SPECIFYING THE EFFECTS OF AN ONLINE, SELF-HELP COUPLES' INTERVENTION ON PTSD CLUSTERS AND THE INFLUENCE OF IMPROVEMENTS IN RELATIONSHIP SATISFACTION

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A THESIS SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OR ARTS

GRADUATE PROGRAM IN PSYCHOLOGY
YORK UNIVERSITY
TORONTO, ONTARIO

June 2023

Abstract

Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction; CH) is an online dyadic intervention for individuals with posttraumatic stress disorder (PTSD) and their partners. Initial analyses provide support for the efficacy of CH in improving general PTSD symptoms and relationship satisfaction, but it is unclear which symptom clusters of PTSD are improving (i.e., intrusions, avoidance, cognitions and mood, and/or arousal). Moreover, there is a potent association between PTSD symptoms and relationship distress, such that improvements in relationship satisfaction are associated with improvements in PTSD symptoms. However, it is unclear whether this is true in CH, and if so, for which clusters. This information is pertinent to identify when relationship satisfaction requires direct targeting to promote recovery from PTSD symptoms. The current study was a secondary data analysis of the CH case series and uncontrolled trial (N = 27 dyads) and had two aims: (1) to identify which clusters of PTSD are impacted by CH, and (2) to examine whether changes in relationship satisfaction was associated with changes in PTSD clusters. Hierarchical multilevel modelling revealed that CH led to improvements in intrusions, cognitions and mood, and arousal symptom clusters, but not in the avoidance cluster. Avoidance symptoms did improve when changes in relationship satisfaction were moderate to high. Changes in relationship satisfaction were not associated with changes in intrusions, cognitions and mood, or arousal. This study suggests that CH effectively targets intrusion, cognition and mood, and arousal symptoms, but changes in avoidance symptoms are dependent on changes in relationship satisfaction.

Keywords: Posttraumatic stress disorder, relationship satisfaction, intrusions, avoidance, cognitions and mood, arousal.

Acknowledgements

I gratefully acknowledge financial support for this project from the Joseph-Armand Bombardier Canada Graduate Scholarship from the Social Sciences and Humanities Research Council and the Ontario Graduate Scholarship from York University.

I would like to thank my supervisor, Dr. Skye Fitzpatrick for providing me with unconditional guidance and support over the course of this project and my Masters degree. To Dr. Monson and the Couple HOPES team, thank you for being leaders in psychotherapy development and for creating an accessible intervention for individuals with PTSD and their loved ones. To Dr. Alexander Crenshaw, this project would not be possible without your assistance with the statistical analysis of this project. To my colleagues, Alyssa Di Bartolomeo, Sonya Varma, Lindsay Fulham, Talia Tissera, and Elizabeth Earle, as well as the members of my cohort, thank you for your support throughout this process. I would like to extend a special thanks to my colleague and best friend, Katie Benitah, for being by my side every step of the way.

I would also like to extend my deep appreciation for my mother Jennifer Siegel and sisters, Megan Siegel and Taryn Atlin, for their constant encouragement throughout my entire academic career thus far. Finally, I would like to dedicate this project to my late father, Richard Siegel, MSW. Your commitment to mental health pursuits and compassion for others motivated me to be the mental health researcher I am today. Although you are no longer with us, your efforts to make a difference in the world of mental health will continue through my current and future academic pursuits.

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Specifying the Effects of an Online, Self-Help Couples' Intervention on PTSD Clusters and the Influence of Improvements in Relationship Satisfaction

Posttraumatic stress disorder (PTSD) is a severe and debilitating condition affecting 2.5 million Canadians and 70,000 Canadian first responders (Wilson et al., 2016). According to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition-text revision (DSM-5-TR), symptoms of PTSD are grouped into four clusters: (1) intrusions (e.g., repeated, involuntary memories; distressing dreams; flashbacks of the traumatic event); (2) avoidance (e.g., avoiding people, places, activities, and situations that may trigger distressing memories); (3) alterations in cognition and mood (e.g., distorted thoughts about the cause or consequences of the event; anhedonia); and (4) alterations in arousal and reactivity (e.g., self-destructive behavior; being easily startled; APA, 2022). Research suggests that these different PTSD clusters have unique effects on individual functioning and are impacted differently by treatments (Macdonald et al., 2011; Mahoney & Marx, 2022). Moreover, there is a strong association between PTSD and relationship problems, such that relationship distress is a risk factor for worse PTSD treatment outcomes and relationship satisfaction and PTSD bidirectionally predict subsequent improvements in each other (DiMauro et al., 2019; Evans et al., 2010; Monson et al., 2012). This thesis aims to examine the influence of a self-help, online intervention for couples wherein one member is a military members, veterans, and first responders (MMVFR) with probable PTSD [Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction (CH)); Monson et al., 2021)] on specific PTSD symptom clusters. It also aims to elucidate the relationship between changes in PTSD clusters and relationship satisfaction across the intervention.

PTSD and Daily Functioning

Approximately one in eleven individuals are diagnosed with PTSD in their lifetime (APA, 2022). To receive a PTSD diagnosis, the traumatic event must include being exposed to actual or threatened death, serious injury, or sexual violence. Further, individuals must have either: (1) directly experienced the traumatic event(s), (2) witnessed the event in person as it occurred to others, (3) learned that the event occurred to a close family member or friend, or (4) experienced repeated or extreme exposure to aversive details of the event (e.g., first responders; APA, 2022).

Individuals with PTSD often experience significant impairments in daily functioning (Jellestad et al., 2021). Compared to healthy controls, individuals with PTSD reported impairment in all functional domains according to the World Health Organization International Classification of Functioning. These domains include learning and applying knowledge, general tasks and demands, communication, physical mobility, self-care, domestic life, interpersonal interactions and relationships, major life areas, and community, social and civic life (Jellestad et al., 2021). Moreover, veterans with PTSD have reported a poorer ability to regulate negative moods and higher levels of daily negative affect compared to veterans without PTSD (DiMauro et al., 2016). Thus, symptoms of PTSD interfere with individuals functioning in multiple domains of daily life and often reduce quality of life (Schnurr et al., 2009).

The Impact of Relationship Satisfaction on PTSD

As noted, interpersonal interactions and relationships are one domain of daily life that are impacted by PTSD (Jellestad et al., 2021). Indeed, there is a robust association between PTSD and relationship satisfaction (Taft et al., 2011). A meta-analysis of 31 studies indicated that PTSD had a positive association with intimate relationship discord (assessed by measures of relationship quality), intimate partner physical aggression perpetration, and intimate partner

psychological aggression perpetration (Taft et al., 2011). Similarly, PTSD is associated with more frequent displays of hostility and psychological abuse and fewer expressions of acceptance and humour in both veterans and their partners (Miller et al., 2013). The link between PTSD and relationship satisfaction is particularly robust amongst MMVFR. Specifically, there is a stronger association between intimate relationship discord and intimate partner physical aggression perpetration amongst MMVFR samples than civilian samples (Taft et al., 2011). Therefore, participants in the current study were MMVFR.

Two primary models regarding the association between relationship satisfaction and PTSD outcomes create the foundation for which this relationship can be understood. First, the buffering hypothesis posits that having more social support (i.e., the presence/absence of support, perceived helpfulness of interactions) reduces the effect of stress from trauma, decreasing subsequent PTSD severity (Cohen & Wills, 1985). Second, the social negativity hypothesis highlights the significance of the valence of social interactions that occur following trauma exposure in influencing PTSD. Specifically, the social negativity hypothesis suggests that negative social interactions following trauma exposure have a greater impact on mental health symptoms and adjustment than positive interactions (Major et al., 1997). Researchers suggest that this is because cognitive appraisals and reappraisals of the traumatic event are influenced by others' opinions (Joseph et al., 1997) and unhelpful or critical responses might elicit avoidance and limit further discussion of the event (Lepore, 2001). Both models suggest that relationship satisfaction impacts the development and severity of PTSD symptoms.

Numerous studies provide support for both the buffering hypothesis and social negativity hypothesis. In line with the buffering hypothesis, positive social factors (e.g., emotional support, instrumental support) buffer against the onset of PTSD symptoms (Wagner et al., 2016) and

relationship satisfaction in the early aftermath of trauma contributes to changes in PTSD (Fredman et al., 2016). Further, improvements in relationship satisfaction also predict recovery from PTSD (Monson et al., 2012). As outlined in the social negativity hypothesis, partner conflict is positively associated with PTSD severity (Hauff et al., 2016) and, upon return to home from deployment, relationship distress increases the likelihood of military veterans developing PTSD (Dirkzwager et al., 2003). Moreover, relationship distress in military veterans decreases PTSD treatment response (Evans et al., 2010). Although both theories are empirically supported, research suggests that the effect of relationship distress on PTSD is more potent than the effect of positive social factors (Wagner et al., 2016). Therefore, targeting relationship distress may be essential in subsequently improving PTSD symptoms and is an important treatment consideration in and of itself.

