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Partner Outcomes from an Uncontrolled Trial of Couple HOPES: A Guided Online Couple Intervention for PTSD and Relationship Enhancement

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Acknowledgements: The parent study for Couple HOPES, with all measured outcomes and planned sample sizes for individual samples, was pre-registered on the Clinical Trials Registry (www.clinicaltrials.gov identifier: NCT04231578). Data analysis code can be found at https://osf.io/exfzw/. Data cannot be shared as consent for sharing was not obtained from participants at this phase. All procedures were approved by Research Ethics Boards at Toronto Metropolitan University and York University, and participants provided informed consent. We thank the Canadian Veterans Transition Network and the Focused Forward Society for promoting Couple HOPES, and Drs. Alice Mohr and Maya Roth for wisdom and promotion of Couple HOPES. Finally, we are grateful to the participants who generously participated in this research and gave us invaluable feedback to make it better.

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Abstract

Posttraumatic stress disorder (PTSD) is associated with significant individual and relationship impairment for those with PTSD and their romantic partners. Conjoint treatments, such as Cognitive Behavioral Conjoint Therapy for PTSD (CBCT), are designed to address individual and relationship factors, yet significant barriers impede accessing in-person therapy. Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction) is a coach-guided, online couple intervention for PTSD based on CBCT that was designed to address these barriers. Previous investigations found preliminary efficacy of Couple HOPES for improving PTSD symptoms, relationship functioning, and some individual functioning domains for the partner with probable PTSD. However, no study has yet tested individual outcomes for romantic partners, which is needed to fully evaluate the intervention's promise. The current study tested these partner outcomes in a combined, uncontrolled sample of 27 couples. Intent-to-intervene analyses found significant improvements at post-intervention in four of eight tested outcomes, including ineffective arguing (g = 0.74), anger (g = 0.32), perceived health (g = 0.67), and quality of life (g = 0.56). Depressive symptoms, generalized anxiety, alcohol misuse, and work functioning did not significantly change (gs = 0.17-0.42). In the subset of participants that completed a 1-month follow-up assessment, generalized anxiety (g = 0.43) and perceived health (g = 0.73) significantly improved over follow-up, while anger (g = -0.48) lost gains previously made. Results were largely consistent in the completer sample. These results show the potential of Couple HOPES to have broad benefits, not only for those with probable PTSD, but also their romantic partners.

Keywords: posttraumatic stress disorder, relationships, couples, online interventions, conjoint interventions, partner outcomes

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Posttraumatic stress disorder (PTSD) is a pervasive and debilitating condition associated with significant individual and interpersonal impairment for the individual with PTSD (Taft et al., 2011). There are particularly high rates of PTSD (Thompson et al., 2016), as well as especially strong links between PTSD and relationship problems (Taft et al., 2011), in the population comprised of military members, veterans, and first responders (MMVFR). In addition, PTSD is associated with myriad negative consequences for romantic partners of those with PTSD, including lower relationship satisfaction and higher ratings of relationship conflict (Taft et al., 2011), more psychological distress (Lambert et al., 2012), and higher depression, anxiety, and somatic problems (Manguno-Mire et al., 2007).

Given the negative impact of PTSD on relationships and the well-being of romantic partners, conjoint interventions that can target all of these domains, such as Cognitive-Behavioral Conjoint Therapy (CBCT; Monson & Fredman, 2012), may be particularly promising. Research finds CBCT is effective for improving PTSD symptoms and relationship satisfaction, as well improving partners' relationship satisfaction, relationship happiness, depression, and anxiety (Liebman et al., 2020; Pukay-Martin et al., 2021). However, significant barriers impede access to face-to-face evidence-based treatments, including limited trained clinicians, geographical distance, scheduling, and stigma (Kazdin & Blase, 2011), which have been exacerbated by the COVID-19 pandemic. Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction), an online, coach-assisted, self-help dyadic intervention, was adapted from CBCT to address these barriers (Monson et al., 2021).

Evidence from a case series of 10 couples (Fitzpatrick et al., 2021) and uncontrolled trial of 17 couples (Monson et al., 2022) support the initial safety, acceptability, and efficacy of Couple HOPES in MMVFR samples. The case series found improvements in PTSD symptoms

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and perceived health for the individual with probable PTSD (hereafter referred to as the PTSD+ partner), plus improved relationship satisfaction in romantic partners. The uncontrolled trial showed improvements in the PTSD+ partner's PTSD symptoms, depressive symptoms, and ineffective arguing, and the partners' relationship satisfaction and symptom accommodation.

