adults (Adler-Baeder et al., 2018; Bradford et al., 2016; Nowlan et al., 2017; Owen et al., 2017; Van Epp et al., 2008). Only one study used a random assignment design: Nowlan et al. (2017) evaluated an online HMRE curriculum adapted for use with individual adults and found that it had positive impacts on individuals' self-reported quality of life, work functioning, and perceived health at program exit. Moreover, only one of these studies (Adler-Baeder et al., 2018) examined an HMRE program that exclusively served women. Adler-Baeder et al. (2018) examined the *Together We Can* HMRE curriculum to mothers of children enrolled in a Head Start program and compared the outcomes of program participants to those of mothers from the same Head Start program who chose not to enroll. Program participants reported greater improvements in coparenting quality 1 year after program enrollment compared with mothers who chose not to participate in the program; the two groups had similar levels of punitive parenting behaviors, however. To the best of our knowledge, no studies to date have used a random assignment design to evaluate the impact of HMRE programs that exclusively serve women or mothers—or more broadly, the impact of HMRE programs for individual adults on outcomes beyond program exit.

## Current study

This study presents findings from a random assignment impact study of *MotherWise*, an HMRE program for new and expectant mothers. *MotherWise* integrates the *Within My Reach*

curriculum into a comprehensive set of HMRE services and supplementary supports. The program's primary goal is to empower women to make informed decisions about healthy relationships. MotherWise was designed by the developer of the *Within My Reach* curriculum and delivered by staff at the University of Denver.

This study addresses the following primary research question: What are the 1-year impacts of MotherWise on women's relationship skills, attitudes, and related outcomes? To answer that question, we randomly assigned 949 women to one of two groups—a group that was offered MotherWise and a control group that was not—and analyzed data from a follow-up survey of women in both groups that we administered after 1 year. We examined impacts on study participants' outcomes in six domains, including (a) relationship skills, (b) relationship attitudes, (c) unintended pregnancy, (d) exposure to intimate partner violence, (e) coparenting, and (f) emotional well-being. Our analysis of impacts on these outcomes represents the main test of whether MotherWise achieved its intended effects.

The first two domains, relationship skills and attitudes, were directly addressed by the program's core group workshop that was designed to equip women with the skills and attitudes necessary to make informed decisions about relationships. An important goal of MotherWise was guiding participants to recognize unhealthy relationships to help them protect themselves against intimate partner violence. For this reason, we examine its effects on participants' exposure to intimate partner violence. MotherWise also emphasized the importance of making careful and deliberate decisions about relationships—including when to have a child and with whom—which we hypothesized could reduce the likelihood of unintended pregnancy. Further, we anticipated that the relationship skills taught by the program could improve participants' coparenting relationships. Finally, we hypothesized the program could improve participants' emotional well-being through its messages of personal empowerment, by helping new mothers avoid feelings of isolation, and through impacts on other outcomes.

In additional analyses, we examined a second research question: Among the three quarters of women who were in a steady romantic relationship with the baby's father when they enrolled in the study, what are the 1-year impacts of MotherWise on the status and quality of that relationship? This question is of substantive and policy significance, given that improved relationship quality could reduce conflict in the home environment, improve parenting, and ultimately, improve children's well-being (Carlson & McClanahan, 2006; Hughes et al., 2020). We categorized this research question as secondary because these outcomes were not as central to the program's goals and are only relevant for a subset of women served by MotherWise.

## METHOD

### Study design

The study team conducted a randomized trial involving new and expectant mothers with low incomes in the Denver, Colorado, area. We randomly assigned women to one of two research groups: (a) an intervention group that was offered MotherWise, and (b) a control group that was not offered MotherWise but was free to seek other services available in the community. We obtained institutional review board (IRB) approval from the Denver Health IRB and the University of Denver IRB and preregistered the study on [clinicaltrials.org](https://clinicaltrials.org) (identifier: NCT02792309).

The study team ultimately enrolled 949 women over a 26-month period from September 2016 through December 2018. This total is consistent with the original plan for the evaluation: enrolling 900 women into the study, which, with an 80% survey response rate, would enable detection of an effect size of 0.18 assuming  $\alpha = .05$  and power of .80 (Wood et al., 2018). Prior research has found impacts of this magnitude for HMRE programs serving parents with

low incomes (Devaney & Dion, 2010), suggesting this sample size was adequate to detect the impacts of the MotherWise program if they were of similar size or larger.

## Participants

To be eligible to participate in MotherWise, women had to be at least 18 years old and either be pregnant or have delivered a baby in the previous 3 months. To identify potential study participants, the University of Denver partnered with Denver Health, a large public hospital that is the primary health care provider for families with Medicaid-funded births in the Denver, Colorado, area. MotherWise staff primarily recruited study participants in places where women received their perinatal care, including the main Denver Health hospital campus and two community health centers operated by Denver Health. MotherWise staff also sought referrals from other medical and social service agencies that served new and expectant mothers with low incomes in the Denver area. MotherWise staff first identified eligible women and then approached eligible women about participating in the study while they were at doctor's appointments to describe the program and study. If women were interested in participating in the program and in the study, MotherWise staff scheduled an intake appointment to verify the potential participant's eligibility, complete the consent process, administer the baseline survey, and conduct random assignment.

## Random assignment

We used a stratified random assignment design to assign study participants to either the MotherWise group or the control group. MotherWise was offered in both Spanish and English. Random assignment took place within each language group to ensure the proportion of Spanish-speaking women was the same for both research groups.

At the beginning of the study enrollment period in September 2016, participants had an equal chance of being placed in either research group. Beginning in November 2016, assignment ratios were temporarily adjusted upward (with two thirds of participants assigned to the MotherWise group) to maintain adequate enrollment. (Appendix Table A.1 in the supplemental materials has the assignment probabilities by language group.) We used a permuted block design to conduct random assignment by generating a random string of characters (C for control and T for treatment) for each stratum of study participants (Mattis & Lachin, 1998). The string was created in a manner that ensured the number of participants in the study groups aligned with the random assignment ratios described above at any point in the study enrollment process. Overall, we randomly assigned 512 young adults to the MotherWise group and 437 to the control group.

## Intervention and control conditions

MotherWise was developed by researchers at the University of Denver. It included a core group workshop, individual case management, and an optional couples' workshop. The core group workshop consisted of six weekly 4-hour sessions and included 18 hours of content and an hour each session for a meal and socializing. Fifteen hours of content were drawn from the *Within My Reach* curriculum, an HMRE curriculum developed for individual adults that focuses on improving relationship skills and attitudes and is designed to help participants make informed and healthy decisions about their personal and romantic relationships regardless of their relationship status (Pearson et al., 2015). The *Within My Reach* curriculum was supplemented by

**TABLE 1** Overview of the six MotherWise *Within My Reach* workshop sessions

Session	HMRE content covered
Session 1	<ul style="list-style-type: none"> <li>• The state of relationships today</li> <li>• Healthy relationships: What they are and what they aren't</li> <li>• Sliding versus deciding</li> </ul>
Session 2	<ul style="list-style-type: none"> <li>• Sliding versus deciding (continued)</li> <li>• Smart love</li> <li>• Knowing yourself first</li> </ul>
Session 3	<ul style="list-style-type: none"> <li>• Knowing yourself first (continued)</li> <li>• Making your own decisions</li> <li>• Danger patterns in relationships</li> </ul>
Session 4	<ul style="list-style-type: none"> <li>• Where conflict begins</li> <li>• Smart communication</li> <li>• The speaker-listener technique</li> </ul>
Session 5	<ul style="list-style-type: none"> <li>• The speaker-listener technique (continued)</li> <li>• Infidelity, distrust, and forgiveness</li> <li>• Two types of commitment: Why it matters to adults and children</li> </ul>
Session 6	<ul style="list-style-type: none"> <li>• Two types of commitment: Why it matters to adults and children (continued)</li> <li>• Stepfamilies and the significance of fathers</li> <li>• Making the tough decisions</li> <li>• Reaching into your future</li> </ul>

Note. HMRE = healthy marriage and relationship education. Information is from internal MotherWise Program documents.

3 hours of content on infant care and parenting. This additional content not only provided relevant information; it was a cover for women in an unsafe relationship who did not want their partners to know they were in a program that included topics such as recognizing and leaving unhealthy relationships safely (Baumgartner & Paulsell, 2019). Table 1 is an overview of the HMRE content covered in each of the six workshop sessions.

MotherWise included case management to reinforce the skills women learned in the workshops and to refer them to community resources. Participants were expected to attend at least four meetings with a case manager during the 6-week program. MotherWise also featured an optional couples' workshop that mothers could attend with their romantic partners once they had completed at least the first three *Within My Reach* workshop sessions.

MotherWise was offered in both English and Spanish. There were no major differences in the English- and Spanish-language *Within My Reach* core program workshops and case management. The *Within My Reach* curriculum that underlies MotherWise is available from PREP, Inc. in both English and Spanish. However, the English- and Spanish-language optional couples' workshops used different curricula. The English-language optional couples' workshops used *PREP 8.0*, the eighth version of PREP, Inc.'s master curriculum for couples in committed relationships. The Spanish-language optional couples' workshop used *Within Our Reach*, which is also distributed by PREP, Inc., because *PREP 8.0* was not available in Spanish. *Within Our Reach*, is derived from the *PREP 8.0* content and is tailored for couples with low incomes (Baumgartner & Paulsell, 2019).

Women assigned to the control group were not offered MotherWise. They were free to seek other services available in the community. However, the likelihood that control group members received other HMRE services is low. MotherWise staff did not refer control group members to other HMRE services in the community. In addition, a previous implementation study of MotherWise found that few organizations in the community offered HMRE services and no other area program offered HMRE services tailored specifically for expectant and new mothers (Baumgartner & Paulsell, 2019). Consistent with this finding, when asked on follow-up surveys

whether they had participated in any group activities to help with their romantic relationships since random assignment, only 6% of control group members reported that they had.

## Data collection

This analysis draws on data from two surveys of study participants: a baseline survey and a 1-year follow-up survey. The baseline survey was administered via telephone to all participants during the program intake appointment and before they were informed of their research status. This survey collected information on participants' demographic characteristics, family backgrounds, relationship attitudes and experiences, and other outcomes. The follow-up survey was administered about 12 months after study enrollment via telephone or online. Baseline and follow-up surveys were available in English and Spanish. Study participants received a \$30 gift card for enrolling in the study and completing the baseline survey, and a \$25 gift card for completing the follow-up survey. A total of 799 women responded to the 1-year follow up survey (a response rate of 84%). Response rates were similar for the intervention group (83%) and control group (85%).

## Outcomes

We examine the impacts of MotherWise on nine primary outcomes across six domains, and five secondary outcomes. The theory of change that underlies the design and delivery of MotherWise also guided our selection of outcomes. This theory of change posits that the program's implementation system (supported by trained facilitators, case managers, and recruiters) will encourage participants to use the key services and supports offered by MotherWise (including the *Within My Reach* workshops, case management, and optional couples' workshops). In the short term, participants' use of these services is theorized to lead to changes in participants' knowledge and attitudes; improved relationship, communication, and conflict management skills; reduced exposure to intimate partner violence; improved satisfaction with relationships; and reduced depressive symptoms. These short-term improvements, in turn, are theorized to lead to longer-term outcomes including improved relationship and family stability, improved personal well-being, and improved child well-being (Baumgartner & Paulsell, 2019).

Our primary outcomes are aligned with the anticipated short-term outcomes in the MotherWise theory of change. In contrast, we consider the secondary outcomes to be exploratory, because they are not central to the program's goals and not reflected in the program's theory of change. Importantly, we only collected data from women, meaning our outcome measures capture their perceptions, which might differ from those of their romantic partners or coparents.

## Relationship skills

### *Perceived romantic relationship skills*

We measured participants' perceptions of their romantic relationship skills using six items from the Relationship Deciding Scale (Vennum & Fincham, 2011). For each question, participants reported how much they agreed with a given statement; for example, "I believe I will be able to effectively deal with conflicts that arise in my relationship." Response options for each item ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). We calculated a scale score by taking the average of responses to the six questions. Scale values ranged from 1 to 4, with higher values indicating a perception of greater relationship skills. This scale demonstrated adequate internal consistency in our study sample ( $\alpha = .88$  among the control group and  $\alpha = .84$  among the MotherWise group).



### *Perceived conflict management skills*

We measured participants' perceptions of their conflict management skills using five survey questions adapted from the Conflict Management subscale of the Interpersonal Competence Questionnaire (Buhrmester et al., 1988). For each question, women reported their perceived ability to perform certain conflict management skills, such as listening to another person's opinion during a disagreement. Response options for each question ranged from 1 (*I am bad at this*) to 4 (*I am extremely good at this*). We calculated a scale score by taking the average value of responses across the five items. Scale values ranged from 1 to 4, with higher values indicating greater perceived skills. This scale demonstrated adequate internal consistency in our study sample ( $\alpha = .79$  among the control group and  $\alpha = .78$  among the MotherWise group).

## Relationship attitudes

### *Support for going slow in romantic relationships*

Participants' support for going slow in romantic relationships was measured by the strength of their agreement with the statement, "People are more likely to succeed in their relationships if they take things slowly." Values ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). This measure was recommended by the *Within My Reach* curriculum developers as an appropriate example of the kind of relationship attitude the curriculum is designed to influence.

### *Disapproval of couple violence*

We measured participants' disapproval of couple violence using a subscale of the Acceptance of Couple Violence Scale (Dahlberg et al., 2005). There were five statements on the subscale. Women reported how strongly they agreed or disagreed with the statements, which included, for example, "Violence between dating partners can improve the relationship." Response options for each question ranged from 1 (*strongly agree*) to 4 (*strongly disagree*). We calculated a scale score by taking the average value of responses across the five questions. Scale values ranged from 1 to 4, with higher values indicating greater disapproval of couple violence. This scale demonstrated adequate internal consistency in our study sample ( $\alpha = .83$  among the control group and  $\alpha = .79$  among the MotherWise group).

## Unintended pregnancy since program enrollment

We used questions drawn from the National Survey of Family Growth 2015 – 2017 (National Center for Health Statistics, n.d.) to determine whether participants had had an unintended pregnancy. These survey questions asked women if they had become pregnant since random assignment. For women who had, there was a question asking if they had wanted to have a baby immediately before the pregnancy. The survey also asked if the pregnancy came sooner than the mother wanted, at about the right time, or later than the mother wanted. We constructed a binary measure of unintended pregnancy that was equal to 1 if the mother had become pregnant since random assignment and reported that they had not wanted a baby right before they became pregnant or that the pregnancy came sooner than they wanted.

## Exposure to intimate partner violence

### *Any psychological abuse*

We measured participants' exposure to any psychological abuse using a binary indicator adapted from a measure used in the Supporting Healthy Marriage evaluation

(Hsueh et al., 2012). We asked participants whether they had experienced any of four types of psychological abuse by their romantic partner in the past year, including whether the participant's romantic partner had tried to keep them from seeing or talking with friends, made them feel stupid, kept money from them or took their money without asking, or made her feel afraid the partner might hurt her. We created a binary indicator for whether the participant reported experiencing any of the four types of psychological abuse. If the participant did not respond to one or more of the four questions, and did not say they had experienced any of the four types of psychological abuse, we set this indicator to missing.

### *Any physical abuse*

We measured participants' exposure to any physical abuse using two items from the Physical Assault Scale of the Conflict Tactics Scale—Short Form (Straus & Douglas, 2004). In the survey, participants reported whether they had experienced either of two types of physical abuse by any romantic partner in the past year, including whether any romantic partner had (a) pushed, shoved, or slapped them, or (b) punched, kicked, or beaten them up. We followed the approach recommended by the scale developers and created a binary indicator for whether the participant reported having experienced either of the two types of physical abuse. If the participant did not respond to one or both of the two questions, and did not say they had experienced any of the two types of physical abuse, we set this indicator to missing.

## Coparenting

We measured the quality of participants' coparenting relationships using a subset of 10 items from the Parenting Alliance Inventory (Abidin & Brunner, 1995). Women reported their level of agreement with positive statements about coparenting with the father of the baby—for example, "I feel good about [father]'s judgment about what is right for our children/child." Response options for each question ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). We calculated a scale score by taking the average value of responses across the 10 questions. Scale values ranged from 1 to 4, with higher values indicating higher quality coparenting. This scale demonstrated adequate internal consistency in our study sample ( $\alpha = .97$  among the control group and  $\alpha = .98$  among the MotherWise group).

## Emotional well-being

To examine the impacts of MotherWise on participants' emotional well-being, we examined a measure of participants' depressive symptoms. We measured depressive symptoms using a subscale from the Patient Health Questionnaire (Kroenke et al., 2001). The subscale included eight questions, and for each question, respondents reported how often they experienced a depressive symptom in the past 2 weeks. Response options for each question ranged from 1 (*not at all*) to 4 (*nearly every day*). We calculated a scale by taking the average value of responses across the eight questions. Scale values ranged from 1 to 4, with higher values reflecting more frequent depressive symptoms. This scale demonstrated adequate internal consistency in our study sample ( $\alpha = .89$  among the control group and  $\alpha = .89$  among the MotherWise group).

## Secondary outcomes

In addition to the nine key outcomes in the six primary outcome domains described above, we examined the impact of MotherWise on seven secondary outcome measures related to a



woman's relationship with the baby's father. These outcomes are exploratory, and not part of the main test of program effectiveness, because they were less central to the program's goals and not relevant for all mothers served by MotherWise.

First, we examined two measures of relationship status, including whether women were romantically involved with or married to their baby's father at follow-up. These outcomes were only defined for women who were in a steady relationship with the father at baseline. Second, we examined five measures of relationship quality, including support and affection, relationship commitment, relationship happiness, use of constructive conflict behaviors, and avoidance of destructive behaviors. These outcomes were only defined for women who were in a steady relationship with the father at baseline and follow-up.