Dyadic interventions for PTSD

Given the inextricable linkages between PTSD symptoms and relationship satisfaction, dyadic interventions delivered to people with PTSD and their significant others that target PTSD symptoms and relationship satisfaction have been developed. Cognitive-behavioral conjoint therapy (CBCT) is one such intervention that is comprised of 15 sessions which are divided into three phases: (1) psychoeducation about PTSD, its impact on relationships, and increasing relational safety, (2) communication skills training and dyadic approach exercises to overcome behavioural and experiential avoidance related to PTSD, and (3) cognitive interventions to address problematic thoughts that maintain PTSD symptoms and relationship distress (Monson et al., 2012).

Since its development, 16 empirical studies (three randomized controlled trials (RCTs)) have examined the efficacy of CBCT (Monson et al., 2012; Morland et al., 2022; Liebman et al.,

2020). Nearly all studies found that CBCT significantly improved patient-rated PTSD, depression, and anxiety (Liebman et al., 2020; Morland et al., 2022). In addition, although CBCT has medium to large effect size improvements for PTSD and comorbid symptoms (e.g., depression) that are on par with gold-standard individual PTSD treatments, it also has the additional benefits of improvements in relationship satisfaction (Liebman et al., 2020; Monson et al., 2012). Results from a recent RCT suggest that even a brief version of CBCT delivered to military veterans was effective at improving PTSD symptoms and relational outcomes, with no differences between online or in-person delivery (Morland et al., 2022). Individuals are also less likely to drop-out of CBCT than individual trauma-focused treatments (Liebman et al., 2020). Finally, Pukay-Martin et al. (2022) examined the effectiveness of CBCT for PTSD in a real-world clinical setting [outpatient U.S. Veterans Affairs PTSD Clinic (N = 113)] and found that, across sessions, there were significant reductions in veteran-rated PTSD symptoms and significant increases in both veteran- and partner-rated relationship satisfaction. Thus, CBCT is an efficacious treatment that targets both relationship satisfaction and PTSD symptoms.

Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction)

Despite its benefits, CBCT can be difficult for individuals to access due to geographic, stigma-related, and logistical barriers. For example, the concentration of mental health professionals in the United States is greatest in affluent urban areas and large cities, making treatment difficult to access for anyone outside of these areas. Moreover, the number of individuals who require these services far outnumber the number of professionals available to provide them (Kazdin & Blase, 2011). Accordingly, CBCT was adapted into a self-directed, online format called Couple HOPES (Helping Overcome PTSD and Enhance Satisfaction, or CH; Monson et al., 2021). CH consists of seven interactive, sequential modules that are

comprised of streamed videos and within-module exercises, as well as out-of-module practice assignments. Participants have access to coaching calls with paraprofessionals throughout the CH program which focus on enhancing module and homework completion and troubleshooting problems that interfere with use of the program. Although CH aims to target PTSD and relationship satisfaction in general, much of the content focuses on psychoeducation about the role of avoidance of trauma-related cues in maintaining PTSD, and training in dyadic skills to approach, rather than avoid, such cues. Specifically, beginning in module three of seven, couples learn about avoidance related to PTSD and create a list of PTSD-related people, places, situations, and feelings that they avoid. Homework assignments for modules four through six request that couples engage in approaching both major and minor situations that they typically avoid due to PTSD (Monson et al., 2021). Initial analyses based on a series of 10 couples (Fitzpatrick et al., 2021) and 17 couples (Monson et al., 2022) wherein one member was an MMVFR with probable PTSD, provide support for the efficacy and safety of CH. In particular, CH led to improvements in general PTSD symptoms for participants with symptoms of PTSD (PTSD+ participants) with medium to large effect sizes (g=.72, g=.80, respectively) and in partner-rated relationship satisfaction, with small to medium effect sizes (g=.34, g=.68 respectively). Moreover, research examining outcomes in the intimate partners of the person with PTSD showed significant improvements in conflict (g = 0.74), anger (g = 0.32), perceived health (g = 0.67), and quality of life (g = 0.56) (Crenshaw et al., 2022). In sum, there is initial evidence to suggest that CH improves PTSD symptoms, relationship satisfaction, and overall quality of life for both the individual with PTSD and their intimate partner.

Categorization of PTSD Symptoms

When considering the effects of any treatment, it is important to consider what symptom groups are being targeted beyond a global disorder itself. This is especially relevant with PTSD

given its heterogenous nature. Indeed, across the four PTSD clusters, there are 20 unique symptoms an individual with PTSD may experience, leading to 636,120 potential presentations of PTSD (Galatzer-Levy & Bryant, 2013). However, when attempting to probe the effects of an intervention on symptom groups, a first key question is how to classify the symptom groups themselves. Given the vast amount of potential symptom combinations, it is unsurprising that various categorizations of PTSD have been proposed.

Prior to the DSM-5-TR (APA, 2022), the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR) grouped PTSD symptoms into three categories: (1) re-experiencing, (2) avoidance/numbing, and (3) arousal (APA, 2000). The avoidance/numbing category was then divided into two categories– avoidance and negative alterations in cognitions and mood– in DSM-5, with several additional symptoms added to the latter group (APA, 2022). Other categorizations include the six-factor anhedonia model, which groups PTSD symptoms into (1) intrusions (e.g., recurrent thoughts and/or dreams of trauma, flashbacks), (2) avoidance (e.g., avoidance of thoughts and reminders of trauma), (3) negative alterations in cognitions and mood (trauma-related amnesia, negative beliefs, distorted blame), (4) anhedonia (e.g., loss of interest, detachment, restricted affect), (5) dysphoric arousal (e.g., irritability/anger, self-destructive/reckless behaviour), and (6) anxious arousal (e.g., hypervigilance, exaggerated startle response) (Liu et al., 2016). Researchers have also proposed a six-factor externalizing behaviour model, which groups PTSD symptoms into (1) intrusions, (2) avoidance, (3) negative alterations in cognitions and mood, (4) externalizing behaviours (e.g., irritability/anger self-destructive/reckless behaviour), (5) anxious arousal, and (6) dysphoric arousal (Tsai et al., 2015). Conversely, Armour et al. (2015) provided evidence for a seven-factor hybrid model that consolidates the two six-factor models and is comprised of (1) re-

experiencing, (2) avoidance, (3) negative affect, (4) anhedonia, (5) externalizing behaviours, (6) anxious arousal, and (7) dysphoric arousal. The data on which model best represents PTSD is mixed, with some confirmatory factor analyses suggesting that the current DSM-5-TR four factor model most accurately captures the organization of PTSD symptoms (Gentes et al., 2014; Forbes et al., 2015), while others suggest that the seven-factor hybrid model is more appropriate (Soberón et al., 2016). However, given its adoption by DSM-5-TR, the four-factor model is arguably the most used organization of PTSD symptoms. Therefore, the current study analyzes the CH intervention using the four-factor model, as this is most representative of current practice.

Effects of PTSD Clusters on Individual Functioning

Identifying the impact of CH on individual PTSD symptom clusters is important because individuals' overall impairment due to PTSD and quality of life may differ depending on which symptoms they experience (Mahoney & Marx, 2022). Indeed, intrusions, sleep and concentration difficulties, and hypervigilance are the most frequently reported PTSD symptoms in individuals with functional impairments, whereas reexperiencing and hyperarousal symptoms have been specifically associated with impairments in occupational functioning, learning, and creativity (Kuhn et al., 2003; Lunney & Schnurr, 2007; Norman et al., 2007; Taylor et al., 2006). Avoidance and numbing symptoms, in turn, have been associated with impairments in parenting, relationship distress and difficulties, reduced self-esteem and physical health problems (Kuhn et al., 2003; Litz, 1992; Lunney & Schnurr, 2007; Samper et al., 2004; Woods & Wineman, 2004). These findings suggest that specific symptom clusters are associated with different psychosocial impairments for individuals with PTSD.