However, no research has yet examined the impact of Couple HOPES on partners' mental health and well-being outcomes. Given that partners of people with PTSD experience significant distress and mental health problems (Lambert et al., 2012; Manguno-Mire et al., 2007), identifying whether these domains improve in Couple HOPES is important to fully identify the intervention's promise and help this often-overlooked group. The current study therefore tests the preliminary efficacy of Couple HOPES for improving the mental health and well-being of romantic partners of those with probable PTSD. We hypothesized that partners would demonstrate improvements across all measured mental health and well-being domains, and gains would be maintained at 1-month follow-up.

Method

The parent study for Couple HOPES, with all measured outcomes and planned sample sizes, was preregistered on the Clinical Trials Registry (www.clinicaltrials.gov identifier: NCT04231578). This manuscript focuses on partner mental health and well-being outcomes from the first two trials: a case series and an uncontrolled trial. For transparency, we report throughout this manuscript how we determined our sample size, all data exclusions, all manipulations, and all measures (Simmons et al., 2012). All procedures were approved by Ethics Boards at Toronto Metropolitan University and York University. Data analysis code can be found at https://osf.io/exfzw/.

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Participants

This study includes two samples with identical recruitment procedures and inclusion/exclusion criteria: a case series of 10 intimate dyads (sample 1; Fitzpatrick et al., 2021) and an uncontrolled trial of 17 intimate dyads (sample 2; Monson et al., 2022).[1] Participants were recruited from social media advertisements and community outreach. Inclusion criteria were that the PTSD+ partner was a Canadian MMVFR with a DSM-5 Criterion A traumatic event (APA, 2013) who met criteria for probable PTSD (≥ 33 on the Posttraumatic Stress Disorder Checklist-5; PCL-5; Bovin et al., 2016; Weathers et al., 2013). Exclusion criteria were: (1) elevated suicide risk; (2) severe intimate partner violence within the past year; (3) dual probable PTSD couples; (4) not willing to have coaching sessions audio-recorded; (5) no access to high-speed internet; and (6) partners unable to watch modules together.

Of the 27 romantic partners, a majority were female (n = 19), self-identified as White/Caucasian/European origin (n = 24), in mixed gender relationships (n = 25), and with a mean age of 48.3 years (SD = 9.8). The median participant had a college diploma. All partners were married or common-law married. Full descriptions of participant characteristics are in Fitzpatrick et al. (2021) and Monson et al. (2022). Samples were tested for differences—and did not significantly differ—in age, relationship length, gender, ethnicity, presence of children, or education. Sample 2 had higher household income than Sample 1 (Odds ratio = 6.8, 95% confidence interval [CI] = [1.06, 60.62]).

Intervention

Couple HOPES is an eight-week program consisting of seven interactive modules that include web-streamed psychoeducational videos, within-module exercises, and out-of-module assignments (see Monson et al., 2021 for details on module content). Each individual completed

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questionnaires on PTSD symptoms (self- and collateral report) and relationship satisfaction prior to each module, the results of which were viewable on the platform. Partners had separate, linked, accounts to enter practice assignments and view each other's responses. However, the video and module exercises had to be done conjointly.

Each couple was assigned a coach to encourage engagement and adherence, facilitate the use of Couple HOPES skills, and troubleshoot barriers to progress. All coaches had at least a bachelor's degree, completed training in working with couples and crisis management, and attended bi-weekly consultation meetings with program creators (for more information on coaching see Monson et al., 2021). Couples interacted with coaches through a secure messaging system on the platform and secure video coaching calls. Coaching sessions were 15-20 minutes long and scheduled after modules one, three, five, and seven, with an optional fifth call for troubleshooting. Coaching sessions were manualized and focused on symptom review, content comprehension, practice assignment progress, and troubleshooting barriers to program engagement.

Procedures

After signing up on the program website, www.couplehopes.com, partners were emailed individual screening surveys. Eligible couples were provided online consent forms and were invited to ask any questions via email or phone. Participants completed online self-report assessment measures for all outcomes at baseline, mid-intervention, and post-intervention. Sample 2 participants also completed a 1-month follow-up assessment. The program was free and participants were compensated with gift cards for completing study assessments.