## Analytic methods

Because the study leveraged a rigorous random assignment design and overall and differential attrition at the 12-month follow-up was low, we can attribute simple differences in outcomes between the treatment and control groups to the impact of the MotherWise program with a high degree of confidence (What Works Clearinghouse, 2020). Nevertheless, we estimated multivariate weighted least squares regression models to estimate the impact of MotherWise. This approach accounted for features of the study's random assignment design, including stratification based on language group and varying assignment probabilities, and also allowed us to adjust for the small number of baseline differences that were detected between the MotherWise group and the control group. The regression models included multiple variables to control for characteristics measured at baseline. These covariates included the respondent's primary language, because that was a stratification factor for random assignment, and baseline versions of all primary outcomes (when available). We also included two covariates to account for imbalance between the intervention and control groups in women's relationship status at baseline: a categorical variable representing the woman's relationship status at baseline and an indicator for whether they were in a steady romantic relationship with their child's father at baseline. To help interpret the magnitude of the impact estimates, we calculated and reported an effect size for each outcome. For continuous outcomes, we calculated the effect size by dividing the impact estimate from the regression model by the unadjusted pooled standard deviation of the outcome for women across both the MotherWise and control groups (Hedges, 1981). For dichotomous outcomes, we calculated the effect size by dividing the log odds ratio of the two study groups by 1.65 (Cox, 1970).

We included analysis weights to account for the stratified random assignment design and survey nonresponse. We first calculated base weights that accounted for the varying likelihood of assignment to the MotherWise group and control group across the four enrollment periods and two language groups. We then adjusted the base weights to account for survey nonresponse, using standard approaches to calculate the probability of participants' survey response as a function of baseline characteristics.

For the group of 799 participants that completed the follow-up survey and make up our analytic sample, there was a small amount of missing data for the covariates included in our regression models. For missing baseline data for covariates, we set missing values to a single constant value and included indicator variables for missing data as additional covariates in the regression model (Puma et al., 2009). Respondents with missing data for a particular outcome measure were excluded from the regression models for that outcome. As noted, we used analysis weights to account for nonresponse to the follow-up survey.

To confirm findings were not sensitive to specific analytic decisions, we replicated our analysis using different specifications for the regression model. First, we replicated our primary regression model with weights that adjusted for varying probabilities of treatment assignment due to the random assignment design, but did not adjust for survey nonresponse. Second, we estimated a

regression model that did not include covariate adjustment. Third, we replicated the analysis while accounting for multiple comparisons within an outcome domain. For domains that contained more than one outcome, we corrected for the risk of finding statistically significant results by chance using the Benjamini–Hochberg method (Benjamini & Hochberg 1995).

## RESULTS

### Baseline characteristics

Table 2 shows the characteristics of the analytic sample, which includes the 799 women who were randomly assigned to either the MotherWise group or to the control group and completed a 1-year follow-up survey. Most women in the analytic sample were economically disadvantaged expectant and new mothers. The average age of the women in the analytic sample was 28. About two thirds of the women identified as Hispanic. Most others identified as either non-Hispanic White or non-Hispanic Black. About four in 10 women were born outside of the United States, and a similar share reported they primarily spoke Spanish at home. About one quarter of the women had not completed high school, and about one in 10 had a college degree. At baseline, nearly three in four women reported they had accessed government benefits such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the Supplemental Nutrition Assistance Program (SNAP), or Temporary Assistance for Needy Families (TANF) in the past 30 days, and about four in 10 women were working.

Although MotherWise served women regardless of their relationship status, most participants were in a romantic relationship when they entered the study. About three quarters were in a steady romantic relationship with their baby's father. Eight percent were in an on-again/off-again relationship with a romantic partner (usually the baby's father). Some women reported experiencing violence in their recent romantic relationships. In the past year, nearly 40% had experienced psychological abuse, and about 15% had experienced physical abuse by a romantic partner.

Women in the MotherWise and control groups had generally similar characteristics at random assignment. Across the 21 baseline measures, two statistically significant differences emerged between the two groups, revealing differences in women's relationship status at baseline. Compared with women in the control group, women in the MotherWise group were more likely to be married (and less likely to be single). They were also more likely to be married to or in a steady relationship with their baby's father. As noted, we controlled for these differences in the regressions we used to estimate program impacts. This is a salient difference because relationship status may be associated with some outcomes. However, as described above, the study used random assignment and was marked by low levels of overall and differential attrition, which supports the premise that simple differences in outcomes between the two study groups can be attributed to program impacts (What Works Clearinghouse, 2020). Moreover, as described above, we included two covariates to control for the imbalanced characteristics in multivariate regressions, and conducted sensitivity checks to confirm that the impact estimates are substantively unchanged when we estimate our regression models with and without baseline covariates. Taken together, these factors provide confidence that the differences in relationship status between the MotherWise and control groups pose limited risk of bias to the impact estimates.

### Program participation

An implementation study of MotherWise found that it was generally well implemented (Baumgartner & Paulsell, 2019). Most participants engaged in the core program components,

**TABLE 2** Baseline characteristics for women in the analytic sample

Baseline characteristics	MotherWise group	Control group	Difference
<b>Demographics</b>			
Average age (years)	28	28	1
<b>Race and ethnicity</b>			
Hispanic	69	64	5
Black, non-Hispanic	11	13	-2
White, non-Hispanic	15	17	-2
Other, non-Hispanic	5	7	-1
Foreign born	35	37	-1
<b>Language spoken at home</b>			
English	58	58	-1
Spanish	42	40	2
<b>Family and relationships</b>			
Expecting a baby at time of study enrollment	85	82	2
Married to or in a steady relationship with the baby's father	80	72	8**
<b>Relationship status (with any romantic partner)</b>			
Married or engaged	56	49	7
In a steady relationship	25	24	1
In an on-again/off-again relationship	8	8	-0
Not in a relationship	10	19	-8
<b>Socioeconomic status</b>			
<b>Highest educational level</b>			
No degree or diploma earned	22	29	-6
High school diploma or GED	40	34	6
Some college or vocational technical school	27	29	-2
College degree	11	9	2
Worked for pay in past month	41	38	3
Receipt of SNAP, TANF, or WIC in past 30 days	71	76	-5
<b>Baseline measures of primary outcomes</b>			
Perceived romantic relationship skills (range = 1 to 4)	3.19	3.21	-0.02
Perceived conflict management skills (range = 1 to 4)	2.46	2.50	-0.03
Support for going slow in romantic relationships (range = 1 to 4)	3.30	3.27	0.04
Disapproval of couple violence (range = 1 to 4)	3.64	3.61	0.03
Any psychological abuse in the past year	39	38	0
Any physical abuse in the past year	14	17	-3
Depressive symptoms (range = 0 to 24)	6.32	5.94	0.38
Sample size	426	373	

*Note.* This table shows the baseline characteristics of women who were randomly assigned and responded to the 1-year follow-up survey (percentage, unless otherwise specified). Data were weighted to account for differences in random assignment probabilities and survey nonresponse. SNAP = Supplemental Nutrition Assistance Program; TANF = Temporary Assistance for Needy Families; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children. Data come from baseline and 1-year follow-up surveys conducted by Mathematica.

\*\* $p < .01$ , two-tailed test.  $\diamond\diamond p < .05$ , chi-square test.

including attending at least one workshop session (82%) or participating in case management (83%). About four in 10 participants completed at least four case management meetings (41%). An additional 15% attended three case management meetings, 12% attended two case management meetings, and 15% attended one case management meeting (Dolfin et al., 2022). Participation in the optional couples' workshops was substantially lower: 16% of participants attended at least one couples' workshop with their partner. On average, women received 12 of the 18 hours of core workshop content that were offered. About two thirds of participants completed the program, defined by the program as completing at least five of six possible workshop sessions within 4 months of enrollment.

## Impacts on primary outcomes

Compared with women in the control group, women in the MotherWise group reported better romantic relationship skills and conflict management skills after 1 year. For perceived romantic relationship skills (measured on a scale of 1 to 4, with higher values indicating more skills), women in the MotherWise group had an average value of 3.36, compared with an average value of 3.25 for women in the control group (Table 3). For perceived conflict management skills (measured on a similar 1-to-4 scale), women in the MotherWise group had an average value of 2.71, compared with an average value of 2.58 in the control group. Both of these impacts were statistically significant at the .01 level, with effect sizes of 0.23 and 0.21, respectively.

MotherWise also improved women's attitudes about relationships. Women in the MotherWise group expressed more support for going slow in romantic relationships (measured on a scale of 1 to 4, with higher values indicating higher levels of support) than women in the control group did (3.40 versus 3.31; Table 3). This impact was statistically significant at the .05 level and corresponded to an effect size of 0.15. Women in the MotherWise group also expressed more intense disapproval of couple violence (measured on a scale of 1 to 4, with higher values indicating higher levels of disapproval) than women in the control group did (3.65 versus 3.53). This impact was statistically significant at the .01 level, and corresponded to an effect size of 0.26.

MotherWise reduced the likelihood of an unintended pregnancy during the 1-year follow-up period. In the control group, 11% of women reported they had an unwanted or mistimed pregnancy, compared with 7% of women in the MotherWise group (Table 3). This difference was marginally statistically significant (at the .10 level) and corresponded to an effect size of  $-0.29$ .

MotherWise did not have an impact on participants' exposure to intimate partner violence. At the 1-year follow-up, 28% of women in the MotherWise group and 33% of women in the control group reported experiencing psychological abuse from a romantic partner, a difference that was not statistically significant (Table 3). The percentage of women who reported experiencing physical abuse from a romantic partner in the past year was also similar for women in the MotherWise and control groups (9% and 11%, respectively).

Women in the MotherWise and control groups also reported similar levels of coparenting quality and emotional well-being. On a scale of coparenting quality that ranged from 1 to 4, the average score for both groups was about 3.1 (Table 3). On a measure of depressive symptoms that ranged from 0 to 24, with higher scores indicating more depressive symptoms, both groups reported an average score of about 4.4.

We checked the sensitivity of results to our analytic decisions by repeating the analysis of primary outcomes with three modifications: (a) using weights that only adjusted for varying probabilities of treatment assignment, (b) omitting covariate adjustment, and (c) accounting for multiple comparisons within an outcome domain. None of our robustness checks led to results that differed based on statistical significance or substantive importance (refer to Appendix Table A.2 in the supplemental materials).

**TABLE 3** Impacts of MotherWise on primary outcomes

Outcome	MotherWise group	Control group	Impact	Effect size
Relationship skills				
Perceived romantic relationship skills (range = 1 to 4)	3.36	3.25	0.11**	0.23
Perceived conflict management skills (range = 1 to 4)	2.71	2.58	0.12**	0.21
Relationship attitudes				
Support for going slow in romantic relationships (range = 1 to 4)	3.40	3.31	0.09*	0.15
Disapproval of couple violence (range = 1 to 4)	3.65	3.53	0.12**	0.26
Unintended pregnancy				
Had an unintended pregnancy since study enrollment	7	11	-4 <sup>†</sup>	-0.29
Intimate partner violence				
Any psychological abuse	28	33	-5	-0.13
Any physical abuse	9	11	-1	-0.10
Coparenting				
Quality of coparenting relationship (range = 1 to 4)	3.13	3.14	-0.01	-0.01
Emotional well-being				
Depressive symptoms (range = 0 to 24)	4.35	4.39	-0.04	-0.01
Sample size	426	373		

Note. The numbers in the MotherWise group and control group columns are regression-adjusted predicted values of outcomes for each group. Data come from baseline and 1-year follow-up surveys conducted by Mathematica.

<sup>†</sup> $p < .10$ .

\* $p < .05$ . \*\* $p < .01$ , two-tailed test.

## Impacts on secondary outcomes

About three quarters of the women were in a steady romantic relationship with their baby's father at the time they enrolled in the study. For this subset of women, we examined the status and quality of their relationship with their baby's father 1 year later.

MotherWise did not affect the likelihood that a woman who was in a steady romantic relationship with their baby's father at study enrollment would remain in that relationship 1 year later. In both groups, about 90% of women who were in a relationship with the baby's father at baseline remained romantically involved with the baby's father after 1 year (Table 4).

However, among women who were in a steady romantic relationship with the father at both baseline and follow-up, women in MotherWise reported higher levels of relationship quality compared with women in the control group. MotherWise had positive impacts on three of the five outcome measures for relationship quality. Women in the MotherWise group reported higher levels of relationship commitment and happiness (9.53 and 8.39, respectively, on scales ranging from 1 to 10) compared with the control group (9.13 and 7.96, respectively). The impact on relationship commitment was statistically significant at the .01 level and corresponds to an effect size of 0.25. The impact on relationship happiness was statistically significant at the .05 level and corresponds to an effect size of 0.21. MotherWise also had a positive impact on women's use of constructive conflict behaviors. On a scale ranging from 1 to 4, with higher scores indicating more frequent use of constructive behaviors, women in the MotherWise group had an average value of 3.37 compared with an average value of 3.27 for women in the control group. This impact was statistically significant at the .05 level and corresponds to an effect size of 0.17. We did not find significant impacts on our other two measures of relationship quality, including support and affection and avoidance of destructive conflict behaviors.

**TABLE 4** Impacts of MotherWise on secondary outcomes

Outcome	MotherWise group	Control group	Impact	Effect size
Relationship status <sup>a</sup>				
Romantically involved (percentage)	91	90	1	0.04
Married (percentage)	47	52	-4	-0.10
Relationship quality <sup>b</sup>				
Support and affection (range = 1 to 4)	3.38	3.33	0.05	0.10
Relationship commitment (range = 1 to 10)	9.53	9.13	0.40**	0.25
Relationship happiness (range = 1 to 10)	8.39	7.96	0.42*	0.21
Use of constructive conflict behaviors (range = 1 to 4)	3.37	3.27	0.10*	0.17
Avoidance of destructive conflict behaviors (range = 1 to 4)	2.87	2.77	0.10	0.14
Sample size for relationship status outcomes	345	269		
Sample size for relationship quality outcomes	315	243		

*Note.* The numbers in the MotherWise group and control group columns are regression-adjusted predicted values of outcomes. Data come from baseline and 1-year follow-up surveys conducted by Mathematica.

<sup>a</sup>These outcomes were only defined for women who were in a steady relationship with their baby's father at baseline.

<sup>b</sup>These outcomes were only defined for women who were in a steady relationship with their baby's father at baseline and follow-up.

\* $p < .05$ . \*\* $p < .01$ , two-tailed test.

## DISCUSSION

This study examined MotherWise's success in improving women's relationship skills, attitudes, and related outcomes. After 1 year, we found that MotherWise succeeded in improving all four of the measures of relationship skills and attitudes we examined. This suggests the program succeeded in its most immediate goal of equipping women with the skills and attitudes to make informed and healthy decisions about their personal and romantic relationships.

We also found that MotherWise reduced the likelihood of an unintended pregnancy in the year after women entered the program. MotherWise emphasized the importance of making careful and deliberate decisions about relationships, including when to have a child and with whom. This finding suggests MotherWise may have succeeded in encouraging women to make more deliberate decisions about family planning. In addition, exploratory subgroup analysis suggests the impact on unintended pregnancy was particularly strong among women who entered the program in a romantic relationship with their baby's father (Appendix Table A.3 in the supplemental materials). This pattern suggests MotherWise may have helped these women navigate conversations about when and whether to have another child with their partners. Unintended pregnancy is associated with several negative outcomes for women and children, including delayed prenatal care, low birth weight, and maternal depression (Abajobir et al., 2016; Dibaba et al., 2013; Shah et al., 2011). Unintended pregnancies also come with substantial public costs (Sonfield et al., 2011); even a modest reduction in unintended pregnancies could have considerable benefits for individual participants and society as a whole.

MotherWise did not reduce experiences of intimate partner violence or depressive symptoms, or improve the quality of participants' coparenting relationships. Low levels of depressive symptoms in the control group may explain the lack of impacts on this outcome—there was limited room for improvement. In addition, MotherWise did not include romantic partners in the core workshop, and participation in the optional couples' workshop was low. This may have limited the program's ability to affect intimate partner violence and coparenting. Although we found no impacts on intimate partner violence and coparenting at the 1-year follow-up, we did find impacts on related outcomes, such as conflict management skills and disapproval of



couple violence. Because impacts on outcomes in the realm of relationships can take time to unfold, impacts on coparenting and intimate partner violence could emerge later.

Why did MotherWise succeed in improving relationship skills and attitudes and reducing unintended pregnancies? The program may owe some of its success to strong implementation and participant engagement. More than eight in 10 women attended at least one workshop session, and nearly two thirds of participants completed the workshop series. Moreover, the program leaders (who included developers of the *Within My Reach* curriculum) were closely involved with program implementation, which helped ensure the program was implemented with fidelity (Baumgartner & Paulsell, 2019). Another factor may have been the program's well-defined population, which included new and expectant women with low incomes. Having a well-defined service population allowed the program staff to tailor services more closely to the participants' specific needs, which may have contributed to the program's effectiveness. The transition to parenthood is a time when interventions to support families may have the greatest potential for impact (Feinberg, 2002). The birth of a child may be a time when women are particularly open to taking stock of their romantic relationships, potentially making them more receptive to the program's healthy relationship content.

In additional analyses, we examined the impacts of MotherWise on the romantic relationships of the three quarters of women who were in a romantic relationship with their baby's father when they entered the study. Although we found no impact of MotherWise on the status of the mother's relationship with the baby's father after 1 year, we did find sizable effects on the quality of these relationships. Among women who were still in a romantic relationship with their baby's father 1 year after program enrollment, MotherWise had a positive impact on three of the five dimensions of relationship quality we examined, including relationship commitment, relationship happiness, and the use of constructive conflict behaviors.

Although these analyses are only based on a subset of women, and only reflect mothers' perspectives, the findings on relationship quality are notable because of their consistency and because of the size of the impacts. The average effect size across the five relationship quality measures we examined was considerably larger than effect sizes observed in previous evaluations of HMRE programs serving couples with low incomes (Hsueh et al., 2012; Moore et al., 2018; Wood et al., 2012). The sizable impacts of MotherWise on relationship quality support the promise of providing HMRE services to new and expectant mothers with low incomes. Better parental relationship quality has been linked to better parenting (Carlson & McLanahan, 2006) and fewer behavior problems in children (Hughes et al., 2020). These potential longer-term benefits make these impacts on relationship quality particularly noteworthy.

## Limitations

Although MotherWise shows promise in improving some participant outcomes, we do not yet know whether the program model can be successfully replicated. MotherWise program leaders included developers of the *Within My Reach* curriculum, which helped ensure the program was implemented with fidelity. Future research should examine whether similar HMRE interventions delivered without the direct involvement of curriculum developers can improve participants' outcomes.