Research also suggests that different PTSD treatments target different symptom clusters (Norrholm & Jovanovic, 2010). Upon review of the neurobiological underpinnings of PTSD and

available treatment options, Norrholm & Jovanovic (2010) concluded that psychological treatments, including psychoeducation and individual psychotherapy [e.g., cognitive behavioural therapy (CBT; Beck, 1979), prolonged exposure (PE; Foa et al., 2007), cognitive processing therapy (CPT; Resick & Schnicke, 1993)] target broad spectrum PTSD symptoms (Norrholm & Jovanovic, 2010; Watkins et al., 2018). Nevertheless, it is likely that these interventions do not target all symptom clusters equally. For example, the effect of CBT on PTSD is mediated by change in maladaptive cognitions, suggesting that CBT may be particularly useful in targeting the cognitions and mood cluster (Kar, 2011). In a clinical trial examining CPT for PTSD in military veterans, CPT led to significant decreases in avoidance symptoms compared to waitlist controls, but changes in numbing and hyperarousal symptoms were not observed (Macdonald et al., 2011). In another study, CPT elicited significant changes in the cognitions and mood cluster of PTSD, perhaps because it enables patients to focus on the cognitive and emotional aspects of the event (Norrholm & Jovanovic, 2010). Thus, PTSD treatments do not target symptom clusters uniformly.

With regards to CBCT, Macdonald et al. (2016) found that, in comparison to waitlist controls, patients who received CBCT immediately demonstrated greater improvements in all Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) PTSD symptom clusters (re-experiencing, effortful avoidance, emotional numbing, & hyperarousal), trauma-related beliefs, and guilt cognitions, with medium to large effect sizes (Hedge's *g*s -.33 to –1.51). This suggests that dyadic interventions such as CBCT may impact all PTSD symptom groups. However, it is currently unknown which individual PTSD symptom clusters are impacted by CH. This lack of knowledges impedes the understanding of who may benefit from the intervention and who may need additional treatment elements.

PTSD Clusters and Relationship Functioning

In addition to specifying which PTSD symptom clusters are more or less likely to change in interventions like CH, it is also essential to understand how these symptom clusters relate to changes in relationship satisfaction. Elucidating this association will provide information on when relationship satisfaction should be targeted to help customize treatments and treatment selection. Research suggests that the specific clusters of PTSD symptoms that an individual experiences predict whether and to what extent couples experience relationship satisfaction (Dekel & Monson, 2010). For example, one study examined the unique contributions of numbing, hyperarousal, effortful avoidance, and reexperiencing on relationship difficulties in military veterans (Allen et al., 2018). Results indicated that emotional numbing symptoms (i.e., inability to experience emotions), which fall under the cognition and mood cluster (APA, 2022), explained an independent contribution to problems in intimate relationships. Similarly, Campbell and Renshaw (2018) found that symptoms of emotional numbing had the most consistent negative associations with relationship satisfaction and hyperarousal demonstrated a less consistent but typically negative association with relationship satisfaction. Emotional numbing has also been found to be uniquely associated with poorer marital functioning, decreased positive bonding between couples and increased conflict behaviour over time (Allen et al., 2018). Ultimately, these studies suggest that there is a particularly potent relationship between relationship satisfaction and symptoms in the cognition and mood cluster. Thus, improving relationship satisfaction may be particularly important to yield improvements in the cognitions and mood PTSD symptom cluster.

Conversely, Fredman et al. (2017) examined the bidirectional associations between PTSD symptom severity and dyadic conflict communication in individuals with PTSD that were in an intimate relationship at the time of the trauma. Results showed a unique association between

effortful avoidance and dysfunctional communication, such that effortful avoidance at four weeks predicted greater dysfunctional communication at 16 weeks. This is in line with research that has shown that avoidance leads to a decrease in affective expression and more limited self-disclosure (Dekel & Monson, 2010), both of which are likely to impair a couples' communication. In the other direction, dysfunctional communication at four weeks predicted emotional numbing at 16 weeks. These results suggest that some clusters (i.e. avoidance) may impact relationship satisfaction, whereas other clusters (i.e., numbing) may both impact and be impacted by relationship satisfaction. Ultimately, such research suggests that targeting relationship satisfaction may be particularly important to yield improvements in specific domains of PTSD more so than others (e.g., changes in cognitions and mood). In turn, dyadic interventions may be especially important for individuals who experience symptoms in the cognitions and mood cluster. However, the influence of improvements in relationship satisfaction on specific clusters during PTSD treatments has not been tested, making it unclear which individuals would most benefit from dyadic PTSD interventions.

Current Study

In sum, preliminary evidence suggests that CH improves general PTSD symptoms (Fitzpatrick et al., 2021; Monson et al., 2022) and that CBCT is efficacious in improving all symptom clusters in individuals with PTSD (Macdonald et al., 2016). However, it is unclear whether this is also true for CH. Given the heterogenous presentation of PTSD, CH may benefit some individuals more than others, depending on the symptom clusters it most effectively targets. Therefore, the current study aims to identify which clusters of PTSD may be improved by CH. It is hypothesized that, as with CBCT, couples will report improvements across all PTSD symptom clusters. Given the link between specific symptom clusters and relationship

satisfaction, the current study also sought to examine the association between changes in relationship satisfaction and PTSD clusters. Examining this question will contribute to the optimization of dyadic PTSD interventions by highlighting when relationship satisfaction requires direct targeting to promote recovery from specific PTSD symptom clusters and when it may not. Based on the findings from Fredman et al. (2017), it is hypothesized that greater improvements in relationship satisfaction will be associated with greater improvements in avoidance. Similarly, given research that suggests a link between emotional numbing and relationship functioning (Campbell & Renshaw, 2018; Cook et al., 2004; Fredman et al., 2017), it is hypothesized that greater improvements in relationship satisfaction will also be associated with improvements in the cognitions and mood cluster, as this cluster includes the symptom of emotional numbing.

Method

This study involves a secondary analysis of data collected from both an uncontrolled trial (UCT) and case series study of Couple HOPES (Fitzpatrick et al., 2021; Monson et al., 2022). For comprehensive sample characteristics and procedures, please refer to the parent study protocols (Fitzpatrick et al., 2021; Monson et al., 2021).

Participants

The sample for this study is comprised of intimate dyads (N = 27 couples; 10 dyads from the case series; 17 dyads from the UCT) who were recruited during the COVID-19 pandemic. Inclusion criteria for the study involved one member of the dyad: (1) being a Canadian military MMVFR (2) who experiences a DSM-5-TR Criterion A traumatic event (APA, 2022); and (3) has clinically significant self-reported PTSD symptoms (i.e. a total score of ≥ 33 on the Posttraumatic Checklist-5; Bovin et al., 2016; Weathers et al., 2013; Wortmann et al., 2016). It

was not necessary for traumatic events to occur in the context of the MMVFR's occupation for a participant to be eligible. Participant demographics can be found in Table 1.

Dyads were excluded if either member: (1) endorsed elevated suicide risk (i.e., endorsed any more than "brief" thoughts of suicide in the past week or a suicide attempt in the last year), (2) was not willing to complete intervention modules with their partner, (3) did not have access to high-speed internet, (4) was not willing to have coaching sessions audio- or video-recorded, or (5) reported the occurrence of severe intimate partner violence in the last year (i.e., been hit, kicked, punched, hurt, or experiencing forced sexual activities by a partner in the past year, or not feeling physically safe in the relationship). Participants were also excluded if both members of the dyad met the PTSD inclusion criteria.

Measures

The Posttraumatic Stress Disorder Checklist-5 (PCL-5; Weathers et al., 2013)

The PCL-5 is a reliable and valid 20-item self-report measure of PTSD symptoms consistent with DSM-5-TR criteria (APA, 2022). In the current study, it was used to determine participant eligibility and to measure PTSD throughout. To determine eligibility, participants were instructed to think about a very stressful event that they either experienced directly, witnessed, or learned about happening to a close friend or family member. This event must involve serious or threatened death, serious injury, or sexual violence (i.e., be a criterion A event). They were then asked to identify and write down what they consider to be the worst event of this nature and refer to this event while completing the PCL-5. Individuals were eligible if the event they referred to met the DSM-5-TR definition of a criterion A event (as determined by a member of the research team) and their scores on the questionnaire were greater than 33, which is indicative of probable PTSD (Blevins et al., 2015). When completing the PCL-5 throughout

the intervention, participants were prompted to consider a very stressful experience rather than explicitly instructing them to refer to a criterion A event. They were not asked to describe the event when completing the PCL-5 throughout the intervention.

The PCL-5 was internally consistent for both PTSD+ participants (α = .89) and intimate partners (α = .95). Individuals rate their experience of symptoms on a 5-point Likert scale from 0 (not at all) to 4 (extremely) based on how much they have been bothered by each item in the past month. Partners completed an informant-report version of the PCL-5 to report their perceptions of their partners' PTSD symptoms, which has also shown good internal consistency (α = .95; Monson, 2012). Items on the PCL-5 can be grouped according to the DSM-5 four-factor model (intrusions: items 1-5; avoidance: items 6-7; cognitions: items 8-14; and arousal: 15-20). The PCL-5 can be grouped into intrusion, avoidance, cognitions and mood, and arousal and reactivity subscales according to the DSM-5-TR clusters (α = .57; .74; .78; and .77, respectively; Sveen et al., 2016).