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Measures

Participants completed well-established self-report measures of relationship functioning, mental health, and well-being. Relationship functioning was assessed using the 8-item Ineffective Arguing Scale (IAS; Kurdek, 1994), which assesses perception of destructive conflict communication (range: 8-40; Cronbach's $\alpha = .93$). Four mental health outcomes were assessed. The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) assessed severity and frequency of nine depressive symptoms (range: 0-27; $\alpha = .78$). The Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006) assessed seven generalized anxiety symptoms (range: 0-21; $\alpha = .90$). The State-Trait Anger Expression Inventory-2, Trait Anger Subscale (Spielberger, 2010) assessed trait anger via ten items (range: 10-40; $\alpha = .79$). The Addiction Severity Index (ASI; McLellan et al., 1980) assessed alcohol misuse using six items (range: 0-1; $\alpha = .61$).[2] Finally, three single-item questions assessed well-being indicators: perceived health, work functioning, and quality of life (range: 0-5; WHOQOL Group, 1998). For all outcomes, higher scores indicate higher values on the construct. Three additional partner outcomes that were assessed (relationship satisfaction, collateral report of PTSD symptoms, and symptom accommodation) were previously reported (Fitzpatrick et al., 2021; Monson et al., 2022).

Data Analyses

Analyses followed intent-to-intervene principles, so all available data were included in statistical models. Change was tested using multilevel growth models estimated with restricted maximum likelihood and a Kenward-Roger correction for small samples (McNeish & Stapleton, 2016) in the R (R Core Team, 2018) package lme4 (Bates et al., 2015). Multilevel models account for dependency in repeated measures and enable using all available data even in the presence of missing data. To test change over the intervention phase, a two-level model was used

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with time points nested within individuals, in which each outcome was regressed onto time (0 = pre-intervention, 0.5 = mid-intervention, 1 = post-intervention). Random intercepts, random slopes for time, and slope-intercept correlations were included in all models where possible.[3] Neither visual inspection of plots nor likelihood ratio tests testing a quadratic model (all *p*s > .26) showed evidence of a curvilinear trajectory for any outcome, so only linear effects of time were included.

For testing change over the intervention phase, both samples were combined into a single analysis sample ($N = 27$) to maximize statistical power and minimize Type I error compared with analyzing samples separately. To test for differences in change across the samples, sample was added as a main effect and interaction with time for all outcomes. No outcome showed evidence of differential change across samples (*p*s > .2). Given this finding and the minimal differences in the intervention between samples, sample is included as a covariate only in final models. Power analyses for the intervention phase conducted via simulation of the multilevel model, given the observed sample size and missing data, and assuming a pre-post correlation of $r = .5$, estimated the current study has .8 power to detect population effect sizes of $g = .65$.

Only sample 2 included a follow-up assessment, so maintenance of gains at 1-month follow-up was tested separately. Follow-up analyses used a piecewise model in which we added a separate variable, representing change from post-intervention to follow-up (0 = post-intervention or earlier, 1 = follow-up), to the model described previously, in sample 2 only. For all models, standardized effect sizes presented are computed by dividing model-estimated change by the standard deviation of the baseline outcome variable (Feingold, 2009), with a Hedges' *g* correction for small samples (Hedges, 1981).

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Results

As reported previously, 18 of 27 couples (66.7%) completed the program, and mean partner satisfaction with the program was 3.7 out of 4 (*SD* = 0.4). No adverse events occurred. Missing data analyses found significant associations between missing data and assessment wave, consistent with a missing data pattern due to program dropout. However, neither covariate-dependent dropout analyses nor pattern mixture models (Graham, 2009) found evidence of bias in model estimates attributable to missing data patterns (see supplemental material for details of these analyses), lending confidence that the presented results are not biased by missing data.

Table 1 presents estimated marginal means, estimates of raw change and standardized effect sizes, and confidence intervals from multilevel models for all outcomes for the intent-to-intervene sample. For the relationship outcome, there was improvement in ineffective arguing (Hedge's $g = 0.74$). For mental health outcomes, there was improvement in anger ($g = 0.32$), but not depression ($g = 0.42$), generalized anxiety ($g = 0.17$), or alcohol misuse ($g = 0.27$). For well-being outcomes, there were improvements in perceived health ($g = 0.67$) and quality of life ($g = 0.56$), but not work functioning ($g = 0.28$). Shown in supplementary Table A2, results for program completers were similar, with two exceptions: change in quality of life was slightly smaller for completers and no longer significant ($g = 0.50$ versus $g = 0.56$), whereas change in depressive symptoms was larger and was significant for completers ($g = 0.61$ versus $g = 0.42$).