## IMPLICATIONS

The findings of this study indicate that offering HMRE and other supports to new and expectant mothers with low incomes can improve outcomes related to relationship skills and attitudes, unintended pregnancy, and relationship quality (for some mothers). Although we cannot

isolate the factors that contribute to the programs' impacts, the findings do suggest paths for HMRE programming for individual adults. First, the findings underscore the importance of strong implementation and participant engagement for interventions aimed at supporting families (Brown et al., 2012; Ingoldsby, 2010). In the case of MotherWise, the high levels of participation and the fidelity with which the program was implemented likely helped support the program's impacts. Second, other HMRE programs may want to consider focusing on a well-defined service population, just as MotherWise did. A well-defined service population can help programs to more easily tailor their services to the groups they intend to serve, and serving participants with shared characteristics can help support group cohesion (Alamillo & Ouellette, 2021). HMRE programs may want to focus on adults in particular life circumstances, allowing programs to tailor services more closely to participant needs. Ideally, this also might prime participants to be more receptive to HMRE content.

Importantly, the findings of this study offer a preliminary view of this specific program's effects on the relationship outcomes of women 1 year after program enrollment. The MotherWise study also included a 30-month follow-up survey. Analysis of these data will yield evidence on MotherWise's longer-term effects on relationship outcomes and its effects on the overall well-being of participants and their children. Further, HMRE programs can vary in their service population, focus, services, and the outcomes they try to influence. Additional research is needed to develop a more complete picture of the effects HMRE programs for individuals can have on the full range of populations they serve.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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# Relationship education for women during pregnancy: The impact of MotherWise on birth outcomes

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## Abstract

The field of relationship science has called for more research on the impact of relationship education on child outcomes, yet studies in this area remain sparse, particularly regarding maternal and infant health at birth. Research on group prenatal care demonstrates that individual-oriented group interventions have a positive impact on infant birth outcomes, suggesting the need to consider the impacts of other forms of group programming for women. The current study examined the impact of MotherWise, an individual-oriented relationship education and brief case management/coaching program for minority and low-income pregnant women, on birth outcomes. The study sample included 136 women who enrolled in a larger randomized controlled trial of MotherWise during early pregnancy. Although statistical power was limited due to the sample size and the effects were not outright significant at  $p < 0.05$ , results indicated that the effects of MotherWise on birth outcomes were small to moderate in size (0.23 for birthweight, 0.46 for preterm birth) and suggest important avenues for future tests of relationship education programs and their impacts on maternal and infant health. The current study suggests that relationship education during pregnancy could directly impact women's and infant's health.

## KEYWORDS

birth outcomes, child outcomes, couples, preterm birth, randomized controlled trial, relationship education



## INTRODUCTION

Relationship education is typically a group intervention that covers relationship and communication skills. It has historically been delivered to committed couples and measured by couple outcomes. Reviews and meta-analyses of such couple-based programs show that they are often effective at improving relationship skills and communication (Hawkins et al., 2008; Hawkins & Erickson, 2015; Stanley et al., 2020), and when long-term data are collected, some show the prevention of divorce (Stanley et al., 2014).

Many calls have been made to directly test the impact of relationship education for parents on their children (e.g. Cowan & Cowan, 2014; Markman & Rhoades, 2012), but, compared to the large literature on couple outcomes, few studies have done so (for a review, see Cowan & Cowan, 2014). One of the most direct tests of impacts on child outcomes was for the Family Foundations program for parents during pregnancy and postpartum. The program demonstrated positive impacts on indicators of infant regulation and children's later emotional adjustment (Feinberg et al., 2010; Feinberg & Kan, 2008). Furthermore, a recent meta-analysis suggests that couple-oriented relationship education has significant but small average effects on child well-being and behavior (Hawkins, 2022).

With sustained low rates of marriage and high numbers of children born to unmarried parents, it has become increasingly important to offer relationship education not only to married or premarital couples, but earlier in relationship stages, when some of the most significant events and decisions now happen (Rhoades & Stanley, 2009). Many fewer programs and much less research exist regarding this individual-oriented type of relationship education (Stanley et al., 2020).

This study examined the impact of MotherWise, an individual-oriented relationship education and brief case management/coaching program for minority and low-income pregnant women. Given that all women were pregnant, we chose to examine the program's impact on the earliest indicators of children's well-being – birth outcomes. We used hospital medical chart data to measure preterm birth, the baby's birthweight, and neonatal intensive care unit admission.

The literature on group prenatal (obstetrical) care suggests that birth outcomes could be impacted by this kind of intervention, particularly among highly disadvantaged groups. Group prenatal care is typically offered in hospitals and is a structured group facilitated by a medical provider in which pregnant women meet to learn about pregnancy and infant care. They also receive an individual medical exam during the meeting. Reviews of the literature on group prenatal care indicate that some studies show reductions in preterm birth and decreases in low birthweight for those assigned to group prenatal care versus individual care (Carter et al., 2016), and that these effects may be most pronounced among minority women (Mazzoni & Carter, 2017). Some have hypothesized that the social support component, not only the prenatal medical care received, influences the positive outcomes, particularly for those who are most socially disadvantaged (Chae et al., 2017; Mazzoni et al., 2020). Similarly, prenatal home visiting programs have been shown to have an impact on preterm birth and baby's birthweight, particularly among Black women (Anthony et al., 2021), further suggesting that social programs like relationship education could impact birth outcomes. Additionally, evidence from the Family Foundations couple-based relationship education program shows that it reduces the risk of Cesarean births, although there were no direct impacts on other birth outcomes (Feinberg et al., 2015).

MotherWise is an ongoing community-based program. It includes a 6-week, group-based workshop series on healthy, safe relationships and positive parenting as well as one-on-one coaching/case management. The goal of the program is to equip women with the tools, skills, and resources to make wise decisions for themselves and their children. Using the Within My Reach curriculum (Pearson et al., 2005), mothers meet weekly to consider what strong, healthy families look like to them, ways to communicate effectively, the prevention of domestic violence and maltreatment, and successful co-parenting after a breakup. It also includes



research-based content on partner selection, the impact of relationships on children, strategies for making wise decisions in relationships, co-parenting, aggression, and violence, and communication skills (Rhoades & Stanley, 2009, 2011). Each workshop session also includes information on caring for and connecting with a newborn that was developed for this project.

A recently released report described the positive impact of MotherWise on relationship outcomes. This study was a randomized controlled trial conducted with 953 women. At 1-year after study enrollment, those assigned to the MotherWise program reported better relationship and conflict management skills, less approval of couple violence, greater relationship happiness, and more use of constructive conflict behaviors than those assigned to the no-treatment control group. In addition, those assigned to the MotherWise program had fewer unintended pregnancies in the year following enrollment than those in the control group (Patnaik & Wood, 2021). (For the current study, we used a subset of this sample and medical chart data collected independently.)

In addition, the relationship education curriculum used in the MotherWise program, Within My Reach, has been shown to be effective in improving psychological distress, knowledge of healthy relationships, relationship confidence, communication skills, conflict resolution, commitment, and relationship quality, as well as in reducing domestic violence (Antle et al., 2011, 2013; Carlson et al., 2017, 2018; Cottle et al., 2014; Visvanathan et al., 2015). Improvements in relationship dynamics related to participating in Within My Reach have also been linked with children's mental health (Sterrett-Hong et al., 2018), but impacts on offspring have not been tested directly.

We expected that MotherWise could decrease risk for poor birth outcomes by way of increasing social and community support and decreasing relationship distress, thus reducing maternal stress. Maternal stress has demonstrated clear links to birth outcomes in the obstetrical literature, as stress impacts the vascular system and hormones that can cause preterm birth (Latendresse, 2009). This sample was particularly high risk for poor birth outcomes based on a number of factors, including that most participants were unmarried (Shah et al., 2011) and identified as minorities (Hoyert & Miniño, 2020). Some have argued that the links between maternal stress and poor birth outcomes may be even stronger among groups like those served in MotherWise (Wadhwa et al., 2011).

## Current study

The current study was a randomized controlled trial comparing participants assigned to the MotherWise program to participants assigned to a no treatment control group. We hypothesized that those assigned to the MotherWise program would demonstrate healthier birth outcomes than those assigned to a no-treatment control group as measured by (1) fewer instances of preterm birth, (2) higher birthweight, and (3) fewer admissions to the neonatal intensive care unit. These outcomes were chosen as they are the most investigated and associated with group prenatal care (Mazzoni & Carter, 2017). Hoffman et al. (2016) demonstrated that increased stress during the second trimester, but not at any other time, was associated with an increased risk of preterm birth, so we elected only to include participants enrolled in the study early in pregnancy, who would have been able to receive the intervention by mid-pregnancy.

## METHOD

### Participants

Participants were 136 pregnant women from a larger randomized-controlled trial (see CONSORT diagram in Figure 1). All were receiving prenatal care and delivering at a safety-net hospital in a metro area in the Western U.S. They ranged from 19 to 40 ( $M = 28.68$ ,  $SD = 6.35$ ).

When asked (yes or no) whether they were Hispanic/Latina, 61.8% indicated they were. When asked to check all that apply regarding race, 37.1% checked “other,” 34.1% checked White, 16.7% checked Black or African American, 5.3% checked multiracial, 5.3% checked American Indian or Alaska Native, and 1.5% checked Asian. The majority of participants were unemployed at enrollment (57.8%) and received some form of government benefits (71.9%). Regarding education, 73.8% received a high school diploma or equivalent and 9% graduated from college. In terms of language spoken, 19.6% were monolingual Spanish speaking and the rest spoke English. The vast majority of participants were in a relationship, with 34.6% married, 44.1% engaged or “romantically involved with someone on steady basis,” 9.5% “involved in an on-again off-again relationship,” and 11.8% not partnered.

## Procedures

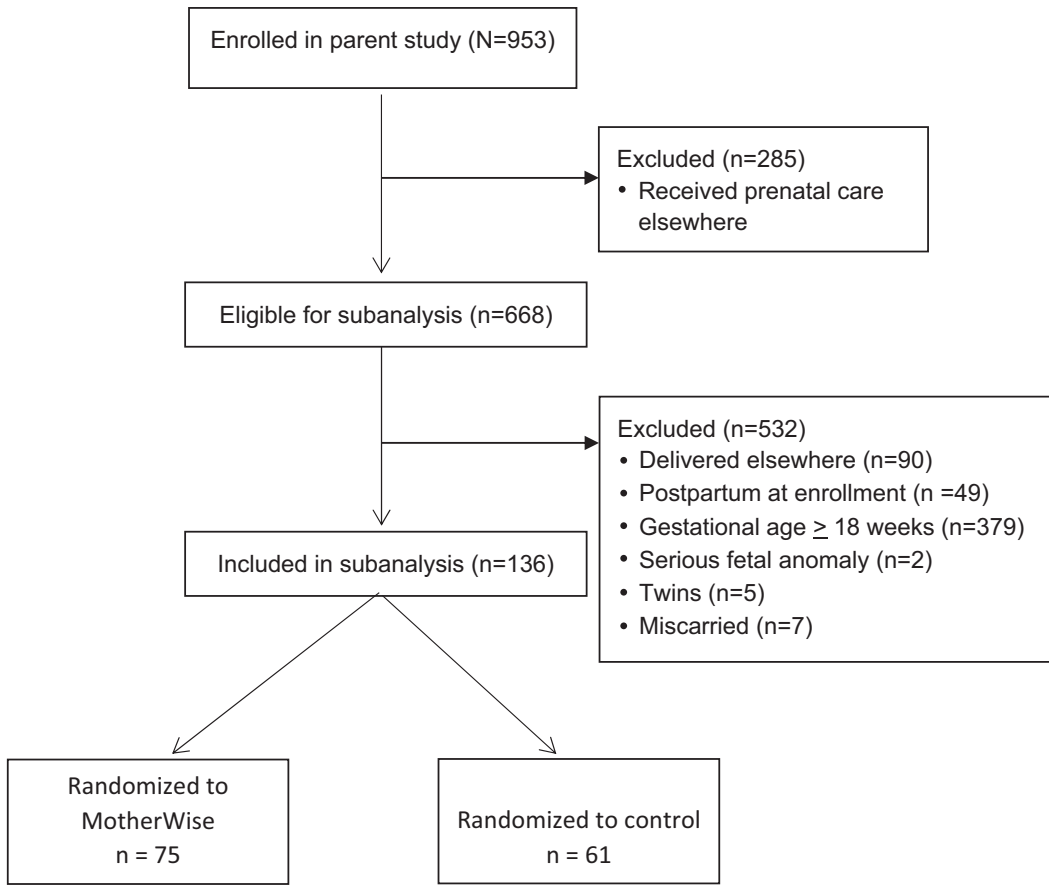
As mentioned earlier, the current study used a subsample from a larger randomized controlled trial on the effectiveness of MotherWise for relationship outcomes conducted by Mathematica Policy Research. For the larger study, pregnant and newly parenting women ( $N = 953$ ) were recruited from prenatal care visits at a safety-net hospital, as well as from the community via social media, radio, and social services referrals. Women did not have to be in a romantic relationship to participate; the only criteria were that they were pregnant or less than 4 months postpartum, 18 years or older, and fluent in English or Spanish. They were either scheduled during their prenatal visits for a study intake or they called or texted the program offices and were scheduled via the phone.

Multiple program staff members performed intakes for the larger study. This intake took place in person and included a description of the study and the MotherWise program, consent procedures (for both the larger study's surveys and the medical chart abstraction used in the current study), as well as a phone survey conducted by Mathematica's calling center. At the completion of the phone survey, computer-generated random assignment was provided and the staff member informed participants of their assigned condition. If they were assigned to the MotherWise group, the staff member scheduled them for a workshop series. If they were assigned to the no treatment control group, they received no services or referrals. All participants were paid \$30 for this intake appointment. Randomization was initially 3:2 to create groups of adequate numbers for workshop groups, then changed to 1:1 when recruitment was deemed sufficient (after 7 months).

For data analyses in the current study, we selected a subsample ( $n = 136$ ) of women who were randomized at <18 weeks gestational age, carrying a singleton, had a non-anomalous gestation, and received prenatal care and delivered at the hospital for which we had direct access to medical records. All study procedures were approved by two university Institutional Review Boards.

## Intervention

As described earlier, MotherWise includes the Within My Reach curriculum (Pearson et al., 2005) augmented with brief (10 min per workshop session) information about self-care and caring for and connecting with a newborn as well as one-on-one coaching/case management. Within My Reach was developed as a relationship education program for those attending without partners. It is based, in part, on the Prevention and Relationship Education Program (PREP, see Markman et al., 2010) as well as Pearson's Love Notes program for teens (Barbee et al., 2016). A central goal of Within My Reach is to provide individuals with resources and skills to make wise choices for themselves and their children. It is based on a cognitive-behavioral model and assumes that it is important to change both behaviors (e.g., conflict management, stay/leave behavior) and cognitions (e.g., self-esteem, expectations for healthy



**FIGURE 1** CONSORT diagram

relationships) to improve relationship experiences. It includes research-based content on partner selection, the impact of relationships on children, strategies for making wise decisions in relationships, co-parenting, aggression and violence, and communication skills (Rhoades & Stanley, 2011). The infant care and parenting content was developed by the program team and covered safe sleep practices, identification of safe caregivers, feeding, self-care, postpartum depression, and connecting with and responding to newborns.

The MotherWise program was offered over 6 weeks in weekly 4-hour workshop sessions. The sessions were a mix of lectures, discussion, videos, group activities, and individual workbook activities. (The workbook they received was kept at the program offices until the end of the program when participants could choose whether to take them home.) For coaching/case management, each MotherWise participant had a dedicated family support coordinator who worked one-on-one with her to apply new skills in her own life and to connect her with other community resources such as mental health, food assistance, housing, and employment services. All program services were available in English and Spanish.

Staff at MotherWise worked as both family support coordinators and workshop facilitators. All workshop sessions were co-facilitated. In some cases, one of the co-facilitators also served as the participant's family support coordinator; in other cases, it was a different person on the family support/facilitation team. These family support coordinators/facilitators ranged in experience and education, with some having a Master's in social work or psychology, others have college degrees, and some having some college education, but no

degree. They were selected based on their experience with the population served, commitment to serving this population, and ability to facilitate classes well. Often, they had lived experience and cultural backgrounds similar to the participants. They were trained in Within My Reach by the developers and met as a team with one of the developers biweekly for supervision.

The program also provided onsite childcare, a meal during workshops for her and her children, and transportation (setup via a rideshare app) to all workshops and family support meetings. Participants in this study also received direct assistance via Visa or Walmart gift certificates for attending program services, including \$30 for their initial visit (mentioned above), \$10 for each workshop session or coaching/case management meeting attended, and \$100 for attending five of six workshop sessions.

In the current study's subsample and of those randomized to MotherWise ( $n = 75$ ), 87% attended at least one class and 30% attended all six classes ( $M = 2.39$  classes,  $SD = 2.83$ ). There were, on average, six women in attendance per class. Participants received an average of three visits with a family support coordinator.

## Measures

### Medical chart data abstraction

Clinical outcomes were abstracted from the participant's electronic medical record and stored in Research Electronic Data Capture (REDCap) by trained data abstractors who were blinded to random assignment. The clinically determined estimated due date was used to ascertain gestational age. Tobacco, illicit drug, and alcohol use were collected by self-report and dichotomized as yes or no as any use at any time during pregnancy. Medical and mental health co-morbidities were defined as any medical illness or psychiatric illness documented in the obstetrical problem list by the caring providers. The primary outcomes of interest were also abstracted from participants' medical records: *preterm birth* (yes/no delivery prior to 37 weeks gestational age), *birthweight* (grams), and admission to the neonatal intensive care unit (NICU) for >1 day (yes/no; excludes infants admitted only for transition). The second author, an obstetrician, reviewed all abstracted clinical data.