The Couples Satisfaction Index (CSI-4; Funk & Rogge, 2007)

The CSI-4 is a self-report measure of relationship satisfaction. Participants are asked to rate their degree of happiness, perceived warmth, reward, and satisfaction in their relationship. The CSI-4 has strong convergent validity with other gold standard satisfaction measures (Funk & Rogge, 2007). The CSI-4 also had strong internal validity for both PTSD+ (α = .92) and intimate partners (α = .91)

Procedures

Procedures for the parent study received approval from both Toronto Metropolitan University and York University Research Ethics Boards. Participants were recruited from social media advertisements and community outreach. Interested participants signed up for the study on

the Couple HOPES website (www.couplehopes.com) and received separate screening surveys via email. Eligible couples were provided with online consent forms and were then prompted to complete an online baseline assessment. Once enrolled, couples were assigned a coach who contacted them via email or secure messaging on the platform to schedule their first coaching call. Participants completed up to seven consecutive modules throughout the study, with coaching calls after modules one, three, five, and seven, and an additional coaching call as needed. Prior to each module, participants completed both the PCL-5 and the CSI-4, which they also completed at baseline, mid-intervention (i.e., after the completion of module three and its associated coaching call), and post-intervention (i.e., after the completion of module seven and its associated coaching call, or after eight weeks since enrollment, whichever came first). This yields up to 10 measurements for each participant in the study.

Participants were considered "non-completers" if all seven modules were not completed within 8 weeks. In this case, they no longer had access to coaching but retained access to the platform for 12 months following the date of their withdrawal or their eight-week timepoint. Participants were compensated in the form of a gift card for the completion of their assessments.

Couple HOPES Intervention

As noted, the CH intervention is a self-help intervention comprised of seven interactive modules. These modules cover: (1) psychoeducation on PTSD symptoms and relationship functioning; (2) safety building in relationships and introducing skills to manage relationship conflict; (3) communication skills; (4) approaching situations; conversations, and experiences that are often avoided due to PTSD symptoms; (5) sharing feelings; (6) sharing thoughts; and (7) consolidating intervention gains and relapse prevention. Each module contains web-streamed videos and activities that are approximately 30 minutes in length and involve interactive

exercises to complete during the modules as well as practice assignments for couples to complete between modules. Additionally, each couple is paired with a coach whom they can message with to troubleshoot homework completion and the use of the platform, monitor relationship satisfaction, clarify information as needed, and encourage the use of the CH platform. There are four 15-minute coaching calls scheduled after modules 1, 3, 5, and 7 (end of intervention), with an additional 15-minute call offered on an as-needed basis. The first three scheduled coaching calls focus on troubleshooting or enhancing program engagement and adherence, whereas the final coaching session focuses on summarizing the program, identifying areas of future growth, and reinforcing couples for their efforts.

Data Analytic Strategy

Initially, a series of hierarchical linear modelling (HLM) analyses using SPSS version 28 were conducted. To address question 1, mean cluster scores on the PCL-5 were entered into the model as the outcome variable, with PTSD cluster and timepoint, as well as the interaction between PTSD cluster and timepoint, entered as predictors. However, upon further consideration, we determined that this analytic plan was inappropriate and insufficiently powered given our sample size of only 27 dyads. In particular, PTSD clusters are not orthogonal to each other, and it would be inappropriate to covary for the impact of one PTSD cluster on the other as it results in an outcome construct that does not reflect the real-world nature of the cluster. Therefore, we chose to analyze each cluster separately to address the current questions, as will be described below.

Current Analysis

To address Question 1, which sought to identify which PTSD clusters are impacted by CH, items from the PCL-5 were divided into their respective clusters (intrusions: items 1-5;

avoidance: items 6-7; cognitions: items 8-14; and arousal: 15-20) and mean scores were calculated for each cluster across each timepoint. Subsequently, using SPSS version 28, eight individual hierarchical multilevel models (HLM; one per cluster for both PTSD+ participants and one per cluster for partner-rated PTSD symptoms) were used to analyze which PTSD clusters are impacted by CH. HLM structures the data such that observations in one level of analysis are nested within observations at another level (Nezlek et al., 2012). Therefore, using an HLM takes into account interdependence among data points. Further, an HLM is composed of the fixed and random effects that best capture the collection of individual trajectories over time. HLM also optimizes power by retaining participants with missing data (Nezlek et al., 2012). However, HLM is only an appropriate strategy when the outcome measures are linear over time (Singer & Willett, 2003). To determine whether HLM was an appropriate data analytic strategy for the data, line graphs were generated examining each outcome variable of interest (i.e., each cluster for PTSD+ participants and intimate partners). Visual inspection suggested that most variables were approximately linear over time, however, statistical analyses were undertaken to more reliably examine this. For each model, we freely estimated the association between random slopes and intercepts. The outcome variable was mean PCL-5 cluster scores, which were nested within participant, with timepoint entered as the predictor. Hedge's g effect size was calculated according to steps outlined by Feingold (2009).

To test associations between change in relationship satisfaction and improvements in PTSD clusters (Question 2), we fit an HLM for CSI-4 scores over the course of treatment and saved empirical Bayes' estimates of change in the CSI-4 for each individual. We then computed a change score in relationship satisfaction by subtracting the CSI-4 estimates of change at timepoint 1 from the CSI-4 estimates of change at timepoint 9. The Bayes' method takes

advantage of repeated measurements to obtain a more reliable estimate over simply subtracting the first from last timepoint values (Doss, 2012; Rogosa & Willett, 1985). This change score, in which higher values represent more improvement in relationship satisfaction, was then centered at the group level through grand mean centering (GMC), which involves subtracting an individual's average score across all time points from the sample average score across time points (i.e., between-person variance). The GMC change score was then added to the above model as a main effect and interaction with timepoint, with separate models run for each cluster and those with PTSD and their partners. For PTSD+ participants, the CSI-4 scores contained an extreme outlier (4.86 SD from the mean). To account for this, we winsorized the data, which sets the extreme score to be equivalent to the next highest score (Ch'ng & Mahat, 2020). The direction and significance of results did not change when using the winsorized value.

We probed the interaction using the Johnson-Neyman (J-N) techinique (Bauer & Curran, 2005), which was developed to evaluate the group mean differences at each level of CSI-4 change. The J-N technique computes regions of significance which define the levels of a moderator for which the group difference is significant. Regions of significance provide an inferential test for any possible simple slope of the focal predictor (timepoint) (Bauer & Curran, 2005). We used the J-N technique to examine change in PCL-5 clusters at three different levels of CSI-4 change (-3.13, .043, 3.99). These values were determined by the mean of CSI-4 change, one standard deviation below the mean, and one standard deviation above the mean (M = 0.428, SD = 3.56).

Results

Descriptive Statistics

The mean PCL-5 scores for PTSD+ participants and their partners is in Table 2 and Figures 1-2. The mean CSI-4 scores across timepoints is in Table 2 and Figure 3.

Initial Analysis

Results from the initial analysis using HLM revealed that for both PTSD+ participants and intimate partners, there was no significant interaction between timepoint and PTSD cluster in predicting PCL-5 scores, $F(3,766) = .475$, $p = .700$ and $F(3,752) = .206$, $p = .892$, respectively.

Current Analysis

Impact of CH on PTSD Clusters

Tables 3 and 4 include the results of the HLM analyses examining the effect of CH on individual PTSD clusters, rated by both PTSD+ participants and their partners. For individuals with PTSD, PCL-5 scores in the intrusion cluster improved significantly over time with a moderate effect size, $F(1,21) = 7.40$, $p = .013$ (Hedges $g = -.705$). Similarly, scores in the cognitions and mood cluster, $F(1,21) = 14.2$, $p = .001$, and in the arousal cluster, $F(1,22) = 12.7$, $p = .002$, improved significantly over time with large effect sizes (Hedge's gs = -.988 and -.756, respectively). No significant changes in the avoidance cluster were found for PTSD+ participants. PCL-5 scores rated by intimate partners did not change significantly over time for any of the clusters.