Supplementary tables A3 and A4 present follow-up results, which were consistent for intent-to-intervene and completer samples. Over follow-up, one outcome (generalized anxiety) improved ($g = 0.43$, 95% CI = [0.02, 0.82]) after not improving during the intervention, one (perceived health) showed additional improvement during follow-up ($g = 0.73$, 95% CI = [0.11, 1.31]) after improving during the intervention phase, and one (anger) showed worsening (g = -

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0.48, 95% CI = [-0.79, -0.13]) that reverted gains during the intervention. Other outcomes did not significantly change at follow-up. When testing total change from baseline through follow-up in sample 2, there was evidence of improvement for ineffective arguing and perceived health, whereas improvements in anger and quality of life from baseline to post-intervention were not reflected at follow-up in this subsample.

Discussion

The present study tested the preliminary efficacy of Couple HOPES in improving relationship functioning, mental health, and well-being for romantic partners of those with probable PTSD. Results supported hypotheses for four of eight outcomes. Partners demonstrated improvements in ineffective arguing, anger, perceived health, and quality of life at post-intervention. In contrast, we did not observe changes in generalized anxiety, alcohol, work functioning, or depression at post-intervention. From post-intervention to 1-month follow-up, generalized anxiety improved, perceived health continued to improve, and anger worsened such that intervention gains were nullified by follow-up.

Reductions in ineffective arguing is consistent with the goal of Couple HOPES to improve relationship functioning through a variety of relationship-focused interventions, including "Time-Out" to interrupt conflict escalation and communication skills such as channel checking, paraphrasing, and sharing thoughts and feelings. Combined with previously-reported increases in relationship satisfaction and symptom accommodation in partners (Fitzpatrick et al., 2021; Monson et al., 2022), this finding suggests Couple HOPES results in broad improvements in relationship functioning for partners.

Results for partner mental health outcomes were less positive. Anger improved over the intervention phase but worsened over follow-up. It is possible that improvements in anger were

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temporary. Alternatively, partner anger may be influenced by opposing factors: for example, increased compassion and understanding for the PTSD+ partner may reduce anger, while greater willingness and ability to express their own, previously censored, negative feelings may increase anger (Shnaider et al., 2014). The other tested mental health outcomes did not significantly improve for partners by post-intervention, although generalized anxiety improved over follow-up. These outcomes may be less likely or slower to change, particularly as the intervention does not target partner mental health directly. In particular, anxiety may improve after the program if couples continue to live a "lifestyle of approach" as encouraged in the intervention, in which trauma-focused approaching during the program may generalize to more approaching and less avoidance in daily life, improving generalized anxiety. It is also possible that floor effects limited the ability to observe change in mental health outcomes. Partners started the program with average scores in the "mild" range on depression and anxiety (Kroenke et al., 2001; Spitzer et al., 2006), which was substantially lower than their PTSD+ partners (Monson et al., 2022). However, studies of CBCT have tended to find improvements in partner depression and anxiety, particularly for those with higher initial symptoms (Shnaider et al., 2014), whereas improvement in partner anger has not been observed (see Liebman et al., 2020 for a review). Moreover, a recent open trial of CBCT in the VA found significant improvement in partner depression despite partners starting in the mild range (Pukay-Martin et al., 2022). More research is needed and with larger samples to estimate the effect of Couple HOPES on partner mental health more precisely.

Finally, results for well-being outcomes generally supported hypotheses, with perceived health and quality of life both showing improvements by post-intervention. Perceived health continued to improve over follow-up, resulting in considerably larger improvement in this outcome compared with others. Perhaps learning about, attending to, and taking steps to improve

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the relationship and mental health of both partners helped partners perceive their (mental) health improving in multiple domains, leading to large and sustained gains. However, this pattern could have simply resulted from chance, particularly given the small sample, or from crude (1-5) scaling of the measure. In contrast to the other two well-being outcomes, work functioning did not significantly improve. This discrepancy may be due to elements of perceived health and quality of life being more integral to and targeted by the intervention, whereas work functioning is not. Nonetheless, these results suggest that Couple HOPES may have diffuse, far-reaching effects on partners' well-being beyond just those related to PTSD and coping with a partner with PTSD.