### Data analytic plan

All analyses were based on intention to treat. To assess for baseline inequivalence and in order to determine if control variables were necessary to include in the primary analyses, we performed a series of  $t$ -tests for continuous variables and chi-square tests for categorical variables. Several variables from medical charts and the phone surveys Mathematica conducted were tested: age at enrollment, Medicaid insured, race and ethnicity, Spanish speaking, parity (the number of times she has given birth to a fetus with a gestational age of 24 weeks or more), history of spontaneous (not planned or indicated) preterm birth, gestational age at enrollment, medical comorbidity, mental health comorbidity, tobacco use during pregnancy, drug use during pregnancy, and STI during pregnancy. These tests yielded significant differences between participants randomized to MotherWise and participants randomized to the control group on two variables: history of spontaneous preterm birth ( $p = 0.027$ , two tailed) and tobacco use during pregnancy ( $p = 0.006$ , two tailed).

For the primary analyses, binary logistic regressions were used for dichotomous outcomes (NICU admission, preterm birth) and one-way analysis of covariance (ANCOVA) was used for continuous outcomes (birthweight). Given the small sample size and low base rate of the

variables of interest, this report focuses on effect sizes, however, to be consistent with other literature, we present  $p$ -values, as well. Given that the effects were hypothesized, we used one-tailed tests for all primary tests of hypotheses. All analyses controlled for history of spontaneous preterm birth. Given that tobacco use was measured at any point during pregnancy, it is possible that MotherWise could have also affected participants' tobacco use and its subsequent impact on birth outcomes. However, medical chart data abstraction did not capture when tobacco use started or ended relative to program enrollment. Therefore, sensitivity analyses were conducted controlling for tobacco use during pregnancy in order to evaluate the extent to which this variable affected the primary results.

## RESULTS

Preliminary analyses showed that the three outcome variables were minimally to moderately correlated with one another, suggesting they are measuring distinct indicators. Preterm birth was correlated 0.57 with NICU admission and  $-0.34$  with baby's birthweight; baby's birthweight was correlated  $-0.06$  with NICU admissions.

Controlling for history of spontaneous preterm birth, there was a trend for participants randomized to MotherWise to be less likely to experience a preterm birth (spontaneous or indicated; 7 [9.3%]) compared to participants randomized to the control group (12 [19.7%]),  $b = -0.76$ , OR = 0.47,  $p = 0.072$ , one tailed, ES = 0.46). Furthermore, there was a trend for participants randomized to MotherWise to give birth to babies with higher birthweights ( $M = 3254.91$  g,  $SD = 489.77$ ) compared to participants randomized to the control group ( $M = 3136.15$  g,  $SD = 485.79$ ;  $F(1, 132) = 1.687$ ,  $p = 0.098$ , one tailed, ES = 0.23). MotherWise participants were not significantly less likely to have a baby admitted to the NICU (11 [14.9%]) compared to participants randomized to the control group (11 [18.0%]),  $p = 0.187$ , one tailed.

Sensitivity analyses with the addition of tobacco use during pregnancy as a covariate yielded similar findings for preterm birth, birthweight, and NICU admission.

## DISCUSSION

This study is the first to indicate that relationship education programs could impact birth outcomes, which has important implications for public health and related policies. This RCT showed that the MotherWise program, compared to a no-treatment control group, was associated with lower preterm birth rates (a 55% reduction) and higher infant birthweight. These effects were small to medium in size, but, given the small sample, they were not statistically significant by typical standards. Post-hoc power analyses indicated that only effect sizes of 0.43 could be detected as significant two tailed with  $p < 0.05$ . Nevertheless, we believe these findings are important for the development of future, larger studies of relationship education programs and the reach they could have on a wider range of outcomes than are usually assessed.

Although there are indications that relationship education for couples or individuals improves mental health (Carlson et al., 2014, 2017; Roddy et al., 2020), that a relationship education program could have impacts on physical health is new to this field. This type of impact has rarely been examined. Two exceptions are that an online relationship education/therapy program for couples significantly improved perceived general health and insomnia (Roddy et al., 2020) and that there were no main effects of the Family Foundations program on birth outcomes, but there was an impact on the risk of birth by Cesarean section (Feinberg et al., 2015).

These preliminary findings also fit with research showing that group prenatal care impacts birth outcomes, at least in some studies (see Mazzoni & Carter, 2017). Group prenatal care



is similar to the MotherWise program in that it is offered during pregnancy, is group based, and includes some psychoeducation about self-care and postpartum depression, but different in that it also includes clinical care such as blood pressure and fetal heartbeat checks. Some have theorized that it may be these shared components, being with other women with similar experiences, and increased social support that make group prenatal care effective (Chae et al., 2017; Mazzoni et al., 2020).

Our study's findings, while limited by sample size, indicate important avenues for future programming, research, and policy. Most importantly, they suggest that relationship education during pregnancy could impact women's and infant's health directly. Future research should replicate these findings with larger samples to better test the impact of the MotherWise program or relationship education more generally during this critical phase in family development. Additionally, this study suggests that research in both the relationship education and group prenatal care fields should consider a wider range of impacts than are typically assessed.

Mechanisms of effect should also be examined. Is the impact of MotherWise due to increased social support (i.e., being with other pregnant women), connections to community resources (e.g., housing, food assistance), improvements in their romantic relationships, or something else as-yet unstudied? Furthermore, the impacts of maternal stress and cortisol on birth outcomes were buffered by being assigned to the Family Foundations program (Feinberg et al., 2015, 2016), suggesting that moderators may be important to assess in future research in this area. Lastly, given that disparities in maternal health have been well documented in the U.S. for decades, particularly for Black women (Flanders-Stepans, 2000; Hoyert & Miniño, 2020), programs like MotherWise should be examined in the context of race and ethnicity to understand whether these kinds of social programs can reduce health disparities and ultimately improve maternal and infant outcomes for all.

Many have called for greater attention and improved policy regarding maternal health in the U.S. (Gingrey, 2020). The U.S. continues to demonstrate abysmal maternal mortality rates, lagging behind other developed nations (Walani, 2020). Preterm birth is a key indicator of maternal health and rates by state are tracked by the March of Dimes. They grade states from F (among six states) to A (only Vermont), with the U.S. overall last receiving a C- (2021 March of Dimes Report Card, 2021). The cost of a single preterm birth, only in terms of medical care within the 6 months after birth, is estimated to be \$76,153 (Beam et al., 2020). A full cost study of the MotherWise program would need to be conducted to fully sort out the financial, tax-payer savings related to the program, but we estimate, based on the first 5 years of running the program, that the cost per person of the MotherWise program is roughly \$2000. MotherWise is cost effective in part because implementing the program does not require medical/other advanced degrees or medical or mental healthcare, as traditionally defined. Due to the coronavirus/Covid-19 pandemic, it has also now been implemented virtually, via video conferencing, which could lead to further cost savings. Future research could compare these models. More broadly, if the effects of this study are replicated and a relatively inexpensive psychosocial program like this can reliably impact maternal and infant health, these kinds of programs should be used widely as a way to address the maternal health crisis in the U.S.

## DISCLOSURES

With Scott Stanley and Marline Pearson, Galena Rhoades co-developed “Within My Reach” and receives royalties and payment for trainings in the curriculum.

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# Individual-Oriented Relationship Education and Postpartum Depression: The Impact of the MotherWise Program

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Postpartum depression is the most common complication of childbearing and has serious negative impacts on both women and their children. Yet, due to stigma and barriers to accessing mental health care, many women do not engage in postpartum depression treatment. As a result, scholars have called for a shift in applied postpartum depression research from intervention to prevention in order to circumvent barriers to treatment and evade the negative consequences of this major public health issue. MotherWise is a community-based program for women who are pregnant or who have recently had a baby that combines an evidence-based relationship education curriculum developed for individuals (Within My Reach) with case management and information on infant care and parenting. Using data from medical charts, the present study evaluated the impact of MotherWise on postpartum depression, as well as history of depression, race, and ethnicity as moderators of these effects. The study sample included 425 women who enrolled in a larger randomized controlled trial of MotherWise during pregnancy. Results indicated that the program was associated with lower rates of positive postpartum depression screens among women without a history of depression, as well as among women who identify as Black or African American. The current project demonstrates the potential for individual-oriented relationship education programming to prevent postpartum depression among certain groups.

### **Public Significance Statement**

It is necessary to consider multiple prevention and treatment options for postpartum depression in order to circumvent barriers to treatment and mitigate the deleterious effects of this disorder on women and their families. This study highlights relationship education as a unique path forward in combatting this major public health issue.

*Keywords:* relationship education, postpartum depression, prenatal

Postpartum depression is the most common complication of childbearing, affecting up to 20% of women in the United States. Although depression of any kind can have serious negative

impacts on women, postpartum depression inherently includes caring for a young infant while experiencing depressive symptoms, contributing to increased stress and poor caretaking behaviors

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(O'Hara & McCabe, 2013). Further, this disorder is also associated with a host of behavioral, cognitive, mental, and physical health-related consequences for the child (Closa-Monasterolo et al., 2017; O'Hara & McCabe, 2013).

Despite the important consequences of postpartum depression, only half of women experiencing this disorder actually engage in treatment (Ko et al., 2012). These low rates of treatment engagement are likely due to barriers such as stigma surrounding mental health care, opposition to treatment, and shame around experiencing depressive symptoms during a time that is meant to be joyful (Bina, 2020; Werner et al., 2015), as well as concern around taking psychotropic medications while breastfeeding (O'Hara & McCabe, 2013; Werner et al., 2015). There are also practical barriers to treatment, such as transportation or cost limitations (Ko et al., 2012). Given these difficulties in engaging women in postpartum depression treatment, scholars have called for a shift in applied postpartum depression research to focus not only on intervention, but also on prevention (Werner et al., 2015).

Poor romantic relationship quality is associated with greater depressive symptoms (Braithwaite & Holt-Lunstad, 2017; Faisal-Cury et al., 2021; Małus et al., 2016). Specifically, destructive patterns of communication contribute to lower relationship confidence in women, which in turn leads to increases in depressive symptoms (Whitton et al., 2007). Indeed, the limited studies of the associations between relationship quality during pregnancy and postpartum depression suggest that issues present in the relationship during pregnancy (e.g., low relationship satisfaction, destructive communication, lack of emotional support) contribute to the development of postpartum depression after the birth of a baby (Letourneau et al., 2012; Perfetti et al., 2004; Whisman et al., 2011). Therefore, engaging in relationship interventions during pregnancy could be one unique way to prevent postpartum depression via reductions in interpersonal distress.

Relationship education provides training in skills and strategies that help individuals and couples increase their chances of having healthy and stable relationships and interpersonal interactions (Markman & Rhoades, 2012). Studies have shown that participating in relationship education during pregnancy is associated with greater psychological well-being postpartum (Pinquart &

Teubert, 2010). Further, a relationship education program for unmarried couples having a baby, Family Expectations, found that participants assigned to the program group demonstrated fewer depressive symptoms at the 15-month follow-up compared to the no-treatment control group (Devaney & Dion, 2010).

Although findings suggest that relationship education targeting perinatal populations has the potential to reduce risk for developing depression, studies of relationship education to date have primarily focused on programming delivered to couples, rather than individuals. Yet, many individuals are not married or in committed relationships when having a baby, suggesting the need for programming relevant to individuals of all relationship stages, including those who are unpartnered (Rhoades & Stanley, 2009). Individual-oriented relationship education has the potential to make even greater impacts on individual and relationship well-being than couple-oriented relationship education because it addresses topics relevant to not only current relationships (e.g., communication skills), but also future relationships (e.g., ways to identify and leave unsafe relationships, how to choose a partner) and parenting/co-parenting (e.g., how children influence and are impacted by relationship choices and experiences; Rhoades & Stanley, 2009, 2011). Indeed, studies of Within My Reach, the individual-oriented relationship education curriculum utilized in the present study, have demonstrated interpersonal benefits for both partnered and unpartnered individuals. For those in a relationship, participating in Within My Reach is associated with increased relationship confidence and quality, better communication skills, and reductions in conflict behaviors (Stanley et al., 2020; Visvanathan et al., 2015), as well as decreases in psychological distress (Carlson et al., 2017). For unpartnered individuals, participating in Within My Reach is associated with improvements in general relationship and communication skills (e.g., problem solving, anger management), as well as belief in their ability to obtain healthy relationships in the future (Visvanathan et al., 2015).

MotherWise is a community-based program for women who are pregnant or who have recently had a baby that combines Within My Reach, information on infant care and parenting, and case management. This study tested the impact of MotherWise specifically on postpartum

depression. In other reports from this randomized controlled trial, women assigned to the program reported better relationship skills and more healthy attitudes toward relationships one and two-and-a-half years after enrollment than those assigned to no-treatment (Patnaik et al., 2022; Patnaik & Wood, 2021). They also experienced fewer relationship transitions than those in the control group (Patnaik et al., 2022).

Further, MotherWise was associated with positive impacts on outcomes not directly targeted within the program, including lower risk for pre-term birth and higher infant birthweight (Rhoades et al., 2022), as well as fewer unintended pregnancies in the year following enrollment (Patnaik & Wood, 2021).

Of particular interest to the present study, the longer term follow-up data show that there was not a significant impact on depression one or two-and-a-half years after enrollment (Patnaik et al., 2022; Patnaik & Wood, 2021). However, postpartum depression symptoms are most likely to emerge in the first few weeks after delivery (American College of Obstetrics and Gynecology, 2019; O'Hara & McCabe, 2013). Given that studies of relationship education have not evaluated postpartum depression symptoms during the early postpartum period (e.g., Devaney & Dion, 2010; Patnaik & Wood, 2021), the present study evaluated program effects on depression in the first 12 weeks following delivery.

Beyond understanding whether MotherWise is effective in preventing postpartum depression, it is also necessary to understand for whom this type of programming is most effective. Previous studies of relationship education suggest that populations most at-risk tend to benefit the most from relationship education (Stanley et al., 2020). One risk factor for postpartum depression is history of depression, as women who have experienced past depressive episodes are more likely to develop depression following the birth of a child (O'Hara & McCabe, 2013). Further, women of color, particularly women who identify as Black or Latina, experience postpartum depression at disproportionately higher rates compared to non-Hispanic White women (O'Hara & McCabe, 2013; Pao et al., 2019). These realities underscore the importance of understanding whether prevention programming such as MotherWise is a feasible option for combatting postpartum depression among groups most at-risk for developing it.

## The Present Study

The present study evaluated the effects of MotherWise on screening positive for postpartum depression at mothers' postpartum or well-baby visit. It also tested history of depression, race, and ethnicity as moderators of these effects. We hypothesized that those randomly assigned to participate in MotherWise during pregnancy would be less likely to screen positive for postpartum depression compared to those in the no-treatment control group. Further, we hypothesized that those at greatest risk for postpartum depression, as measured by identifying as Black or African American or Hispanic/Latina, or having a history of depression, would show the strongest effects of the program.

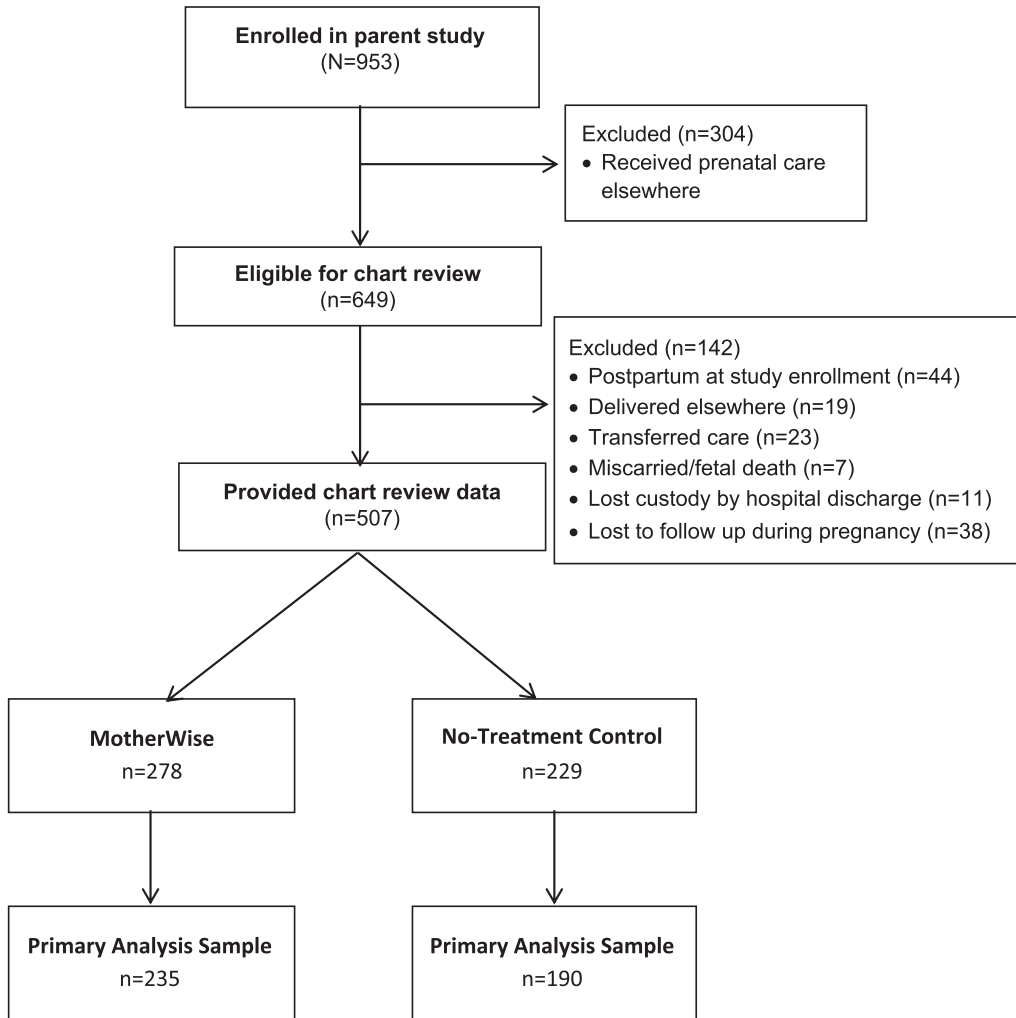
## Materials and Method

### Participants and Procedure

Participants included a subset of 425 women who enrolled in a larger randomized controlled trial (RCT) regarding the effectiveness of the MotherWise program on long-term family outcomes ( $N = 953$ ; see Figure 1). Participants in the present study ranged from ages 18- to 43-years old and primarily identified as Hispanic or Latina (73.2%) followed by non-Hispanic White (14.5%), Black or African American (11.8%), and other (0.4%). Most women had earned the equivalent of a high school degree (e.g., general educational development test) or higher at the time of enrollment (73.4%), while 26.6% did not graduate from high school or earn their general educational development test; 9.9% had earned a college degree. Employment status varied, with the majority unemployed at enrollment (58.3%), and the remaining working temporarily/seasonally (18.2%), part-time (12.6%), or full-time (11.0%). Although not a requirement to participate in MotherWise, the majority of women (75.8%) reported having Medicaid as their primary form of insurance and 72.1% reported receiving some form of public assistance in the past month (e.g., Temporary Assistance for Needy Families, Supplemental Nutrition Assistance Program, Special Supplemental Nutrition Program for Women, Infants, and Children).