Relationship between Changes in Relationship Satisfaction and PTSD Cluster Score

Results from the HLM analyses examining the impact of CSI-4 change scores on PCL-5 cluster scores for PTSD+ participants and their partners in Tables 5 and 6, respectively. For PTSD+ participants, there was a significant interaction between CSI-4 change and time for the avoidance cluster, such that greater improvements in relationship satisfaction was associated greater improvements in avoidance over time, $B = -.021$ (.008), $t(1, 19.5) = -2.43$, $p = .025$ [-.040, -.003]. Changes in avoidance over the course of CH at low (1 standard deviation (SD) below the mean change in relationship satisfaction), moderate (within a SD of the mean change in relationship satisfaction), and high (1 SD above the mean change in relationship satisfaction)

levels of change in relationship satisfaction can be seen in Figure 4. Johnson-Neyman regions of significance (Bauer & Curran, 2005) showed that a CSI-4 change of 1.16 points or greater (range of CSI-change scores: -9.46 to 6.41) was associated with significant improvements in avoidance, whereas changes in relationship satisfaction below that were not. Interactions between CSI-4 and timepoint were not significant for the intrusions, cognitions and mood, or arousal clusters for PTSD+ participants. No interactions were significant for intimate partners.

Discussion

PTSD is a highly heterogeneous disorder that is currently categorized into four symptom clusters: intrusions, avoidance, cognitions and mood, and arousal (APA, 2022). Additionally, there is a strong association between PTSD and relationship satisfaction, such that improvements in relationship satisfaction are associated with improvements in PTSD symptoms (Monson et al., 2012). CH is an online intervention that targets both symptoms of PTSD and relationship satisfaction. Preliminary evidence suggests that CH improves PTSD symptoms and relationship satisfaction (Fitzpatrick et al., 2021; Monson et al., 2022). The present study was conducted to identify which PTSD clusters are impacted by CH, and whether changes in relationship satisfaction are associated with changes in PTSD symptom clusters. Results revealed that PTSD+ participants experienced improvements in intrusions, cognitions and mood, and arousal symptom clusters. Avoidance symptoms improved for PTSD+ participants when changes in relationship satisfaction were moderate to high. Regardless of changes in relationship satisfaction, PTSD scores rated by intimate partners did not change over the course of the intervention for any symptom clusters.

Impact of CH on PTSD Clusters Rated by PTSD+ Participants

As hypothesized, CH led to improvements in intrusions, cognitions and mood, and arousal symptoms over time, according to self-report responses. This is in line with extant

literature which suggests that CBCT improves re-experiencing symptoms, emotional numbing, hyperarousal, trauma-related beliefs, and guilt cognitions (Macdonald et al., 2016). Although the current literature suggests that CBCT and other dyadic interventions improve intrusion symptoms (Macdonald et al., 2016), the mechanisms as to why this is the case is unclear. Ehlers (2010) reported three factors that are important in maintaining distressing intrusive experiences: (1) memory processes responsible for the easy triggering of intrusive memories, (2) the individuals' interpretations of their trauma and memories, and (3) their cognitive and behavioural responses to trauma memories. It is possible that couples' discussions regarding the impact of trauma on their thoughts and behaviours (introduced in module 1 and encouraged throughout the intervention) facilitated trauma memory processing and the development of novel interpretations of the traumatic event for those with PTSD. Trauma memory processing is theorized to reduce intrusive symptoms by increasing awareness that the traumatic event is a memory is from the past rather than a present threat (Ehlers et al., 2004). Thus, by processing and discussing these memories, individuals may be better able to recognize intrusive symptoms as memories, rather than as indicative of a current threat. Likewise, when an intrusive memory is elicited, individuals with PTSD often have difficulty accessing information that corrected or updated the interpretation of the traumatic event and feelings they had at the time. (Ehlers et al., 2004). Through developing and discussing alternate interpretations of the traumatic event, individuals may be generating updated information that they can access more easily when they experience intrusive symptoms. Therefore, CH may improve intrusion symptoms by helping individuals process and create novel interpretations of the traumatic event.

Similar to intrusions, although research suggests that CBCT also leads to decreases in the arousal symptom cluster, the mechanism(s) driving this change in both CBCT and CH are

unclear. Research suggests that there is a large association between some arousal symptoms (i.e., irritability/anger, poor concentration, and sleep problems) and relationship distress (Sippel et al., 2019). Therefore, it is possible that psychoeducation regarding conflict and negative relationship behaviours, and the provision of skills that aim to decrease conflict in couples, may inadvertently decrease arousal symptoms. For example, in module 2 of CH, couples are introduced to the skill of time-outs. Time-outs involve a couple stopping a conversation during periods of high arousal to prevent further escalation and return after a brief outlet (Monson et al., 2021). Learning to regulate their emotions during times of conflict, and use emotion regulation strategies (e.g., utilized during the brief outlet) during conflict, provides participants with additional skills that they can use to decrease their arousal outside of conflict as well. Thus, these skills may in part explain why CH was effective at improving arousal symptoms. However, the directionality of improvements in relationship conflict and arousal symptoms remains an open empirical question in the context of CH.

In line with findings on CBCT (Macdonald et al., 2016), CH led to significant improvements in the cognitions and mood cluster. During module 1 of CH, couples receive psychoeducation on the relationship between PTSD and relationship satisfaction and answer questions regarding the impact of trauma on their relationships and their own thoughts and behaviours. Identifying how and why the trauma has affected them likely helps individuals with PTSD understand their own distorted beliefs (i.e., in the areas of safety, trust, intimacy, and guilt) in relation to their trauma. For example, individuals with PTSD often develop negative thoughts about themselves, other people, and the world (APA, 2022). However, they may be unaware that these thoughts developed because of their traumatic experience. Gaining insight on how cognitions have been impacted by their trauma may decrease their severity over time.

Module 6 includes example cognitions associated with PTSD and relationship distress, and assignments to monitor and share trauma-focused cognitions. This may have helped PTSD+ participants consider and develop more balanced alternative thoughts about their trauma. These exercises may have also provided participants with real-time evidence for more balanced beliefs (i.e., my partner can be trusted to not judge me for what happened). Moreover, all dyadic exercises serve to increase intimacy between partners, which decreases emotional numbing and alienation symptoms (Solomon et al., 2008), both of which fall under the cognitions and mood cluster.

Impact of CH on Avoidance

In contrast to our hypothesis and results from CBCT trials, symptoms in the avoidance cluster did not improve over the course of the intervention. Notably, PTSD+ participants rated their avoidance symptoms as less severe than symptoms in both the cognitions and mood and arousal clusters at baseline. Thus, it is possible that improvements in avoidance were nonsignificant as there was less room to improve (i.e., a floor effect). However, intrusions were rated as the least severe at baseline and still improved significantly, so a floor effect likely does not fully account for this result.

Another explanation for a lack of effect of CH on avoidance symptoms may be the absence of a clinician to assist with approach behaviours. Although participants have access to coaching calls throughout the intervention, they do not get to practice approach behaviours with their coach (i.e., *in vivo* exposure). Thus, it is possible that a clinician is needed to help facilitate approach behaviours, which would consequently decrease avoidance symptoms. Moreover, most of the work that involves approaching avoided trauma-related situations was assigned as homework. For example, after module two, couples are asked to create lists of people, places,

situations, and feelings that they typically avoid because of their PTSD. Throughout the remaining modules, homework involves completing major approaches (i.e., approaching at least three items on their avoidance list) and minor approaches (i.e., approaching small daily activities they avoid). Although coaches are available to discuss avoidance of practice assignments and encourage couples to complete these assignments, it is possible that not all couples were completing every homework assignment. Since many homework assignments deliberately target avoidance, homework completion may be particularly important to this symptom cluster. Indeed, research suggests that low adherence to homework that involves approaching trauma cues leads to less robust change in PTSD symptoms (Cooper et al., 2017). Future analyses should include homework completion as a moderator to determine its impact on treatment outcomes.

Effect of Relationship Satisfaction on the Impact of CH on Symptom Clusters Rated by PTSD+ Participants

Symptoms in the avoidance cluster improved when greater changes in relationship satisfaction were also reported. This finding highlights the association between avoidance and relationship satisfaction and suggests that improvements in avoidance symptoms and relationship satisfaction may be contingent on one another, whereas the other clusters may change independently. It is possible that the impact of CH on avoidance was moderated by changes in relationship satisfaction because of the emphasis placed on dyadic skills (and in turn, the reliance on intimate partners to achieve this skill) to help the participant with PTSD approach avoidance cues. For example, CH emphasizes the construct of accommodation throughout its modules. Accommodation refers to behaviour changes by intimate partners of those with PTSD that aim to minimize the occurrence of PTSD symptoms (e.g., taking over certain chores, avoiding physical contact, not sharing thoughts or feelings that might provoke anger) (Fredman et al., 2014).