Several limitations should be considered. First, these samples lacked a control group, so we cannot make causal conclusions at this time about the effect of the intervention. Second, as the current sample comprised mostly married, white partners in mixed-gender couples, the generalizability of these results to other populations and trauma types remains unknown. Some evidence suggests Black and Hispanic or Latino/a individuals are more likely to terminate individual PTSD treatment than White individuals, but they may not differ in symptom improvement (McClendon et al., 2020). However, studies have not tested differences in partner outcomes, necessitating more research on whether these outcomes generalize across populations. Third, partners endorsed low levels of mental health problems at baseline, limiting the ability to observe change in these outcomes. Finally, the current sample size was modest, limiting statistical power. Future research should test Couple HOPES in a randomized controlled trial, using a more diverse and larger sample.

Overall, this study lends preliminary evidence that partners benefit from Couple HOPES in ways comparable to that of empirically supported CBCT (Liebman et al., 2020). Partners

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showed improvement across multiple outcomes, with improvements in two of three well-being outcomes and consistent improvements across relationship domains. As PTSD has broad negative impacts on interpersonal functioning, romantic partners of those with PTSD are an often-overlooked population with the potential to benefit from interventions that involve them. This preliminary evidence, combined with its flexibility and accessibility, suggests Couple HOPES has the potential to distribute mental health benefits more widely than traditional psychotherapy.

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References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (*DSM-5*). American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*, 1-48. https://doi.org/10.18637/jss.v067.i01

Bovin, M.J., Marx, B.P., Weathers, F.W., Gallagher, M.W., Rodriguez, P., Schnurr, P.P., Keane, T.M. (2016). Psychometric properties of the PTSD Checklist for diagnostic and statistical manual of mental disorders-fifth edition (PCL-5) in veterans. *Psychological Assessment, 28*(11), 1379–1391. https://doi.org/10.1037/pas0000254.

Feingold, A. (2009). Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychological Methods, 14*, 43-53. https://doi.org/10.1037/a0014699

Fitzpatrick, S., Wagner, A.C., Crenshaw, A.O., Varma, S., Whitfield, K.M., Valela, R., Di Bartolomeo, A.A., Fulham, L., Martin-Newnham, C., Mensah, D.H., Collins, A., Landy, M.S.H., Morland, L., Doss, B.D., & Monson, C.M. (2021). Initial outcomes of couple HOPES: A guided online couple intervention for PTSD and relationship enhancement. *Internet Interventions*, *25*, 100423. https://doi.org/10.1016/j.invent.2021.100423

Graham, J. W. (2009). Missing data analysis: making it work in the real world. *Annual Review of Psychology, 60*(1), 549-576. https://doi.org/10.1146/annurev.psych.58.110405.085530

ACCEPTED MANUSCRIPT

Hedges, L.V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics*, *6*, 107–128. https://doi.org/10.2307/1164588

Kazdin, A.E., & Blase, S.L. (2011). Rebooting psychotherapy research and practice to reduce the burden of mental illness. *Perspectives on Psychological Science*, *6*(1), 21–37. http://doi.org/10.1177/1745691610393527

Kroenke, K., Spitzer, R.L., & Williams, J.B.W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*, 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kurdek, L.A. (1994). Conflict resolution styles in gay, lesbian, heterosexual nonparent, and heterosexual parent couples. *Journal of Marriage and the Family*, *56*, 705-722. https://doi.org/10.2307/352880

Lambert, J.E., Engh, R., Hasbun, A., & Holzer, J. (2012). Impact of posttraumatic stress disorder on the relationship quality and psychological distress of intimate partners: A meta-analytic review. *Journal of Family Psychology, 26*, 729-737. https://doi.org/10.1037/a0029341

Liebman, R.E., Whitfield, K.M., Sijercic, I., Ennis, N., & Monson, C.M. (2020). Harnessing the healing power of relationships in trauma recovery: A systematic review of cognitive-behavioral conjoint therapy for PTSD. *Current Treatment Options in Psychiatry, 7*, 203-220. https://doi.org/10.1007/s40501-020-00211-1

ACCEPTED MANUSCRIPT

Manguno-Mire, G., Sautter, F., Lyons, J., Myers, L., Perry, D., Sherman, M., Glynn, S., & Sullivan, G. (2007). Psychological distress and burden among female partners of combat veterans with PTSD. *The Journal of Nervous and Mental Disease, 195*(2), 144-151. http:doi.org/10.1097/01.nmd.0000254755.53549.69