Most participants were in a relationship at enrollment, with 32.5% married, 46.6% engaged



**Figure 1***Consolidated Standards of Reporting Trials Diagram of MotherWise Participants in Present Study*

or “romantically involved with someone on steady basis,” 8.2% “involved in an on-again off-again relationship,” and 12.7% not partnered. One-third (33%) of women had a history of depression and 26% screened positive for prenatal depression at some point during pregnancy. Forty percent (40%) were pregnant with their first child at the time of enrollment. The average gestational age at enrollment was 23.68 weeks ( $SD = 8.45$ ; range = 5.29–38.71 weeks). See Table 1 for demographic and prenatal characteristics by randomization status.

For the larger randomized controlled trial of MotherWise, participants were recruited from

exam rooms in obstetrics and gynecology clinics and pediatrics clinics, flyers, referrals from the clinic or agency staff members, and radio, television, and social media advertising. For in-person recruitment (e.g., in exam rooms), project staff described the MotherWise program and associated study to the patient and, if she was interested in participating, staff scheduled her for an intake appointment. Women were eligible for enrollment into the larger RCT if they were pregnant or delivered a baby within the past 3 months, were age 18 or older, and were English or Spanish speaking. Inclusion in the present study was further restricted to only women who were pregnant

**Table 1**  
*Demographic and Pregnancy Characteristics by Randomization*

Characteristic	No-treatment control ( <i>N</i> = 190)	MotherWise ( <i>N</i> = 235)	<i>p</i> value
	<i>M</i> ( <i>SD</i> ) or %	<i>M</i> ( <i>SD</i> ) or %	
Age at enrollment (years)	27.56(6.22)	28.18(5.79)	.293
Black/African American (%) <sup>a</sup>	15%	12%	.318
Hispanic/Latina (%)	63%	71%	.086
High school degree (%)	69%	77%	.067
Medicaid (%)	76%	76%	.992
Unemployed (%)	56%	59%	.455
In a relationship (%)	84%	90%	.093
History of depression (%)	35%	31%	.423
Gestational age at enrollment (weeks)	24.32(8.50)	23.32(8.37)	.179
Prenatal EPDS <sup>b</sup>	6.43(4.78)	6.54(4.76)	.814

*Note.* EPDS = Edinburgh Postnatal Depression Scale.

<sup>a</sup>Seven participants identified as both Black/African American and Hispanic/Latina. In these cases, participants were assigned to the Black/African American group. <sup>b</sup>Based on average of prenatal depression EPDS scores across first, second, and third trimesters.

at enrollment, delivered at the local safety-net hospital, and attended a postpartum or well-baby visit following delivery, when women were regularly assessed for postpartum depression. Women did not need to be in a romantic relationship to participate, though the vast majority were. All services were offered in both English and Spanish.

At intake, participants met with an intake specialist at the MotherWise offices in order to learn more about the study and MotherWise program. Verbal consent was then obtained over the phone by the organization conducting the larger RCT, Mathematica Policy Research, before study measures were collected. At the end of the appointment, participants were randomly assigned to the program or no-treatment control condition by Mathematica using computer-generated randomization software. Randomization was initially 3:2 in order to create adequate class sizes in the program group, then changed to 1:1 when recruitment was deemed sufficient (after 7 months). Participants were paid \$30 for this intake appointment, regardless of randomization status.

Participants assigned to the MotherWise program attended six weekly group-based workshops lasting 4 hr each (with a meal, childcare, and transportation included) and up to four case management sessions. In the present study, of those randomized to MotherWise (*n* = 235), participants attended an average of four out of six classes and three out of four case management sessions.

MotherWise participants received a \$10 gift card for each workshop session and case management meeting attended, and \$100 for attending five of six workshop sessions. Participants assigned to the no-treatment control group did not receive any additional services or referrals as part of this study but continued prenatal care as usual.

All participants in the present study also consented to medical chart review. Trained research assistants blinded to random assignment extracted data from participants' medical records via the hospital electronic medical record system. Reliability checks were conducted every 4–6 weeks in order to ensure that all research assistants were correctly following the data extraction protocol.

For the present study, we limited the sample to only those who enrolled in MotherWise during pregnancy and delivered a live infant at the local county hospital where medical chart data were available (45% of the larger sample; see Figure 1). This study was not preregistered and all study procedures were approved by two university institutional review boards.

## Intervention

MotherWise is designed to support pregnant and postpartum women, particularly those who are underresourced, in making wise decisions for themselves and their children by learning about healthy relationship patterns, new skills,

and self-awareness through participation in group-based workshops. It is based on a cognitive behavioral model and assumes that it is important to change both behaviors (e.g., conflict management, stay/leave behavior) and cognitions (e.g., self-esteem, expectations for healthy relationships) to improve relationship experiences. The 6-week program (24 hr) utilized the evidence-based curriculum for individuals, *Within My Reach* (Pearson et al., 2005), and addresses research-supported ways to choose a partner, communicate effectively in close relationships, solve problems, manage conflict in their families, co-parent, address aggression and violence, and exit unhealthy relationships safely (Rhoades & Stanley, 2009, 2011). The program also includes brief (approximately 10 min), supplemental information about caring for and connecting with a newborn, engaging in self-care, and recognizing postpartum depression. All groups were co-facilitated by women with experience providing case management and/or relationship skills education and with relevant educational backgrounds, including some holding Bachelor's or Master's degrees in social work or psychology. All facilitators completed a 24-hr *Within My Reach* training prior to delivering the curriculum, as well as on-the-job training in the *MotherWise* program.

In addition to these workshops, each *MotherWise* participant was assigned a dedicated case manager with whom she worked individually to apply skills learned in the workshops to her own life and to connect her with other community resources (e.g., food assistance, housing, and employment services). There were six case managers involved in the program at the time of the present study, each with an active caseload of 10–20 participants. Some of the time, participants had a group workshop facilitator who also served as their case manager, and other times, participants had facilitators different from their case manager. The case managers and group facilitators often held identities and had lived experiences similar to the participants served. Treatment adherence was assessed using surveys after each workshop session. In the surveys, facilitators reported how much of the curriculum materials they used and the degree to which they followed the instructor's manual. Fidelity was assessed via biweekly meetings with one of the curriculum developers. The facilitators recorded all workshop sessions for fidelity review. The developer reviewed approximately 5 hr of audiotape of *Within My Reach*

workshop sessions every 2 weeks to identify topics to discuss during biweekly check-in meetings with the program director and facilitators. Patnaik and Wood (2021) reported that facilitators demonstrated high treatment adherence and fidelity to the program.

## Measures

### *Postpartum Depression*

The hospital from which participants were recruited and received prenatal care utilizes the 10-item Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) to screen for depression during the perinatal period. Participants' EPDS scores were collected via medical chart review of postpartum and well-baby visits. The majority of women (70.8%) provided postpartum depression data between 5 and 9 weeks postpartum ( $M = 6.80$  weeks,  $SD = 1.92$ , range = 2–12 weeks postpartum), which is typically when their postpartum visit is scheduled. For the present study, a positive screen for postpartum depression was defined as a score  $\geq 10$  (Closa-Monasterolo et al., 2017; Earls, 2010). The present study also demonstrates good internal consistency among items ( $\alpha = .91$ ).

### *Moderators and Covariates*

History of depression was gathered via medical chart review. History of depression was defined as any diagnosed depression prior to pregnancy that was documented in participants' medical chart notes or problem lists by a medical provider.

The EPDS (Cox et al., 1987) was also used clinically to assess prenatal depression during each trimester of pregnancy. In the present study, prenatal depression was measured using the mean of EPDS scores across all trimesters of pregnancy to account for inconsistency in timing and frequency of prenatal EPDS administration (only 4.9% of participants were administered the EPDS during each trimester).

Participant race and ethnicity were gathered as part of Mathematica's baseline phone survey and were self-reported. We were particularly interested in examining women who identified as Black/African American or Hispanic/Latina; therefore, these variables were dichotomized into Black/African American (1) versus not Black/African American (0) and Hispanic/Latina (1) versus not Hispanic/Latina (0).

## Statistical Analysis

Approximately, 7.5% of the overall sample was excluded from analyses due to missing values (6% of the no-treatment control group, 9% of the program group). As a result, 393 participants ( $n = 179$  in the control group,  $n = 214$  in the program) were included in analyses. All analyses were intent-to-treat and used two-tailed tests and a standard of  $p < .05$ . To assess for baseline inequivalence among demographic characteristics, we performed a series of  $t$  tests for continuous variables and chi-square tests for categorical variables. These tests demonstrated a significant difference in the percentage of participants randomized to the program and control groups who identified as Hispanic/Latina ( $p = .046$ ). Ethnicity was tested as a moderator of program effects. Participants assigned to the program and control groups did not demonstrate significant differences in any other demographic characteristics at enrollment ( $ps > .086$ ).

We report effect sizes using the Cox index, which is an unbiased estimator of the effect for a dichotomous outcome comparable to estimates of effect sizes for continuous outcomes (e.g., Hedges'  $g$  or Cohen's  $d$ ; Sánchez-Meca et al., 2003; see also, What Works Clearinghouse, 2020). The impact of MotherWise on the dichotomous outcome of screening positive for postpartum depression was evaluated using binary logistic regression, with intervention status (MotherWise vs. control) as the independent variable and postpartum depression as the outcome variable. For analyses of moderation, the interaction between intervention status and each moderator variable (Black/African American, Hispanic/Latina, and history of depression) was added to separate binary logistic regression models. In order to account for variability in gestational age at enrollment, gestational age was included as a covariate in all analyses. In addition, in order to parse out the possibility of depression during pregnancy contributing to program effects on postpartum depression, we included prenatal depression as a covariate in all analyses.

## Results

Although those assigned to MotherWise were less likely to screen positive for postpartum depression (16%) compared to the control group (21%) overall, this difference was not statistically

significant ( $b = -.35$ ,  $OR = .71$ ,  $p = .221$ , effect size [ES] = .21; see Table 2).

There was a main effect of race on postpartum depression such that those who identified as Black or African American were significantly more likely to screen positive for postpartum depression compared to those who did not identify as Black or African American ( $b = 1.29$ ,  $p = .008$ ,  $ES = .78$ ). Race also moderated the impact of MotherWise on postpartum depression ( $b = -1.76$ ,  $p = .035$ ; see Table 2) such that program effects were significant only for participants who identified as Black or African American. Over one-third (39%) of Black control group participants screened positive for postpartum depression compared to only 15% of Black participants assigned to MotherWise ( $b = -2.52$ ,  $p = .019$ ,  $ES = 1.53$ ). Those who did not identify as Black did not significantly differ in their postpartum depression based on random assignment ( $p = .899$ ).

The main effect of ethnicity on postpartum depression was not significant ( $p = .971$ ). In addition, the test for moderation of program effects based on whether participants identified as Hispanic or Latina was not significant ( $p = .961$ ; see Table 2).

The main effect of history of depression on postpartum depression was not significant ( $p = .321$ ). However, history of depression moderated program effects ( $b = 1.25$ ,  $p = .030$ ; see Table 2) such that program effects were significant only for participants without a history of depression, contrary to our hypothesis. Nineteen percent (19%) of control group participants without a history of depression screened positive for postpartum depression compared to only 10% of those assigned to MotherWise without a history of depression ( $b = -.85$ ,  $p = .031$ ,  $ES = .51$ ). Those with a history of depression did not significantly differ in their postpartum depression based on random assignment ( $p = .361$ ).

## Discussion

The findings from our study indicate that the MotherWise program did not significantly impact the incidence of having a positive postpartum depression screen overall; however, the program was associated with lower rates of positive postpartum depression screens among women without a history of depression, as well as among women who identify as Black or African American. Thus, our results demonstrate the potential for

**Table 2**

*Binary Logistic Regression Models of Main Effects and Moderation of MotherWise on Postpartum Depression*

Variable	<i>b</i>	<i>SE</i>	Odds ratio	(95% CI)	
				<i>LL</i>	<i>UL</i>
<b>Main effects</b>					
MotherWise	-0.35	0.28	0.721	0.41	1.23
Constant	-2.58***	0.51	0.08		
<b>Black or African American</b>					
MotherWise	-0.05	0.31	0.88	0.52	1.76
Moderator	1.29**	0.49	3.63	1.39	9.48
MotherWise × Moderator	-1.76*	0.83	0.17	0.03	0.89
Constant	-2.90***	0.54	0.06		
<b>Hispanic or Latina</b>					
MotherWise	-0.40	0.49	0.67	0.26	1.73
Moderator	-0.05	0.41	0.95	0.42	2.13
MotherWise × Moderator	-0.08	0.60	1.09	0.34	3.50
Constant	-2.55***	0.56	0.08		
<b>History of depression</b>					
MotherWise	-0.90*	0.39	0.41	0.19	0.87
Moderator	-0.43	0.43	0.65	0.28	1.51
MotherWise × Moderator	1.25*	0.58	3.49	1.13	10.84
Constant	-2.30***	0.53	0.10		

*Note.* *SE* = standard error; *CI* = confidence interval; EPDS = Edinburgh Postnatal Depression Scale; *UL* = upper limit; *LL* = lower limit. Positive screen for postpartum depression (EPDS ≥ 10) = 1, does not meet criteria = 0. Black/African American = 1, not Black/African American = 0. Hispanic/Latina = 1, not Hispanic/Latina = 0. history of depression = 1, no history = 0.

\*  $p \leq .05$ . \*\*  $p \leq .01$ . \*\*\*  $p \leq .001$ .

relationship education delivered to pregnant women to prevent postpartum depression among certain groups. It makes sense that MotherWise may not have a universal impact on postpartum depression, as the program does not target depression specifically. Rather, through the many facets of the program, MotherWise addresses barriers to treatment and risk factors for depression that could ultimately lead to lower risk for postpartum depression, at least for some.

Studies have shown that experiencing stress during pregnancy is a risk factor for developing postpartum depression (O'Hara & McCabe, 2013; Werner et al., 2015). Compared to White women, Black women are disproportionately more likely to experience chronic stress (Jackson et al., 2010), including higher levels of stress and fewer buffers of stress during pregnancy (Borders et al., 2015). Perhaps program impacts among Black women stem from MotherWise providing services that combat stress in myriad ways. First, MotherWise teaches women healthy relationship skills that improve romantic relationships (Antle et al., 2011, 2013; Visvanathan et al., 2015). By providing information and skills to reduce interpersonal distress, women likely also experience improvements

in their individual well-being, as relationship and individual functioning are highly correlated (Whisman & Baucom, 2012). Indeed, as previously noted, participants enrolled in the larger MotherWise RCT demonstrated significantly improved relationship skills and more healthy attitudes toward relationships 1 year after enrollment (Patnaik & Wood, 2021), suggesting a possible mechanism by which MotherWise prevents postpartum depression. Second, social support is an important protective factor against postpartum depression, though this has been shown regardless of race (Pao et al., 2019). Perhaps relationship education presents a unique form of support that has not been comprehensively examined among perinatal women. Indeed, other forms of group support, such as group prenatal care, demonstrate that women engaging in group prenatal care with higher levels of stress or lower levels of social support experience greater improvements in individual mental health compared to those who engage in individual care (Heberlein et al., 2016). Similarly to our findings, a meta-analysis conducted by Carter et al. (2016) found that only African American women experienced lower rates of preterm birth after engaging in group prenatal



care, suggesting that women who identify as Black or African American tend to benefit the most from group-based support. Finally, MotherWise offers case management that provides important resources that could address sources of distress, such as lack of housing and essential baby items. Taken together, this combination of resources, education, and social support offered through MotherWise could be especially relevant and helpful for targeting the chronic stress that Black women face.

Further, one barrier to postpartum depression treatment is stigma around mental illness and mental health care (Abrams et al., 2009). In particular, women of color are among those least likely to seek mental health services for postpartum depression, and when they do engage, they often receive a lower standard of care (Kozhimannil et al., 2011; Ward et al., 2009). Indeed, women of color are less likely to receive follow-up treatment or continued care (Kozhimannil et al., 2011) and may have limited access to culturally competent providers and clinicians of color (Ward et al., 2009). Black women can experience several barriers to accessing treatment, including stigma around mental illness, distrust of the health care system, lack of insurance, and lack of culturally competent providers (American Psychiatric Association [APA], 2017a). As a result, they may be more likely to rely on nonclinical forms of depression coping, such as religion (Ward et al., 2013). Perhaps relationship education is a less stigmatizing entry point to services that help to prevent postpartum depression, which extends the reach to populations who may not engage in or receive adequate mental health care otherwise. In comparison, individuals who identify as White tend to be more open to receiving mental health services (Kozhimannil et al., 2011). It is possible that women who are more likely to engage in mental health treatment do not experience additional benefits of MotherWise in fewer incidences of positive postpartum depression screens, as they are more likely to have other clinical supports or resources already in place.

Results also demonstrated that MotherWise may prevent new instances of positive postpartum depression screens but not among those with a history of depression. This makes sense given that the program is focused on implementing healthy relationship skills and recognizing signs of individual distress, rather than treating depression itself. One of the most prominent and

effective postpartum depression prevention programs, Reach Out, Stand strong, Essentials for new mothers (ROSE), addresses similar risk factors for postpartum depression as MotherWise, such as social support, role transitions, and life stressors (Zlotnick et al., 2011, 2016). However, ROSE addresses these risk factors directly using an interpersonal psychotherapy framework and found overall program effects regardless of history of depression (Zlotnick et al., 2011, 2016). Conversely, MotherWise indirectly addresses risk factors for postpartum depression through group participation in relationship education and individual case management. As such, perhaps indirect prevention such as MotherWise is particularly helpful for mothers without a history of depression, who are often overlooked in postpartum depression prevention (Shorey et al., 2018).