Partners can interfere with recovery of symptoms by reinforcing avoidance through accommodation (Figley & Kisler, 2013). Research also shows that partner accommodation in PTSD is negatively associated with clients' perceived social support and feelings of intimacy (i.e., lower relationship satisfaction) for both members of the dyad (Campbell & Renshaw, 2019; Fredman et al., 2022; Pukay-Martin et al., 2015). Thus, decreasing accommodation may be essential for improving both relationship satisfaction and avoidance symptoms. Initial results suggest from the CH case series suggest that there were medium effect size improvements in partner accommodation (Fitzpatrick et al., 2021). Therefore, it is possible that these improvements in accommodation did in fact moderate the relationship between avoidance and relationship satisfaction.

Research also suggests that partner accommodation is slow to change in comparison to general PTSD symptoms, and improvements are not always seen immediately after completion of an intervention (Fredman et al., 2021). For example, in a study examining the effects of an abbreviated version of CBCT, PTSD symptoms had improved significantly at one-month follow-up, but improvements in partner accommodation were only seen at three-months follow-up. Therefore, it is possible that partner accommodation improved in some but not all couples throughout CH. This may explain why general improvements were not found in the avoidance cluster, as these participants may have not yet experienced improvements in partner accommodation. Examining follow-up data regarding avoidance symptoms, relationship satisfaction, and longitudinal changes in partner accommodation is a key next step.

Another plausible explanation is that PTSD+ participants needed to feel safe and supported by their partner before approaching trauma cues. One question on the CSI-4 is: *I have a warm and comfortable relationship with my partner.* Responses to this question as well as the

other CSI-4 items likely reflect how supported individuals feel by their partner. Research suggests that feelings of security and safety in intimate relationships can improve adjustment to trauma cues and curtail avoidance symptoms (Johnson & Williams-Keeler, 1998). Therefore, greater relationship satisfaction may be a precursor for individuals with PTSD to be able to approach trauma cues with their partner. Such approaching may also have a reciprocal effect on relationship satisfaction, such that reduced avoidance also results in partners feeling less compelled to engage in accommodation and, subsequently, relationship satisfaction increasing.

For PTSD+ participants, there was no association between changes in relationship satisfaction and the remaining three clusters (intrusions, cognitions and mood, arousal). This contradicts our hypothesis and previous findings that suggests there is a particularly strong association between emotional numbing (accounted for in the cognitions and mood cluster) and relationship satisfaction (Campbell & Renshaw, 2018; Cook et al., 2004; Fredman et al., 2017). However, the cognitions and mood cluster also include items that reflect individuals' ability to remember the trauma, distorted thoughts about the cause or consequences of the event (e.g., "I am bad," "No one can be trusted"), and a persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame). Thus, it is possible that there is an association between relationship satisfaction and emotional numbing, but the association between relationship satisfaction and the additional symptoms in the cognitions and mood cluster is not as strong and therefore obfuscated this effect. It is also plausible that, for these symptoms, the reverse direction is more important (e.g., changes in symptom clusters impacting changes in relationship satisfaction). This is in line with literature that suggests that symptoms such as emotional numbing led to decreases in relationship satisfaction (Kuhn et al., 2003; Litz, 1992; Lunney & Schnurr, 2007; Samper et al., 2004; Woods & Wineman, 2004).

Our hypothesis regarding the moderating effect of changes in relationship satisfaction on intrusion and arousal symptoms was exploratory, as the literature examining these specific associations is sparce. Results from the current study suggest that improvements in intrusion and arousal clusters are not associated with improvements in relationship satisfaction. It is possible that partners are less involved in the interventions that target these clusters than they are with the avoidance cluster. As noted, previous research suggests that symptoms in the intrusions cluster are maintained through memory processes that trigger the intrusive memories, the individual interpretation of their trauma and memories, and their cognitive and behavioral responses (Ehlers, 2010). As such, completing exercises, such as answering trauma impact questions, may allow PTSD+ participants to think about the trauma and create novel interpretations of it, which may be sufficient in improving intrusion symptoms, independent of relationship satisfaction. Similarly, it is possible that thinking about and processing their trauma allowed participants to habituate to trauma reminders (i.e., have a decreased physiological response; Marks et al., 1998), in turn decreasing arousal symptoms. Similar to intrusions, habituation may rely more heavily on intrapersonal rather than interpersonal processes, and thus lead to a decrease in arousal, independent of relationship satisfaction. Moreover, as is possibly true with the cognitions and mood cluster, it is also plausible that the impact of intrusion and arousal symptom clusters on changes in relationship satisfaction may be more potent than the impact of changes in relationship satisfaction on intrusions and arousal. Taken together, both changes in intrusion and arousal symptom clusters may depend more on intra- rather than inter-personal processes.

Impact of CH on PTSD Clusters rated by Intimate Partners

In contrast to ratings from PTSD+ participants, there were no significant improvements in partner-rated PTSD symptoms in any clusters across the CH intervention, regardless of

changes in relationship satisfaction. This is consistent with previous research that has found that PTSD+ participants reported reductions in their symptoms during and after CH, but collateral-reported PTSD symptoms were not comparably improved (Fitzpatrick et al., 2021; Monson et al., 2022). It is possible that collateral reports of PTSD symptoms could have increased at some points throughout the intervention (i.e., partners reported more severe PTSD symptoms for the individual with PTSD) due to an enhanced understanding of the disorder, rather than an actual change in symptoms. For example, as partners learn more about avoidance, they may begin to notice more situations in which their partner with PTSD symptoms avoids trauma cues. Thus, an increase in severity ratings for avoidance may reflect an increased awareness of avoidance behaviours that they did not previously notice, rather than an increase in the behaviours themselves. The same may be true for the other three clusters, and this effect may conflate PTSD symptom reduction with increased PTSD symptom awareness. Such a conflation could result in the appearance of a lack of change in PTSD symptoms.

Moreover, there was a steep increase in ratings of informant-rated severity for intrusions, avoidance, and cognitions and mood from the last module (i.e., timepoint eight) to post-treatment (i.e., timepoint nine). In-between these timepoints, participants completed module seven, in which they reflected on their progress throughout the intervention and planned for the future. It is possible that intervention termination caused distress, as participants are aware that they will no longer be explicitly guided on skills to promote recovery and will no longer have additional support from a coach. Such an increase in distress for intimate partners may have led to worsening of reported symptoms (Belar, 2008) and masked any potential improvements in outcomes that could be observed throughout the program. Follow-up data indicating whether intimate partners ratings of symptom severity decreases again after intervention termination is

essential. This would inform whether the increase in symptom severity from the last module to post-treatment was a result of external factors (e.g., distress related to termination) or are indeed a true reflection of PTSD symptom severity worsening.

Limitations and Future Directions

There are several limitations to the current study that may have affected results. Firstly, the current study had a small sample size (N = 27 couples), which limits its statistical power. Moreover, as participants were either part of the case series or uncontrolled trial, there was no control group to compare outcomes against. Therefore, it is unclear if improvements in PTSD clusters were due to the CH intervention specifically or the engagement of an intervention or repeated assessment more broadly. Likewise, follow-up data was not analyzed in the current study. It is possible that, as couples continue to practice the skills learnt in CH, their relationship satisfaction may increase further, and PTSD symptoms may decrease to a greater extent. On the contrary, it is also possible that improvements in PTSD symptoms and relationship satisfaction will not be maintained long-term. Thus, to understand the longitudinal effects of CH on individual symptom clusters, follow-up data is needed. Participants in the current study were also the first to receive the CH intervention. Coaching calls and study protocols have been refined throughout the study (e.g., coaching calls increased from 15 minutes to 20 minutes and coaching content was refined). In turn, results do not necessarily reflect the most updated version of CH.

Although HLM somewhat accounts for missing data points, it is important to note that missing data points and outliers may have still affected the results. In the current study, the majority of participants had missing data for at least one timepoint, with some participants missing data for up to 9 timepoints. Thus, missing data further reduced statistical power. Additionally, both the current study (α = .83, .55, .62, .75) and extant literature (α = .57, .74, .78,

and .77; Sveen et al., 2016) suggests poor reliability of the individual cluster measures within the PCL-5. This may imply that items within each cluster are reflecting distinct symptoms that may not actually fit together, and thus that the primary constructs under investigation- or the way in which they are being measured- are themselves invalid. Additional research using a more reliable measure is needed.