McClendon, J., Dean, K.E., & Galovski, T. (2020). Addressing diversity in PTSD treatment: Disparities in treatment engagement and outcome among patients of color.*Current Treatment Options in Psychiatry, 7*(3), 275-290. https://doi.org/10.1007/s40501-020-00212-0

McLellan, A.T., Luborsky, L., Woody, G.E., & O'Brien, C.P. (1980). An improved diagnostic evaluation instrument for substance abuse patients. *Journal of Nervous and Mental Disease*, *168*(1), 26–33. https://doi.org/10.1097/00005053-198001000-00006

McNeish, D., & Stapleton, L.M. (2016). Modeling clustered data with very few clusters. *Multivariate Behavioral Research*, *51*, 495–518. https://doi.org/10.1080/00273171.2016.1167008

Monson, C.M., Fitzpatrick, S., Wagner, A.C., Valela, R., Whitfield, K.M., Varma, S., Landy, M.S.H., Di Bartolomeo, A., Crenshaw, A.O., Fulham, L., Morland, L., Knopp, K., Proctor, D.W., Toller, A., Webster, K., & Doss, B.D. (2021). The development of Couple HOPES: A guided online intervention for PTSD and relationship satisfaction enhancement. *European Journal of Psychotraumatology*, *12*(1), 1917879. https://doi.org/10.1080/20008198.2021.1917879

Monson, C.M., & Fredman, S.J. (2012). *Cognitive-behavioral conjoint therapy for PTSD: Harnessing the healing power of relationships.* The Guilford Press.

ACCEPTED MANUSCRIPT

Monson, C.M., Wagner, A.C., Crenshaw, A.O., Whitfield, K.M., Newnham, C.M., Valela, R., Varma, S., Di Bartolomeo, A.A., Fulham, L., Collins, A., Donkin, V., Mensah, D.H., Landy, M. S.H., Samonas, C., Morland, L., Doss, B.D., & Fitzpatrick, S. (2022). An uncontrolled trial of Couple HOPES: A guided online couple intervention for PTSD and relationship enhancement. *Journal of Family Psychology*. https://doi.org/10.1037/fam0000976

Pukay-Martin, N.D., Fredman, S.J., Martin, C.E., Le, Y., Haney, A., Sullivan, C., Monson, C. M., & Chard, K.M. (2021). Effectiveness of cognitive behavioral conjoint therapy for posttraumatic stress disorder (PTSD) in a U.S. Veterans Affairs PTSD clinic. *Journal of Traumatic Stress,* https://doi.org/10.1002/jts.22781

R Core Team (2018). R: A language and environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Shnaider, P., Pukay-Martin, N.D., Fredman, S.J., Macdonald, A., & Monson, C.M. (2014). Effects of cognitive-behavioral conjoint therapy for PTSD on partners' psychological functioning. *Journal of Traumatic Stress, 27*(2)*,* 129-136. https://doi.org/10.1002/jts.21893

Simmons, J.P. Nelson, L.D. & Simonsohn, U. (2012). *A 21 word solution*. SSRN. http://dx.doi.org/10.2139/ssrn.2160588

Spielberger, C.D. (2010). State-Trait Anger Expression Inventory. In I.B. Wiener & W.E. Craighead (Eds.), *The Corsini encyclopedia of psychology*. John Wiley & Sons, Inc. https://doi.org/10.1002/9780470479216.corpsy0942

ACCEPTED MANUSCRIPT

Spitzer, R.L., Kroenke, K., Williams, J.B.W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, *166*, 1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Taft, C.T., Watkins, L.E., Stafford, J., Street, A.E., & Monson, C.M. (2011). Posttraumatic stress disorder and intimate relationship problems: A meta-analysis. *Journal of Consulting and Clinical Psychology, 79,* 22-23. https://doi.org/10.1037/a0022196

Thompson, J.M., VanTil, L.D., Zamorski, M.A., Garber, B., Dursun, S., Fikretoglu, D., Ross, D., Richardson, D.J., Sareen, J., Sudom, K., Courchesne, C., & Pedlar, D.J. (2016). Mental health of Canadian Armed Forces Veterans: Review of population studies. *Journal of Military, Veteran and Family Health, 2*(1), 70-86. https://doi.org/10.3138/jmvfh.3258

Weathers, F.W., Litz, B.T., Keane, T.M., Palmieri, P.A., Marx, B.P., Schnurr, P.P. (2013). *The PTSD Checklist for DSM-5 (PCL-5*). National Center for PTSD. www.ptsd.va.gov.