It is important to acknowledge that the effects of MotherWise on screening positive for postpartum depression were not moderated by whether women identified as Hispanic or Latina, despite the fact that Hispanic/Latina women face barriers to mental health treatment and risk factors for postpartum depression similar to Black women (APA, 2017b; Borders et al., 2015; Kozhimannil et al., 2011). Perhaps these groups of women differed in their social support, stress, or depression upon entering the program, which led to differences in program impact. Indeed, Hispanic and Latina participants were less likely to have a history of depression (27% vs. 33%) and demonstrated lower prenatal depression scores at enrollment (6.08 vs. 7.20) compared to Black participants, though these differences were not statistically significant ( $ps > .144$ ). Further, a sizeable portion of Hispanic/Latina participants were born outside of the United States (46%). Though we did not have the sample size to analyze these groups separately, it is possible that program effects occurred in the context of the immigrant paradox (Schwartz et al., 2010) in which immigrants demonstrate better psychological health compared to nonimmigrants. Additionally, some participants were also undocumented (though we did not collect data on exact numbers), which likely affected their willingness to disclose mental health concerns and receive similar community resources compared to women who hold documentation status. As a result, they may not have been able to fully benefit from MotherWise in the same way as Black women.

## Implications and Applications

The present study lays the groundwork for exploring unique avenues of preventing postpartum depression. MotherWise, an individual relationship education and case management program, is associated with fewer positive postpartum depression screens among women who identify as Black or African American and women without a history of depression. Consistent with a previous study examining depression 1 year after enrollment, the program did not have an impact on depression in the early postpartum period among the overall sample (Patnaik & Wood, 2021), and it is less clear why program effects emerged only among particular groups. We hypothesize that increased access to social support and healthy relationship skills that help to reduce stress could be particularly effective for those who are less likely to interface with mental health providers and/or receive suboptimal health care (Kozhimannil et al., 2011; Ward et al., 2009). Thus, participating in group relationship education classes may be a more approachable way to promote self-awareness, overall well-being, and openness to seeking help. In addition, perhaps certain content within the program was more salient for Black women, or the overall structure of gathering as a group of women was particularly impactful, as suggested by Carter et al. (2016). Thus, further exploration of the mechanisms by which MotherWise is associated with fewer positive postpartum depression screens (e.g., improvements in relationships, increases in social support, reductions in stress) is important.

Given the low rates of postpartum depression treatment engagement and increased need for more prevention options (O'Hara & McCabe, 2013; Werner et al., 2015), MotherWise and other relationship education programs could be a viable way to expand current postpartum depression prevention efforts. Further, MotherWise may also strengthen women's awareness of postpartum depression and ways to access services, creating an approachable entry point for pursuing important mental health services. It is pertinent to evaluate how the effects of MotherWise compare to other forms of relationship education, such as those serving pregnant and postpartum couples (e.g., Family Expectations; Ritchie et al., 2022) or online services (OurRelationship; Roddy et al., 2020). Such knowledge would help to further clarify whether our findings are limited to

MotherWise or generalizable to other relationship education programming that could further expand the reach of postpartum depression prevention.

Despite promising findings demonstrating the potential for individual-oriented relationship education to prevent postpartum depression among certain groups of women, certain limitations should be noted. First, our data collection were limited to medical chart review data extraction, as well as a standard set of items provided by Mathematica Policy Research and required by the funding agency. Additionally, the primary outcome was a positive screen for depressive symptoms assessed at one postpartum time point rather than a diagnosis gleaned from a comprehensive evaluation. Many women also underreport their postpartum depression symptoms due to stigma regarding mental illness, shame, or fear of being deemed an unfit parent (Perfetti et al., 2004). Thus, we were limited in our ability to thoroughly evaluate depression and test the mechanisms by which MotherWise was associated with lower rates of postpartum depression screens. Further, although certainly a strength of the program, MotherWise includes multiple services to support pregnant and postpartum women, which limits our ability to pinpoint which aspects of MotherWise are particularly impactful on postpartum depression. However, this combination of services is similar to other relationship education programs (e.g., Family Expectations in Oklahoma City; Ritchie et al., 2022), allowing for easier comparison and generalization. Future studies would benefit from exploring which aspects of MotherWise (e.g., curriculum, case management, financial assistance, group dynamics) separately or jointly contribute to postpartum depression prevention.

## Conclusion

In sum, our study demonstrates the viability of MotherWise, an individual-oriented relationship education program, as a form of postpartum depression prevention. This type of programming offers many benefits, such as reducing barriers to treatment (e.g., providing transportation, childcare, services in English and Spanish) and providing relationship education that is generalizable to a variety of relationship stages. In order to expand the reach of services and mitigate the deleterious effects of postpartum depression on

women and their families it is necessary to consider multiple prevention and treatment options. Black and African American women and women without a history of depression enrolled in MotherWise are less likely to screen positive for postpartum depression, thus demonstrating an innovative path forward in combatting this major public health issue.

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Review

# Harnessing technology to provide online couple interventions

Brian D. Doss and Stephen Gabe Hatch

## Abstract

The logistical, financial, and attitudinal barriers to in-person treatments for relationship distress become even more formidable during periods of social isolation and physical separation. Digital couple interventions are a way to overcome these barriers to work with distressed couples in a remote and asynchronous fashion. We present the OurRelationship program as an example of such approach and detail its significant effects on relationship functioning, mental health, health behaviors, coparenting, and child adjustment across several randomized controlled trials. Notably, the program is more effective (and more likely to be completed) when it is provided with a coach and with the romantic partner—illustrating the importance of social connection even when treatments cannot be provided in person.

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Digital Couple Intervention, OurRelationship, Internet, Relationship Education.

## Harnessing technology to provide online couple interventions

Social isolation and separation—including that caused by the recent COVID-19 pandemic—have profound effects on various aspects of individual and relationship functioning. During this pandemic, depressive symptoms [1] and global psychological distress [2] have spiked. There has been a corresponding increase in the use of mental health forums, websites, phone- and text-based crisis lines, as well as apps [3]. Popular online mental health programs, such as *BetterHelp* and

*TalkSpace*, saw large spikes in the number of people seeking help for their mental health concerns [4,5]. As a result, the field needs to ensure that the individuals from disadvantaged populations have access to evidence-based and evidence-informed couple care [3,6].

Information on the impact of the COVID-19 pandemic on relationships in the United States is still in its preliminary stages [7]. Some studies have suggested that the average impact on relationship satisfaction may have been minimal [8]—although there was important variability in that impact. In our own data collected from 260 low-income couples in the United States seeking online help for their relationship (gathered after COVID-19 was declared a national emergency), 35% of couples reported that the pandemic had made their relationship worse. These couples also indicated that family responsibilities also changed. Thirty-five percent of individuals reported spending more time with their kids and family, and 29% of parents reported having more parenting responsibilities. The pandemic also appeared to impact help-seeking behaviors, with 14% of individuals reporting that COVID-19 was among the primary reasons they were motivated to complete our online relationship program.

## In-person couple therapy

Historically, the primary treatment for relationship distress or conflict has been couple therapy. Meta-analyses indicate that couple therapy is effective in improving relationship functioning, with minimal difference among well-established treatments [9]. One of these well-established treatments—Integrative Behavioral Couple Therapy (IBCT; [10])—has been studied in three randomized trials (refer to the study by Christensen and Doss [11] for a summary). In the largest study involving 134 chronically distressed couples, IBCT was shown to improve relationship satisfaction immediately after treatment and through 5-year follow-up, with within-group effect sizes in the large range. Furthermore, couples randomized to IBCT reported significantly larger gains than the couples randomized to Behavioral Couple Therapy at 2-year follow-up [12] but not at 5-year follow-up [13].

Unfortunately, there are important barriers to seeking and receiving couple therapy. Many of those barriers are

logistical, which include taking time off work, transportation, and finding childcare—barriers that are further exacerbated during situations of forced isolation such as the recently experienced COVID-19 lockdowns. Other important barriers include stigma, reluctance to discuss sensitive topics, and substantial costs of couple therapy. As we have discussed elsewhere, the application of technology—both in the form of telehealth and online digital couple interventions—has the ability to overcome many of these barriers [14,15].

### Translating in-person couple therapy to an online program

One promising digital couple intervention—the OurRelationship program [16]—was adapted from IBCT as an online tool to help distressed couples. This program consists of approximately 7–10 h of online content that helps couples identify one or two relationship problems on which to focus (the Observe phase), helps them develop a more nuanced understanding of those problems (the Understand phase), and then provides suggestions for resolving those problems (the Respond phase). Typically, the OurRelationship program is supplemented by four 15- to 20-min calls with a staff coach; these calls occur before, during, and after the program. More information on the structure of the program was provided by Doss et al [16].

From an IBCT perspective, there are several challenges distressed couples face that should be addressed in any relationship intervention—whether delivered online or in person. These challenges guided the major adaptations we made to IBCT in developing the OurRelationship program.

First, the distressed couples tend to perceive their partner as the primary—or even sole—source of their relationship difficulties. This narrow conceptualization typically places too much blame on the partner and ultimately limits the couples' ability to respond with changes that would be more successful in addressing the underlying problem. To address this challenge, IBCT conducts a detailed assessment process during the first several sessions, with a therapist meeting with partners together and separately. Based on this assessment, the therapist presents a DEEP understanding—how Differences, hidden Emotions, External stress, and Patterns of communication create and exacerbate their relationship difficulties—to the couple in the feedback session. In the OurRelationship program, couples develop their own DEEP understanding of their relationship problems by watching videos of example couples, reading about the importance of these DEEP domains and how they impact relationships, and receiving feedback on how they and their partner score (e.g., for Differences, seeing scores on standardized measures of personality, attachment styles, and emotional expressiveness). Once each partner develops his/her own DEEP understandings (by working separately on the

activities on their own), the program then brings the couple together to have a structured conversation to share what they selected for each DEEP component.

A second common challenge for treatment of distressed couples is that they tend to get into fights easily owing to difficulty in regulating emotions, poor communication, or both. In IBCT, the therapist is very active in the sessions to interrupt negative patterns and to structure disclosures and discussions in a way that will be most helpful. In the OurRelationship program, however, this structure is imposed by asking partners to complete activities mostly on their own. In these individual activities, users are encouraged to pick selections (e.g., the biggest difference related to their relationship problem) and write about them in a way that will not be perceived by the partner as blaming. These responses are saved by the program, and then, when the time comes for the partners to share their responses, the program displays these carefully crafted responses on the screen and encourages each partner to share them with the other using a structured speaker–listener conversation. This combination of having time to think about issues ahead of time, carefully editing their statements, and being prompted with those statements during a structured conversation greatly reduces the chance that they will fight during the program.

A third challenge of working with distressed couples is that many of their attempts to solve their relationship difficulties actually make their problems worse. In IBCT, this is addressed by helping couples apply their DEEP understanding to their relationship and engage in acceptance work before turning to more deliberate change strategies. Similarly, the OurRelationship program is structured such that the couples first need to complete the Observe and Understand phases before deciding on the changes that they both want to attempt in the final phase.

Finally, a fourth challenge of working with distressed couples is that they have minimal inclination (and often minimal ability) to be emotionally vulnerable. They often become so focused on defending themselves or landing the next verbal jab that admitting their fears, worries, and hurts feels like surrender. However, it is exactly these vulnerable emotional disclosures that offer the best hope to help them reestablish their emotional intimacy [17]. In IBCT, therapists elicit disclosures of soft emotions, validate those emotions when they appear, encourage direct sharing of those emotions with the partner, and structure the partner's reaction so that both feel validated. In the OurRelationship program, we have struggled to elicit these types of disclosures through the online program. Instead, we have provided these opportunities during the brief scripted coaching calls. These 15- to 20-min calls occur before, during, and at the end of the program with the couple together (not

individually). During these calls, our coaches use leading questions, reflect emotions, and use a soft tone of voice to create emotionally vulnerable disclosures and supportive responses—especially when the couple is responding well to the program and there are important insights or changes to celebrate.

### Research on the OurRelationship program

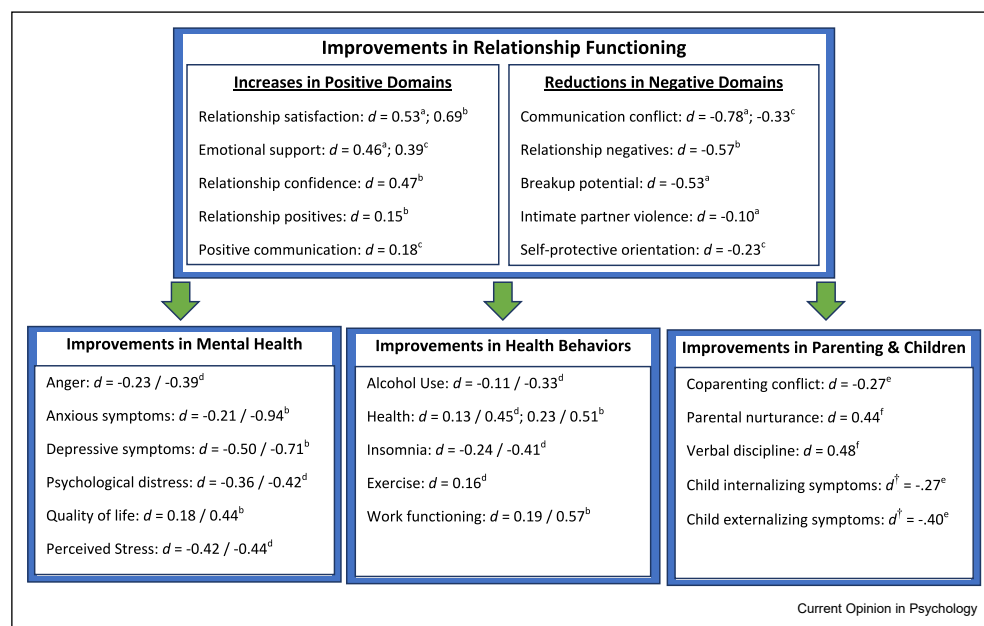
The OurRelationship program has been studied in four randomized trials involving more than 2,000 couples [18–21]. Across those studies—which have included both nationally representative and low-income samples—the OurRelationship program has consistently been shown to improve relationship functioning, with effects generally in or approaching a medium effect size (Figure 1). Furthermore, although the program does not directly focus on individual mental and physical health, the program has consistently shown significant effects in these domains as well. The program's effects on individual functioning tend to be in range of a small effect size when examined across the entire sample; however, the effects are often in the medium range within subsamples of individuals who reported difficulties in individual functioning at baseline (Figure 1). Finally, the program has also been shown to create significant improvements in co-parenting, parenting behaviors, and child depressive and anxious symptoms (Figure 1). Effects of the program on relationship functioning have been shown to be generally consistent across a wide range

of demographic and personality characteristics [20,22–24]. Additionally, gains in relationship satisfaction during the program are mediated by improvements in positive and negative communication, problem intensity, confidence in handling relationship problems, and emotional support [25]. Furthermore, gains in effects on perceived health during the program are mediated by improvements in communication conflict, emotional support, psychological distress, and insomnia [26].

### Social contact within the program

Until now, we have been discussing the role of digital couple interventions in helping couples connect with effective programs to improve their relationship. However, there are two other aspects of social contact to consider within the context of digital couple interventions. First, having virtual contact with a project coach improves program completion rates; couples randomized to have only one call with a coach (compared with the regular four calls) were approximately half as likely to complete the program (36% vs. 66%). Furthermore, couples with only one call experienced significantly smaller reductions in anxious symptoms (but not depressive symptoms or relationship satisfaction [21]). Second, the individuals who did a version of the OurRelationship program on their own (without their partners) did not experience significant gains in relationship functioning (only in individual functioning; [27]). However, these limited effects may be explained

Figure 1



Effects of the OurRelationship program. Between-group effects of the OurRelationship program at the end of the program relative to the wait-list control group. *Note.* <sup>a</sup> = Doss, Knopp, et al., 2020; <sup>b</sup> = Doss et al., 2016; <sup>c</sup> = Roddy et al., 2019; <sup>d</sup> = Roddy et al., 2020; <sup>e</sup> = Doss et al., 2020; <sup>f</sup> = Le et al., 2020; <sup>†</sup> = within-group effect at 12 months (post-tx measure not available). For mental health and health behaviors, the effect sizes before the slash are effects for the entire sample and effect sizes after the slash are for the individuals who presented with problems in those domains at baseline.

by baseline differences in couples where only one partner is willing to participate [27,28] rather than contact between the partners during the program.

## Conclusions

Over a decade ago, in a chapter in a book aptly subtitled “The shape of couple therapy to come,” we wrote about the potential advantages of digital couple interventions and concluded that “the possibilities for expanding our horizons into interventions that reach more and higher-risk couples dramatically increase our potential impact on real-world couples” [29], p. 214. As we have described in this article, much of that potential has been realized. However, other gains in applications of telehealth (which were out of the scope of this article) should also be recognized and celebrated. Furthermore, the possibilities of integrating digital couple interventions into an abbreviated, and thus more accessible, course of couple therapy—whether conducted in person or via telehealth—are exciting and may present an important opportunity to further the reach and effectiveness of both types of interventions [6]. The consequences of extended social isolation and loss, illustrated by the COVID-19 pandemic, are severe and wide-ranging [30,31]. From this despair, however, a renewed focus has emerged on the ability of technology to reduce important barriers to couple interventions even after the end of the pandemic.

## Conflict of interest statement

Brian D. Doss is a coinventor of the intellectual property used in this study and an equity owner in OurRelationship LLC. As such, he may gain royalties from commercialization of the intellectual property.