Given the current study limitations, avenues for future research should be considered. Firstly, research probing the association between individual PTSD clusters and relationship satisfaction is needed. In particular, studies should further examine how partner accommodation affects avoidance and approach behaviors in individuals with PTSD, and how this impacts relationship satisfaction. Such information would indicate when, whether, and how much dyadic PTSD interventions should focus on partner accommodation. Moreover, such information may be critical to disseminate to the general population, as it can inform intimate partners how they can best support their loved one with PTSD. Similarly, research should continue to examine the effect of interventions on PTSD symptoms at both the overall and cluster-specific level given that the current study and extant literature suggest that interventions do not target all symptom clusters equally (Norrholm & Jovanovic, 2010). Additionally, research should compare the effects PTSD interventions (e.g., cognitive behavioural conjoint therapy, CH, cognitive processing therapy, and cognitive behavioural therapy) on individual clusters to determine which interventions best target specific PTSD symptoms. These pursuits will help to determine which intervention is most effective for which cluster and, in turn, inform clinicians as to which treatment may be most suitable for a particular client.

Finally, although the current study focuses on intimate partners, it is possible that the impact of CH on symptom clusters and the association between relationship satisfaction and

avoidance in particular may hold true for other types of interpersonal relationships (e.g., parents, siblings, friends). Future research should investigate if this is true by expanding inclusion criteria for studies testing CH to any close relationship, rather than selectively focusing on intimate relationships. Such findings would indicate whether it may be beneficial for clients who are not in an intimate relationship to still engage in the intervention.

Clinical Implications

The current study has numerous clinical implications. First, results suggest that CH exerts moderate to large effects on the intrusions, cognitions and mood, and arousal symptom clusters, regardless of whether relationship satisfaction improves. Therefore, individuals who present with symptoms in any of these three clusters may benefit from CH. Additionally, as avoidance only improved when greater improvements in relationship satisfaction were observed, targeting relationship satisfaction in clients who present primarily with symptoms of avoidance may be critical to optimizing outcomes. Thus, CH may be a particularly important intervention for individuals in relationships who present with avoidance symptoms.

Conclusion

Overall, the current study provides more information on the specific benefits of CH to PTSD symptoms. Results suggest that, regardless of changes in relationships satisfaction, CH is effective at targeting intrusions, cognitions and mood, and arousal symptoms of PTSD. Thus, findings from the current study further support the efficacy of CH in the treatment of PTSD. CH also led to improvements in avoidance symptoms when there were greater improvements in relationship satisfaction, highlighting that improvements in avoidance and relationship satisfaction may be contingent on one another. These findings further emphasize the need for dyadic PTSD interventions, such as CH, for targeting avoidance symptoms in PTSD.

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Table 1

Demographic Data for all Participants (*N* = 54)

		PTSD+ Participants	Intimate partners
Age (Mean (standard deviation))		48.8(9.99)	48.3(9.78)
Gender	Male	66.7%	29.6%
	Female	29.6%	70.4%
	Non-binary	3.7%	0
Ethnicity	White/ European Origin	88.9%	88.9%
	Aboriginal Canadian/First Nations/Métis/Inuit	3.7%	3.7%
	Bi-racial/Multi-racial	NA	3.7%
	Other Asian or other Asian Canadian	3.7%	NA
	Other	3.7%	3.7%
Current MMVFR Status	Veteran/Former First Responder	37%	7.4%
	Member of the Royal Canadian Mounted Police	7.4%	0
	Military Service Member	29.6%	14.8%
	Member of a search and rescue organization	3.7%	0
	First Responder and Related Professions	18.5%	7.4%
Relationship Status	Married	81.5%	81.5%
	Common Law (Cohabitation one year or more)	18.5%	18.5%
Baseline Current Treatment	Individual therapy or counselling, with or without medications	88.9%	25.9%
	Family or Couples Therapy	22.2%	7.4%
	Self-help (e.g., Alcoholics Anonymous)	7.4%	3.7%
	Group Therapy	22.2%	0
	Medications Only	7.4%	0

Note. PTSD – Posttraumatic Stress Disorder; MMVFR = Military Member, Veteran, or First responder.

Table 2

Means (standard deviations) of variables across timepoint

	PTSD+ Participants					Intimate Partners				
Timepoint	Intrusions	Avoidance	Cognitions & Mood	Arousal	CSI-4	Intrusions	Avoidance	Cognitions & Mood	Arousal	CSI-4
0	2.11(.814)	2.26(.881)	2.34(.644)	2.38(.695)	12.3(4.61)	1.28(1.08)	1.44(1.18)	1.32(.843)	1.29(.842)	12.1(4.22)
1	2.01(.735)	1.94(.901)	2.03(.692)	2.26(.643)	12.5(4.55)	1.32(.857)	1.60(.989)	1.40(.716)	1.63(.758)	11.5(4.21)
2	1.89(.706)	2.00(1.11)	2.07(1.97)	2.18(.698)	12.5(4.50)	1.23(.906)	1.30(.895)	1.53(.736)	1.65(.768)	12.0(4.42)
3	1.62(.788)	2.02(1.12)	1.97(.663)	2.03(.763)	13.0(4.72)	1.08(.840)	1.48(1.03)	1.41(.819)	1.46(.753)	12.0(3.96)
4	1.81(.837)	2.10(.981)	1.96(.823)	2.12(.836)	13.1(4.58)	1.22(.807)	1.50(.922)	1.45(.756)	1.54(.740)	12.2(3.49)
5	1.81(.810)	1.82(1.07)	1.86(.892)	2.10(.817)	12.7(5.03)	1.33(.844)	1.37(.940)	1.42(.806)	1.52(.793)	12.6(4.09)
6	1.79(.886)	1.87(1.04)	1.73(.858)	2.03(.823)	13.4(4.41)	1.32(.895)	1.37(.970)	1.35(.848)	1.50(.797)	12.6(4.34)
7	1.59(.896)	1.78(1.23)	1.77(.945)	1.97(.846)	13.8(4.72)	1.14(.982)	1.50(1.16)	1.49(1.04)	1.44(.844)	12.7(5.17)
8	1.55(.904)	1.74(1.08)	1.72(1.00)	1.85(.870)	14.3(4.87)	1.20(.975)	1.18(1.12)	1.25(.889)	1.33(.874)	14.0(4.40)
9	1.58(.977)	1.81(1.21)	1.68(1.01)	1.91(.955)	13.6(4.12)	1.34(.926)	1.44(1.03)	1.42(.964)	1.48(.827)	14.3(3.93)

Note: CSI-4 = Couple Satisfaction Index-4; PTSD = Posttraumatic stress disorder

Table 3

HLM equations analyses examining the effect of CH on PCL-5 clusters for PTSD+ participants

Variable	*B*	SE	F	*df*	95% CI	*p*-value	*d*
Cluster: Intrusions							
Intercept	2.10	.133	249	25	[1.83, 2.38]	< .001	
Timepoint	-.059	.022	7.40	21	[-.104, -.014]	.013	-.705
Cluster: Avoidance							
Intercept	2.18	.162	182	26	[1.85, 2.51]	< .001	
Timepoint	-.047	.028	2.91	19	[-.105, -.011]	.104	-.519
Cluster: Cognitions and Mood							
Intercept	2.29	.112	414	25	[2.05, 2.42]	< .001	
Timepoint	-.066	.017	14.2	21	[-.102, -.029]	.001	-.988
Cluster: Arousal							
Intercept	2.35	.119	389	26	[2.11, 2.60]	< .001	
Timepoint	-.054	.015	12.7	22	[-.086, -.022]	.002	-.756

Note. HLM = Hierarchical multilevel modelling; PTSD = Posttraumatic Stress Disorder; PCL-5 =Posttraumatic Checklist-5

Table 4

HLM equations analyses examining the effect of CH on PCL-5 clusters for intimate partners

Variable	*B*	SE	F	*df*	95% CI	*p*-value	*d*
Cluster: Intrusions							
Intercept	1.25	.167	56.5	25	[.910, 1.60]	< .001	
Timepoint	.007	.030	.050	23	[-.056, .069]	.825	.060
Cluster: Avoidance							
Intercept	1.48	.168	77.3	25	[1.13, 1.83]	< .001	
Timepoint	-.008	.036	.045	21	[-.104, -.013]	.834	-.062
Cluster: Cognitions and Mood							
Intercept	1.43	.103	190	23	[1.21, 1.64]	< .001	
Timepoint	-.004	.031	.018	18	[-.069, .061]	.894	-.048
Cluster: Arousal							
Intercept	1.49	.131	129	25	[1.22, 1.75]	< .001	
Timepoint	.085	.074	.016	20	[-.062, .055]	.901	-.041

Note. HLM = Hierarchical multilevel modelling; PTSD = Posttraumatic Stress Disorder; PCL-5 = Posttraumatic Checklist-5

Table 5

HLM equations analyses examining the interaction between CSI-4 change and timepoint on PCL-5 cluster scores for PTSD+ participants