WHOQOL Group. (1998). The World Health Organization quality of life assessment (WHOQOL): Development and general psychometric properties. *Social Science & Medicine, 46*, 1569-1585. https://doi.org/10.1016/S0277-9536(98)00009-4

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Footnotes

1. Sample size determination: The trial registration planned 10 couples for sample 1 and 20 couples for sample 2, the latter based on an a priori power analysis for the primary outcome of PTSD symptoms. Sample 2 data collection stopped after 18 couples enrolled due to the end of the funding period and project timeline. One enrolled couple did not start the program and requested their data be withdrawn, resulting in $n = 17$.
2. Drug use measured by the ASI was an additional planned outcome but was dropped due to unacceptable internal reliability ($\alpha = .22$), consistent with past studies from these samples (see Monson et al., 2022 for a discussion of possible causes).
3. Due to convergence problems, intervention models for anger and perceived health and follow-up models for anger, perceived health, and work functioning did not include slope-intercept correlations. Follow-up models for ineffective arguing did not include random slopes or slope-intercept correlations.

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Table 1

Intent-to-Intervene Sample: Estimated Marginal Means and Model-Estimated Effect Sizes During the Intervention

		Estimated marginal means					
Variable	**Range**	**Pre** ***M* (*CI*)[a]**	**Mid** ***M* (*CI*)[a]**	**Post** ***M* (*CI*)[a]**	**Comparison with null model[b]**	**Pre-Post Change (CI)[c]**	**Pre-Post** ***g*** **[d] (CI)**
Ineffective arguing	8-40	25.14 (22.59–27.70)	22.60 (20.06–25.13)	20.05 (16.85–23.26)	$\chi^2(4) = 19.5^{***}$	5.09^{**} (2.56, 7.64)	0.74^{**} (0.37, 1.12)
Depression	0-27	6.39 (4.71–8.08)	5.43 (4.19–6.67)	4.47 (2.84–6.09)	$\chi^2(4) = 18.9^{***}$	1.92 (-0.07, 3.96)	0.42 (-0.02, 0.87)
Generalized anxiety	0-21	4.85 (2.88–6.83)	4.43 (2.91–5.95)	4.01 (2.34–5.68)	$\chi^2(4) = 7.3$	0.84 (-0.98, 2.55)	0.17 (-0.19, 0.51)
Anger	10-40	22.10 (19.99–24.22)	21.10 (19.01–23.18)	20.09 (17.88–22.30)	$\chi^2(3) = 19.2^{***}$	2.01^{**} (0.88, 3.18)	0.32^{**} (0.14, 0.50)
Alcohol	0-1	0.16 (0.08–0.24)	0.13 (0.07–0.20)	0.10 (0.03–0.18)	$\chi^2(4) = 6.6$	0.06 (-0.03, 0.15)	0.27 (-0.16, 0.70)
Perceived health	1-5	2.54 (2.19–2.90)	2.89 (2.59–3.20)	3.24 (2.81–3.68)	$\chi^2(3) = 12.9^{**}$	0.70^{**} (0.24, 1.23)	0.67^{**} (0.23, 1.18)
Work functioning	1-5	3.67 (3.27–4.07)	3.82 (3.44–4.19)	3.97 (3.49–4.44)	$\chi^2(4) = 2.3$	0.30 (-0.12, 0.69)	0.28 (-0.11, 0.64)
Quality of life	1-5	3.55 (3.22–3.88)	3.79 (3.50–4.08)	4.03 (3.65–4.40)	$\chi^2(4) = 18.2^{**}$	0.48^{*} (0.09, 0.88)	0.56^{*} (0.10, 1.02)

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Note. Positive values for change and effect sizes represent improvement. CI = 95% confidence intervals.

[a] Means are estimated marginal means from multilevel models; CIs computed from standard errors of the mean with a Kenward-Roger correction for small samples.

[b] Comparison with null model conducted using a likelihood ratio test of the full model compared with a null model with no predictors and a random intercept only.

[c] Confidence intervals obtained using parametric bootstrapping with 1000 resamples.

[d] Effect sizes are the estimated change from multilevel models divided by the standard deviation of the outcome variable at baseline, with a *Hedge's g* correction due to effect size inflation at small samples (Hedges, 1981).

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

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