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# Effects of ePREP and OurRelationship on Low-Income Couples' Mental Health and Health Behaviors: a Randomized Controlled Trial

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## Abstract

Relationship distress is a pervasive problem in the USA that disproportionately impacts couples with low-income levels. The goal of the present study was to evaluate the effectiveness of two online relationship interventions, OurRelationship and ePREP, both of which were supported by a paraprofessional coach, in improving mental health and physical health behaviors with low-income couples. Couples ( $N = 742$ ) were randomized to either intervention or a 6-month waitlist control group and assessed pre-, mid-, and post-intervention as well as at 4 and 6 months after randomization. Results from multilevel models indicated that during treatment, compared to couples in the waitlist group, couples in the intervention groups reported significantly greater improvements in mental health that were small to moderate in magnitude (psychological distress, anger, problematic alcohol use, and perceived stress) as well as improvements in physical health/health behaviors (perceived health, insomnia, and exercise) that were small in magnitude. Furthermore, the differences between intervention and waitlist groups were maintained over follow-up. Treatment gains in both mental health and physical health behaviors were generally stronger for those who began treatment with greater difficulties in those areas. Implications of these findings with regard to intervention and policy are discussed.

**Keywords** Low-income · Couple · Individual mental health · Physical health behaviors · Online

Relationship distress is a pervasive problem in the USA. At any one time, around one-third of marriages are classified as relationally distressed (Whisman et al. 2008); however, research shows less than one-fifth of couples have attended therapy (Johnson et al. 2002). Web-based programs overcome many of the traditional barriers to treatment such as time, cost, transportation, and stigma. Interventions that are easy to disseminate, such as web-based programs, have the potential to create significant change for a large number of people who otherwise may not be able to access treatment. This increased

reach can have impacts not only on relationship functioning but on individual mental health and health behaviors as well.

## Connections Between Relationship and Individual Functioning

Relationship distress is associated with several domains of physical health (see meta-analyses by Robles et al. 2014). Additionally, controlling for baseline illness severity of cardiovascular disease, relationship distress increases the mortality risk (relative-risk ratio = 1.65–2.01; Schafer et al. 1998). Experiencing intimate partner violence also increases the risk of obesity, chronic pain, and other health problems (HHS 2014).

The Strengths and Strains Model of Marital Quality and Physical Health posits that the connections between relationship functioning and health are mediated by changes in individual mental health and health behaviors (Slatcher 2010). Indeed, poor relationship functioning has also been found to negatively impact mental health across multiple studies and across multiple domains of mental health such as increasing depression, anxiety, and substance use (e.g., Whisman 2007). For example, experiencing divorce increases risk for depression (HHS 2014) and relationship distress predicts a 3.7-fold increase in alcohol

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abuse/dependence in the following year, even after controlling for demographic factors and a previous history of alcohol use (Whisman et al. 2006). Furthermore, longitudinal studies link increases in depression/psychological distress immediately following divorce to higher subsequent risk for cardiovascular diseases (Zhang and Hayward 2006) and higher rates of general physical illness a decade later (controlling for initial illness severity; Lorenz et al. 2006).

## Efficacy of Couple Interventions for Mental Health and Health Behaviors

If the Strengths and Strains Model of Marital Quality and Physical Health is correct, interventions targeting relationship distress should have spillover effects into individual domains of mental and physical health. Indeed, prior research has found evidence of these spillover effects. For example, in a study of couple therapy with military veterans, both men (within-group Cohen's  $d = -0.26$ ) and women (within-group Cohen's  $d = -0.23$ ) reported significant decreases in psychological distress over the course of treatment (Doss et al. 2015). Furthermore, the in-person versions of the two web-based interventions tested in the current study, Prevention and Relationship Education Program (PREP) and Integrative Behavioral Couple Therapy (IBCT), have also been shown to reduce psychological distress (Carlson et al. 2014; Christensen et al. 2004).

**OurRelationship Program** An online adaptation of IBCT, the OurRelationship (OR) program, helps couples select the biggest problem they want to work on in their relationship, develop an objective or third-party perspective on that problem, and develop tailored solutions to put into effect around their biggest problem. Compared to the control group, couples in OR reported improvement across a variety of domains of relationship functioning during the program (Doss et al. 2016). In addition, across the entire sample, there was significant but small-sized improvement in depression and anxiety for all participants. Furthermore, when only those individuals who were experiencing difficulties in a particular domain of individual functioning were examined, the effect sizes tended to be in the medium to large range (Cohen's  $d$ s = 0.44 to 0.94; Doss et al. 2016). Over 1-year follow-up, couples in OR maintained the improvements they saw in depression (pre-to-follow-up within-group Cohen's  $d = -0.66$ ) and anxiety (Cohen's  $d = -0.79$ ; Doss et al. 2019).

**ePREP** Originally developed as an in-person marriage and relationship education program (Markman et al. 2010), PREP was later adapted to an online format (ePREP). ePREP is a skills-based program that teaches couples about risk factors for relationship problems including communication danger

signs, conflict management techniques, communication and problem-solving skills, and ways to build commitment and friendship. ePREP has been shown to positively impact several key domains of relationship functioning (Braithwaite and Fincham 2007; Braithwaite and Fincham 2009; Braithwaite and Fincham 2014). In addition to improving the relationship domain, there is evidence that ePREP impacts individual functioning. Specifically, the ePREP program reduced both depression and anxiety symptoms compared to controls at the end of the program (Braithwaite and Fincham 2007) and at 10-month follow-up (Braithwaite and Fincham 2009).

## Critical Relationship Needs of Low-Income Couples

Distress in romantic relationships is heightened for couples with the fewest economic resources. Couples with low-income levels report significantly lower relationship quality than couples with higher-income levels in nationally representative surveys (Lundquist et al. 2014). Furthermore, both non-married cohabiting couples (YouGov Online Survey Firm 2015) and married couples (Bramlett and Mosher 2002) making less than \$25,000 per year are significantly more likely to end their relationship than higher-income households. Importantly, the magnitude of the relationship between relationship distress and psychopathology is consistent across racial and ethnic groups (McShall and Johnson 2015), and relationship distress predicts declines in self-rated health and quality of life within lower-income individuals (Schoenborn 2004).

## OR and ePREP with Low-Income Couples

A meta-analysis of in-person relationship education programs for low-income couples found they have statistically significant but, overall, very small effects on relationship distress ( $d = 0.061$ ), with somewhat larger effects for studies with larger numbers of distressed couples at baseline (Hawkins and Erickson 2015)—a finding that has been replicated in subsequent studies (e.g., Carlson et al. 2017).

Fortunately, the evidence for online programs for low-income distressed couples is more encouraging. In the previous study of OR, 33% of couples were classified as low-income (85 couples; Georgia Salivar et al. 2018), defined as reporting a household income less than 200% of the federal poverty line. Results show couples with lower incomes significantly improved relationship functioning as well as depression and perceived health over the course of the intervention (Georgia Salivar et al. 2018). Furthermore, there were no significant differences in relationship or individual outcomes between couples with lower- and those with higher-income, White, non-Hispanic couples. However, it is important to note

that statistical power to detect differences was low given the small sample size.

Utilizing the same sample of low-income couples as the current study, ePREP and OR created significant improvement at the end of the programs compared to the waitlist control group across several indicators of relationship functioning with minimal differences between the two programs and no moderation by initial distress. Furthermore, couples in both programs maintained gains through a 4-month follow-up (Doss et al. [in press](#)).

## Current Study

The goal of the present study was to evaluate the impact of the OR and ePREP programs on low-income couples' mental health and physical health behaviors during the program and over a 6-month follow-up. We assessed a broader range of individual mental (e.g., psychological distress, perceived stress, alcohol use; see “[Measures](#)” section) and physical health behaviors (e.g., exercise, sleep, perceived health) measures than previously studied. Based on prior literature on these programs, we hypothesized that both OR and ePREP would have a significant impact on mental health relative to a waitlist control group. Given the links between relationship distress and physical health, we also hypothesized that they would have a significant impact on self-reported physical health. We hypothesized these gains in individual mental and physical health would be maintained over short-term follow-up. Furthermore, we investigated whether gains in individual mental health and physical health behaviors during the program and over follow-up were moderated by initial levels of individual functioning.

## Method

### Participants

The majority of participants were female (53%), and same- and opposite-sex couples were included and analyzed together. Participants on average were 33.19 years old ( $SD = 8.51$ ). Most participants were White non-Hispanic (55%) with fewer Black (25%), White Hispanic (9.4%), biracial (5.9%), Asian (1.1%), Black Hispanic (1.1%), American Indian or Alaskan Native (1.0%), and Native Hawaiian or Pacific Islanders (0.3%). Additionally, 1.3% of the participants identified their race as Other. Less than half of the sample was employed full time at enrollment (44%). Couples' median household income was \$27,000 annually ( $M = \$29,046$ ,  $SD = \$16,671$ , range = \$6000 to \$108,000). Thus, 42% of couples were at or below the federal poverty line and 85–100% of the sample was at or below 200% of the federal poverty line (based on household

income and number of individuals in the household).<sup>1</sup> The majority of the sample was married (52%) while the remainder were either engaged (25%) or cohabiting for 6 months or longer (23%). This sample was previously reported on by (Doss et al. [in press](#)).

### Procedures

Couples were recruited to the study through a variety of paid (e.g., Google Ads, Facebook ads) and free (e.g., word of mouth) advertising. When participants navigated to the website, they read more about the OR and ePREP programs and what participation in each program entailed. If a couple decided that they wanted to participate, they clicked a hyperlink that took them to the online screening survey. The first page of the screening survey was an online informed consent form; after the informed consent form was complete, the individual was taken to the rest of the survey. Couples had to be married, engaged, or living together for at least 6 months; report a household income within 200% of the federal poverty line, and agree to abstain from other relationship-focused treatment for 6 months in order to be eligible. Further information can be found in Doss et al. [in press](#) (see Supplementary Fig. 1 for CONSORT).

If eligible, the couple scheduled an initial, 15-min phone call or videoconference with project staff. On this call, the staff briefly reviewed the components of the program and answered any questions the couple had. The staff also reviewed the design of the research study and requirements for participation (using a script approved by the IRB). Couples were given a chance to ask any questions they had about the research requirements. Then, they were asked to verbally agree to the key requirements of the study. All procedures were approved by the University of Miami Institutional Review Board and registered on [ClinicalTrials.gov](#) (#NCT02806635) prior to the initiation of data collection. Couples who consented to the research study and participation requirements were randomized on the call using a random number generator to one of the three conditions: OR, ePREP, or a 6-month waitlist control.

**Program Procedures** Couples randomized to the waitlist were contacted via email for the completion of assessments. Couples randomized to the active interventions were immediately given access to the online program content following the call, described below.

Couples assigned to the OR program completed three online phases with 15-min calls from their coach at the end of each phase. Participants worked separately through the majority of

<sup>1</sup> According to one partner's reports of annual household income, all couples were within 200% of the federal poverty line. However, when annual household income was extrapolated from each individual's reports of individual income in the last 30 days, 85% of couples fell within that range. It is unclear which method of reporting is more accurate, so we include both here.

the online content, coming together for structured conversations at the end of each phase. Coach calls at the end of each phase reinforced program material, provided technical support, and encouraged couples to stay on track to complete the program in under 2 months. Couples assigned to the ePREP program watched 1 hour of online content and completed a homework assignment each week for 6 consecutive weeks. Three, 15-minute coach calls occurred every 2 weeks and aided couples in practicing the skills learned during the program, provided technical support, and encouraged couples to stay on track to complete the program in under 2 months. More information about the interventions is available in Doss et al. [in press](#).

## Measures

Distressed cut-scores for psychological and physical health behaviors were derived from established literature for each measure when available.

**Psychological Distress** Measured by the Kessler Psychological Distress 6-item scale (K6), participants are classified as having severe psychological distress if they score 13 or greater on a sum of the 1- to 5-point Likert scale. The K6 has strong reliability ( $\alpha = 0.87$ ) and a two-factor model separating anxiety and depression fits better than a unidimensional factor (Bessaha 2017). A sample item is, “In the last 30 days, how often have you felt nervous?” In this sample,  $\alpha$  was 0.86.

**Perceived Stress** The Perceived Stress Scale (Cohen and Williamson 1988) is a 4-item measure tapping general feelings of being overwhelmed and out of control in ones’ life. A sample item is, “In the last 30 days, how often have you felt that you were unable to control the important things in your life?” In this sample,  $\alpha$  was 0.74. Individuals who scored greater than or equal to 6.27 (one standard deviation above population norms; T-score of 60) at pre-treatment on a sum of the 0- to 4-point Likert scale were coded as distressed.

**Anger** The 5-item Anger-Short Form from the NIH PROMIS measure bank was used to assess anger not directed toward their partners (Pilkonis et al. 2011). Items were scored on a 1- to 5-point Likert scale, with higher numbers indicative of greater anger. A sample item is, “In the last 30 days, I was irritated more than other people.” In this sample,  $\alpha$  was 0.92. Items were summed and individuals who scored greater than or equal to 16 at pre-treatment were classified as initially distressed.

**Problematic Alcohol Use** The 7-item PROMIS Alcohol Use measure, developed through the NIH Common Fund effort, was used to assess problematic alcohol use in the past month (Pilkonis et al. 2013). Items were scored on a 1- to 5-point Likert scale, with higher numbers indicative of greater problems. A sample item is, “In the last 30 days, how often have

you felt that you were unable to control the important things in your life?” In this sample,  $\alpha$  was 0.91. Items were summed and individuals who scored 9 or greater at pre-treatment were classified as distressed.

**Perceived Health** The 5-item General Health Perceptions subscale of the SF-36 assesses overall physical (not mental) health (Ware Jr and Sherbourne 1992). A sample item is, “I am as healthy as anyone I know.” In this sample,  $\alpha$  was 0.84. Individuals who scored less than or equal to 11.65 or one standard deviation below population norms were initially distressed on a sum of the 1- to 5-point Likert scale. Higher scores indicate better perceived health.

**Insomnia** Sleep was assessed using the Insomnia Severity Index, a 5-item self-report measure (Bastien et al. 2001). A sample item is, “how satisfied are you with your current sleep pattern?” In this sample,  $\alpha$  was 0.86. Individuals who scored greater than or equal to 10 at pre-treatment were initially distressed on a sum of the 0- to 4-point Likert scale; higher scores indicate greater sleep difficulties.

**Exercise** A one-item measure of exercise was adapted from the CDC BRFSS 2016 Questionnaire. Participants are asked to rate “During the last month, other than your regular job, did you participate in any physical activities or exercises such as running, working out, playing sports, gardening, or walking for exercise?” on a scale from 1=Not at all to 6=More than four times per week. Because no national norms were available for this measure, individuals who scored less than or equal to 1.98 (one standard deviation below the group mean at baseline) at pre-treatment were categorized as initially distressed.

**Demographics** We collected information on gender, race/ethnicity, age, income, highest degree of education, employment, and relationship status.

## Data Cleaning and Analysis Plan

Data was missing at mid-treatment (8.2%), post-treatment (10.3%), 2-month follow-up (12.5%), and 4-month follow-up (13.0%); therefore, data were imputed using Blimp (Enders et al. 2017; Keller and Enders 2018), a multilevel imputation program, accounting for auxiliary variables related to missingness. Ten imputed datasets were created and all reported results are averages across those datasets. All participants were invited to complete assessments regardless of relationship status; at the final follow-up, 15% of couples were broken up.

There were minimal significant differences between the two treatment groups on changes in relationship functioning during the intervention and over follow-up (Doss et al. [in](#)



press). Additionally, there were no significant differences between the two treatment conditions on any measures of individual health for slopes during the program or slopes over follow-up with the exception of perceived stress such that couples in OR reported significantly greater reductions in perceived stress during the intervention ( $b = 0.034$ ,  $SE = 0.017$ ,  $p = 0.044$ ; see Supplementary Table 1 for full results). Therefore, we collapsed across the treatment groups and compared the combined intervention group to the waitlist control group. At baseline, couples in the intervention group reported significantly higher insomnia ( $M = 11.10$ ,  $SD = 6.33$ ) than the control group ( $M = 10.42$ ,  $SD = 5.98$ ;  $t(1480) = -2.00$ ,  $p < 0.05$ ); there were no other significant baseline differences between the intervention and control groups.

**Analysis Plan** The individual mental health and physical health behaviors outcomes were entered as the dependent variable in separate models; the same models were used to test all questions. We used multilevel modeling within the Hierarchical Linear Modeling program (HLM 7.01; Raudenbush et al. 2011) in order to account for nested data. Time was modeled at level 1, individual characteristics were modeled at level 2 (including a grand-mean centered gender variable and a random effect on the intercept), and couple characteristics were modeled at level 3 (including random effects on the intercept and slope terms; Atkins 2005). The model incorporated a piecewise (spline) model allowing for separate linear slopes during and following the intervention (Raudenbush and Bryk 2002) with the post-treatment time point as the intercept (time = 0). Additionally, although we did not hypothesize

significant differences by gender, we included gender, grand-mean centered, in level 2 as a predictor of both the level 1 intercept and both slopes to better represent the nested structure of the data. In order to test moderation, a pretreatment indicator of distress of the outcome in question (e.g., 0/1 absence/presence of alcohol abuse at pretreatment when alcohol abuse was the dependent variable) was grand-mean centered and included as a level 2 predictor of the overall intercept, the slope of time during treatment, and the slope of time over follow-up.

This study was sufficiently powered (0.80) to detect an intervention effect on physical and mental health that is small in magnitude (Cohen’s  $d \approx 0.23$ ) and was sufficiently powered to detect an interaction effect size of 0.40 with 80% power for the moderation analyses comparing the combined treatment groups to waitlist control.

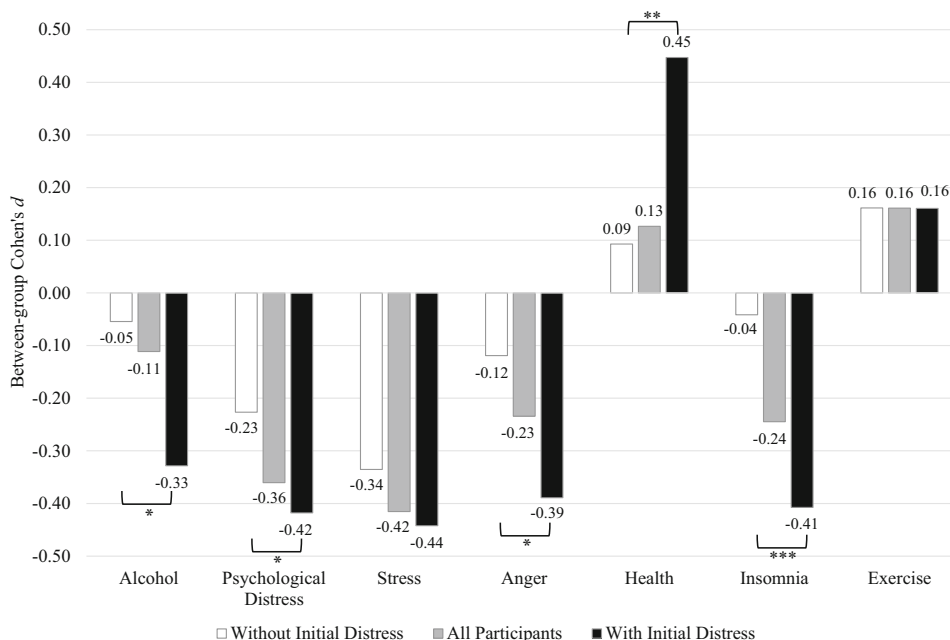
## Results

Correlations between outcomes at baseline as well as means and standard deviations for all outcomes at all time points are available in Supplementary Tables 2 and 3.

### Effect of Treatment on Mental Health and Health Behaviors

During treatment, participants in the combined intervention group (OR or ePREP) reported significantly larger improvements in individual mental health and physical health behaviors than participants in the waitlist control group (see Fig. 1).

**Fig. 1** Pre- to post-program effect sizes. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ . Asterisks indicate significant moderation effects by initial distress in that domain



Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . Asterisks indicate significant moderation effects by initial distress in that domain.



**Table 1** Pre to post and pre to follow-up change comparing combined intervention groups to waitlist control groups

	Slope during treatment for waitlist group		Effect of treatment		Between-group effect size pre to post		Slope over FU for waitlist group		Effect of treatment over FU		Between-group effect size post to FU	
	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>
<b>Psychological health</b>												
Distress	-0.196 (0.027)	< 0.001	-0.265 (0.037)	< 0.001	-0.024 (0.012)	0.050	0.008 (0.015)	0.623	0.03	-0.33		
Perceived stress	-0.117 (0.015)	< 0.001	-0.169 (0.022)	< 0.001	-0.005 (0.008)	0.577	-0.002 (0.010)	0.873	-0.01	-0.43		
Anger	-0.161 (0.022)	< 0.001	-0.143 (0.031)	< 0.001	0.016 (0.011)	0.127	-0.026 (0.014)	0.055	-0.11	-0.35		
Alcohol	-0.094 (0.024)	< 0.001	-0.088 (0.031)	0.004	-0.003 (0.012)	0.772	0.012 (0.014)	0.416	0.04	-0.07		
<b>Physical health</b>												
Perceived Health	-0.004 (0.016)	0.814	0.071 (0.022)	0.001	0.004 (0.007)	0.545	0.015 (0.009)	0.076	0.07	0.20		
Insomnia	-0.158 (0.027)	< 0.001	-0.198 (0.037)	< 0.001	0.046 (0.013)	< 0.001	-0.016 (0.016)	0.299	-0.05	-0.30		
Exercise	-0.009 (0.010)	0.362	0.034 (0.013)	0.009	0.005 (0.004)	0.259	-0.009 (0.005)	0.098	-0.11	0.06		

Italicized terms indicate statistically significant findings

Specifically, intervention couples, compared to control couples, reported significantly larger decreases in psychological distress (Cohen’s  $d = -0.36$ ), perceived stress (Cohen’s  $d = -0.42$ ), anger (Cohen’s  $d = -0.23$ ), and alcohol use (Cohen’s  $d = -0.11$ ; see Table 1). In addition to improvements in individual mental health, participants in the combined intervention group reported significantly larger increases in physical health and health behaviors including perceived health (Cohen’s  $d = 0.13$ ) and exercise (Cohen’s  $d = 0.16$ ) as well as significantly larger decreases in insomnia (Cohen’s  $d = -0.24$ ) than the control group during the intervention (see Table 1). There were no significant gender differences except for anger; men decreased anger more than women ( $b = -0.14$ ,  $SE = 0.03$ ,  $p < 0.001$ ). As expected, improvements in domains were slightly-to-moderately correlated within participants and moderately-to-strongly associated between partners (Supplementary Table 4).

**Maintenance of Mental Health and Health Behaviors**

The effect of treatment over follow-up from post-treatment to 4-month follow-up was non-significant for all mental health and physical health outcomes (Cohen’s  $ds$  post to follow-up  $-0.11$  to  $0.07$ ), indicating the gains made during treatment were maintained afterward (Cohen’s  $ds$  pre- to follow-up  $|0.06$  to  $0.43$ ); see Table 1). There were no gender differences over follow-up.

**Moderation by Initial Distress**

**Mental Health** Participants experienced significantly greater program benefits for psychological distress, anger, and problematic alcohol use when they began the intervention in the distressed range for psychological distress (Cohen’s  $d_{\text{distressed}} = -0.42$ ,  $d_{\text{non-distressed}} = -0.23$ ;  $p = 0.033$ ), anger (Cohen’s  $d_{\text{distressed}} = -0.39$ ,  $d_{\text{non-distressed}} = -0.12$ ,  $p = 0.011$ ), and problematic alcohol use (Cohen’s  $d_{\text{distressed}} = -0.33$ ,  $d_{\text{non-distressed}} = -0.05$ ;  $p = 0.026$ ) without any indication of significant changes over follow-up in this initial moderation (see Table 2 for effect sizes). Being below a cutoff for distress in perceived stress did not significantly moderate outcomes during treatment or during follow-up (see Table 2).

In order to compare to studies that recruit specifically for difficulties within a specific domain, we also calculated effect sizes for the established measures using the standard deviation of the distressed subsample. Using the distressed subsample standard deviations, the effect sizes were somewhat larger for participants with initial distress for decreased psychological distress (Cohen’s  $d = -0.57$ ), perceived stress (Cohen’s  $d = -0.63$ ), anger (Cohen’s  $d = -0.72$ ), and alcohol use (Cohen’s  $d = -0.36$ ).

**Table 2** Moderation by initial distress in individual health

	Moderation during treatment				Between-group Cohen's <i>d</i>		Moderation during follow-up				Between-group pre to FU Cohen's <i>d</i>	
	<i>b</i>	SE	<i>t</i>	<i>p</i>	Without distress	With distress	<i>b</i>	SE	<i>t</i>	<i>p</i>	Without distress	With distress
<b>Psychological health</b>												
Distress	<i>-0.140</i>	<i>0.066</i>	<i>-2.140</i>	<i>0.032</i>	-0.23	-0.42	0.006	0.028	0.201	0.841	-0.21	-0.38
Stress	-0.043	0.045	-0.963	0.335	-0.34	-0.44	-0.015	0.021	-0.723	0.470	-0.27	-0.48
Anger	<i>-0.165</i>	<i>0.065</i>	<i>-2.555</i>	<i>0.011</i>	-0.12	-0.39	-0.014	0.027	-0.506	0.613	-0.21	-0.53
Alcohol	<i>-0.216</i>	<i>0.097</i>	<i>-2.232</i>	<i>0.026</i>	-0.05	-0.33	-0.033	0.040	-0.804	0.422	0.01	-0.38
<b>Physical health</b>												
Health	<i>0.198</i>	<i>0.066</i>	<i>3.006</i>	<i>0.003</i>	0.09	0.45	0.008	0.027	0.287	0.774	0.16	0.55
Insomnia	<i>-0.297</i>	<i>0.069</i>	<i>-4.301</i>	<i>&lt; 0.001</i>	-0.04	-0.41	0.043	0.029	1.484	0.138	-0.17	-0.40
Exercise	0.000	0.028	-0.007	0.995	0.16	0.16	<i>0.040</i>	<i>0.012</i>	<i>3.366</i>	<i>&lt; 0.001</i>	-0.07	0.42

Italicized terms indicate statistically significant results

**Physical Health and Health Behaviors** Individuals who reported initial distress with insomnia and perceived health experienced significantly more gains during the program than those without initial distress for insomnia (Cohen's  $d_{\text{distressed}} = -0.41$ ,  $d_{\text{non-distressed}} = -0.04$ ;  $p < 0.001$ ) and perceived health (Cohen's  $d_{\text{distressed}} = 0.45$ ,  $d_{\text{non-distressed}} = 0.09$ ;  $p = 0.003$ ). Although there was no significant moderation effect for exercise during the intervention, over follow-up, individuals who were distressed at pre-treatment reported significantly greater increase in exercise than those who were not distressed at pre-treatment (Cohen's  $d_{\text{distressed}} = 0.42$ ,  $d_{\text{non-distressed}} = -0.07$ ,  $p < 0.001$ ; Table 2).

Using the distressed subsample standard deviations to calculate effect sizes resulted in larger effect sizes for perceived health (Cohen's  $d = 1.14$ ) and insomnia (Cohen's  $d = -0.61$ ) for participants with initial distress during the program.<sup>2</sup>

## Discussion

This study tested the effect of OR and ePREP, online, paraprofessional-assisted programs for couples, on individual mental and physical health among couples with low-income levels. Results revealed that intervention couples reported significantly greater improvements in individual mental health and physical health behaviors during the programs compared

to the control group; further, intervention couples maintained those gains over short-term follow-up.

## Mental Health

Results replicate and extend previous work on web-based relationship programs' impact on individual mental health. Previous trials of the OR program (Doss et al. 2016; Doss et al. 2019) and ePREP (Braithwaite and Fincham 2007; Braithwaite and Fincham 2009) demonstrated their ability to reduce symptoms of anxiety and depression, findings which were replicated in the present study (the measure of psychological distress is a mixture of depressive and anxious symptoms). This project extends previous work by demonstrating positive benefits to problematic alcohol use, anger, and perceived stress. Furthermore, the current study extended previous findings of the OR and ePREP programs to a sample of low-income couples.

Effect sizes for individual mental health in the present study were smaller than previous trials of OR and ePREP, which could be due to several reasons. The effect sizes for changes in relationship functioning were smaller, and completion rates lower, in this sample (Doss et al. in press) than previous studies of OR (Doss et al. 2016), leading to a smaller intervention dose. Second, different domains of mental health were collected in the present study than in previous trials of OR and ePREP. Across trials, the effect sizes for psychological distress (current study) and depressive/anxious symptoms (previous studies of OR and ePREP) were similar in magnitude. However, assessment of new domains including alcohol use, perceived stress, and anger demonstrated smaller effects. It is possible that the more specific areas of mental health (stress, alcohol use, and anger) saw less spillover from the intervention.

<sup>2</sup> In addition to testing initial levels of individual mental and physical health as moderators of outcomes, initial levels of relationship distress using the Couple Satisfaction Index (CSI-4; Funk and Rogge 2007) were tested as a moderator of mental health and physical health/health behaviors in separate analyses. No significant moderation effects were observed for initial gains during the intervention or for maintenance of those gains over follow-up by initial relationship distress with the exception of perceived health maintenance from post to follow-up such that those with distress reported greater gains over follow-up (see Supplementary Table 5).

Finally, the context of the participants' lives must be considered. Couples with lower incomes experience higher levels of uncontrollable external stress than a more advantaged population. It is possible that events external to the program impacted participants which slowed or prevented improvement in individual mental health. Furthermore, although the program may have alleviated the stress associated with their relationships, the program likely had minimal impact on economic stress.

Not only did participants experience immediate gains during the program in individual mental health, but effects were largely maintained over the short-term follow-up period. This finding is consistent with previous work on the OR program demonstrating maintenance of gains through 12-month follow-up (Doss et al. 2019), and aligns with previous research of the ePREP program which had previously demonstrated maintenance through 10 months (Braithwaite and Fincham 2009). The stability of improvements in mental health is particularly notable because it suggests these gains are not a temporary reaction to better relationship health or generally feeling less distressed overall. Rather, participants continue to report improved mental health over follow-up, with minimal relapse.

**Moderation by Initial Levels** Participants who reported greater distress at baseline in problematic alcohol use, psychological distress, and anger not directed at the partner reported greater benefit from the program in those domains than did individuals who started the intervention within the non-distressed range. Furthermore, this pattern of results was maintained over follow-up. Moderation by baseline levels of problematic alcohol use and psychological distress could be attributable to a floor effect, as many participants were not reporting difficulties in these domains at baseline. However, at baseline, anger was relatively normally distributed. The program content—focused on communication and interpersonal skills—may have been especially helpful for individuals reporting high anger at baseline, whereas individuals with lower baseline anger could have had stronger social skills coming into the program, and thus limited room to improve. Furthermore, participants who reported low levels of anger not directed at the partner may have been angry for objective, realistic reasons (e.g., working with a difficult boss or a frustrating commute), which would not have been changed by the program.

When considering the effect sizes for participants initially distressed within domains of individual mental health, results found here are generally in line with other treatments for mental health. Specifically, a meta-analysis of online treatments for depression reported a medium effect size ( $d = 0.56$ ; Richards and Richardson 2012) and a second meta-analysis of online treatments for anxiety reported medium to large effect sizes (Cohen's  $ds = 0.49$ – $1.14$ ; Reger and Gahm 2009)—which are comparable to the medium effect size for psychological distress found here using the  $SD$  from the

distressed sample (Cohen's  $d = -0.57$ ). Furthermore, a meta-analysis of online programs for problematic drinking reported a small effect size (Hedge's  $g = 0.44$ ; Riper et al. 2011) which is similar to results here using the distressed sample  $SD$  (Cohen's  $d = -0.36$ ).

## Physical Health and Health Behaviors

The statistically significant, positive impact of the relationship-focused programs on individual physical health behaviors strengthens previous work on the OR program and establishes evidence for ePREP. However, although significant, effect sizes were in the negligible to small range for all participants ( $ds = |0.13$  to  $0.24$ ). The previous trial of the OR program found a between-group Cohen's  $d$  of 0.23 for a one-item measure of perceived health within a distressed subsample (Doss et al. 2016), which is smaller than the finding for perceived health here within a distressed subsample. This increase in magnitude may be due to a more robust measure of perceived health. This study also established evidence for the OR and ePREP programs to positively impact insomnia and exercise, although the effects were small.

**Moderation by Initial Levels** Individuals who were within the distressed range for insomnia and perceived health at pretreatment reported significantly greater decreases in those domains over the course of the program; this pattern persisted over follow-up. Notably, baseline scores on both the perceived health and insomnia measures were skewed towards better initial functioning. As a result, the significant moderation effects may be driven in part by ceiling/floor effects; many participants were already doing well in these domains before the intervention and thus could not improve functioning further. Conversely, exercise (which did not show moderation by baseline) had a somewhat positively skewed distribution at baseline (31% of participants reported no exercise, the remaining were evenly distributed), suggesting most participants could increase exercise and it be captured within this measure.

Maintenance of program gains over follow-up was generally not moderated by levels of baseline functioning in individual functioning. However, participants who reported lower levels of exercise at the start of the program had significantly larger gains in exercise during the 4 months following the program. Although an interesting finding, it should be interpreted with caution due to the exploratory nature of the measure.

The health behavior effects of the OR and ePREP programs for the distressed subsample may be somewhat smaller than the effects of online programs designed to target physical health behavior change. Specifically, our medium effect size for insomnia using the  $SD$  from the distressed sample (Cohen's  $d = -0.61$ ) is smaller than a meta-analysis of online programs for sleep difficulties using the same measure (ISI;

Cohen's  $d = -0.86$ ; Cheng and Dizon 2012). However, a meta-analysis of internet-based interventions for physical health behaviors, including physical activity and dietary behavior among others, found a more modest effect size in line with findings here ( $d = 0.16$ ; Webb et al. 2010). Relationship-focused programs could have impacts on health behaviors similar in size to online programs built to specifically target these behaviors. Future work should consider the combination of specific health behavior information and relationship support in interventions.

### Limitations and Future Directions

This study is not without limitations. All measures of relationship functioning and mental health and physical health behaviors were self-report, potentially increasing the shared variance (and magnitudes of association/changes) in the study. Additionally, measures instructed participants to retroactively report on different time periods (e.g., last 7 days for anger to last 30 days for alcohol) which could impact results. The one-item exercise measure was developed for this study and results should be replicated with an established measure of exercise. Furthermore, the sample was majority low-income and thus results may not generalize to more advantaged populations. Finally, the intervention may not be feasible with even lower-income participants who do not have smartphones and wireless access (and thus were not captured in this sample).

Research should continue to test online, paraprofessional-assisted relationship interventions on health. First, including an objective measure of health either remotely such as heart rate variability, salivary cortisol, actigraphy (or other wearable tech to measure exercise or sleep), or in-person measurements of blood pressure, BMI, and other health indicators would further support the positive results found here with self-report measures. Second, in its present form, the programs include only tangential coverage of individual mental health (e.g., how stress can impact a relationship); more direct content on how couples can improve their mental health and physical health behaviors together would likely boost effect sizes. Third, conducting a longer-term follow-up is needed to more fully understand the maintenance of mental health gains as a result of relationship-focused programs. It is possible that over the long run, some or all of these small effects will diminish to the point they are no longer clinically meaningful. Finally, all changes in individual mental and physical health were hypothesized via the mechanism of changes in the relationship; future studies should directly test these mechanistic effects.

### Conclusion

Although relationship functioning and individual mental and physical health are repeatedly related in cross-sectional (e.g.,

Whisman 2007) and longitudinal research (e.g., Beach and O'Leary 1993), this study is one of few that directly demonstrates intervening in the relationship has a positive effect on individual mental health and physical health behaviors (for exceptions, see Barton et al. 2018; Doss et al. 2015; Doss et al. 2016), and one of the first to do so in a majority low-income population. Research shows that interventions for individual health often do not affect relationship functioning (Atkins et al. 2009; Beach and O'Leary 1993); however, the reverse was true here. As such, this study serves as an experimental manipulation of the association between romantic relationships and individual functioning providing some of the first evidence that relationship-focused programs can produce effects in these domains.

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### Compliance with Ethical Standards

**Conflict of Interest** Dr. Brian Doss is a co-inventor of the intellectual property used in this study and an equity owner in OurRelationship LCC.

**Research Involving Human Participants** All procedures performed in studies involving human participants were in accordance with the ethical standards of the University of Miami IRB and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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