Variable	*B*	SE	F	*df*	95% CI	*p*-value
Cluster: Intrusions						
Intercept	2.07	.153	183	24	[1.75, 2.39]	<.001
Timepoint	.076	.022	11.3	18	[-.123, -.028]	.003
CSI-4 change	-.014	.038	.135	25	[-.093, .065]	.717
CSI-4 change x Timepoint	-.012	.007	2.74	20	[-.027, .003]	.113
Cluster: Avoidance						
Intercept	2.22	.186	143	24	[1.84, 2.60]	<.001
Timepoint	-.078	.028	7.87	25	[-.135, -.019]	.012
CSI-4 change	.026	.047	.300	25	[-.070, .121]	.589
CSI-4 change x Timepoint	-.021	.009	5.92	20	[-.040, -.003]	.025
Cluster: Cognitions and Mood						
Intercept	2.26	.129	306	24	[1.99, 2.53]	<.001
Timepoint	-.080	.019	18.2	18	[-.119, -.040]	<.001
CSI-4 change	-.010	.032	.097	25	[-.077, .057]	.758
CSI-4 change x Timepoint	-.010	.006	2.60	20	[-.022, .003]	.123
Cluster: Arousal						
Intercept	2.34	.138	288	25	[2.06, 2.62]	<.001
Timepoint	-.062	.017	13.8	19	[-.097, -.027]	.001
CSI-4 change	-.006	.034	.033	25	[-.077, .065]	.856
CSI-4 change x Timepoint	-.006	.005	1.145	22	[-.017, .005]	.296

Note. CSI-4 = Couple Satisfaction Index-4; HLM = Hierarchical multilevel modelling; PCL-5 =Posttraumatic Checklist-5; PTSD = Posttraumatic Stress Disorder

Table 6

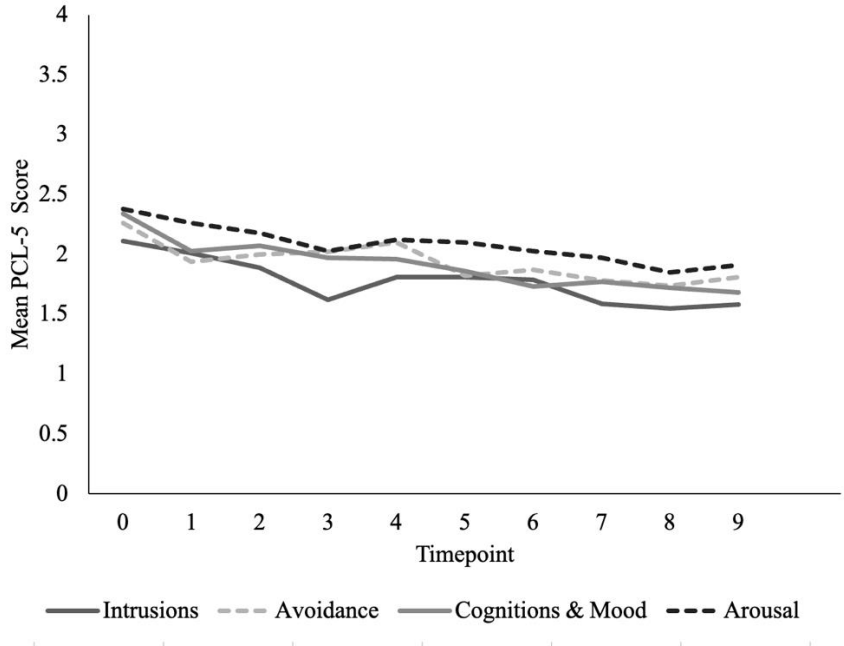
HLM equations analyses examining the interaction between CSI-4 change and timepoint on PCL-5 cluster scores for intimate partners

Variable	*B*	SE	F	*df*	95% CI	*p*-value
Cluster: Intrusions						
Intercept	1.26	.170	54.9	24	[.906, 1.61]	<.001
Timepoint	.004	.030	.015	22	[-.058, .066]	.905
CSI-4 change	.016	.035	.204	26	[-.057, .089]	.655
CSI-4 change x Timepoint	-.009	.008	1.19	32	[-.026, .008]	.284
Cluster: Avoidance						
Intercept	1.49	.167	79.0	23	[1.14, 1.83]	<.001
Timepoint	-.015	.033	.212	19	[-.084, .054]	.650
CSI-4 change	.036	.035	1.06	26	[-.036, .109]	.314
CSI-4 change x Timepoint	-.018	.010	3.41	29	[-.037, .002]	.075
Cluster: Cognitions and Mood						
Intercept	1.43	.104	191	21	[1.22, 1.65]	<.001
Timepoint	-.011	.029	.135	19	[-.071, .050]	.717
CSI-4 change	.023	.022	1.04	26	[-.023, .069]	.317
CSI-4 change x Timepoint	-.017	.008	4.15	28	[-.034, .000]	.051
Cluster: Arousal						
Intercept	1.49	.133	125	24	[1.21, 1.76]	<.001
Timepoint	-.005	.028	.035	20	[-.065, .054]	.853
CSI-4 change	.013	.028	.206	27	[-.045, .070]	.654
CSI-4 change x Timepoint	-.006	.008	.631	29	[-.022, .010]	.433

Note. CSI-4 = Couple Satisfaction Index-4; HLM = Hierarchical multilevel modelling; PCL-5 = Posttraumatic Checklist-5; PTSD = Posttraumatic Stress Disorder

Figure 1

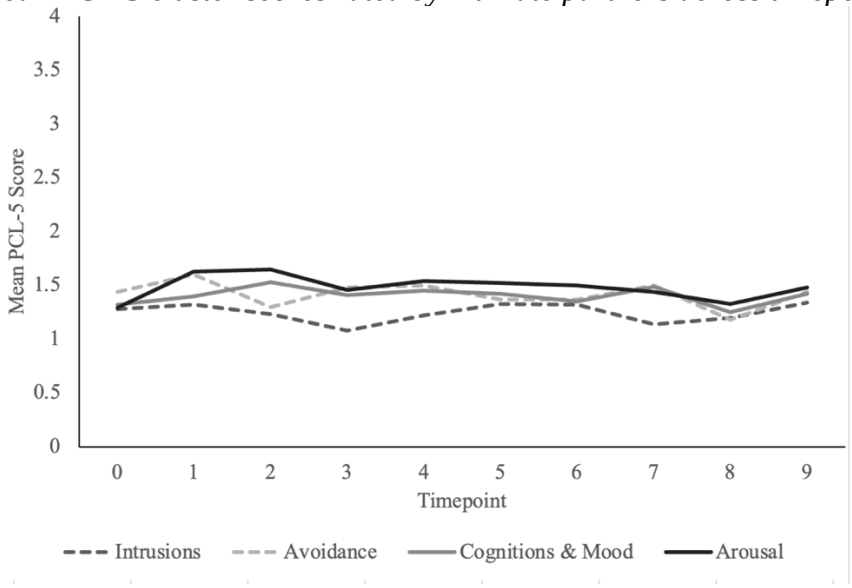
Mean PCL-5 cluster scores rated by PTSD+ participants across timepoints



Note: PCL-5 =Posttraumatic Checklist-5

Figure 2

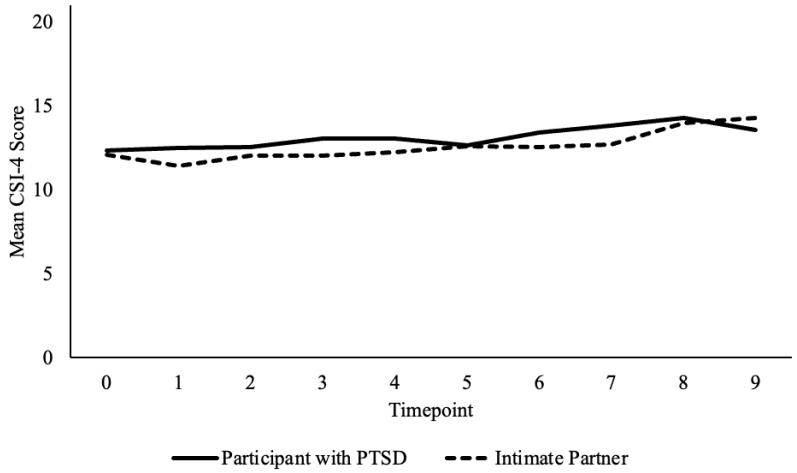
Mean PCL-5 cluster scores rated by intimate partners across timepoints



Note: PCL-5 =Posttraumatic Checklist-5

Figure 3

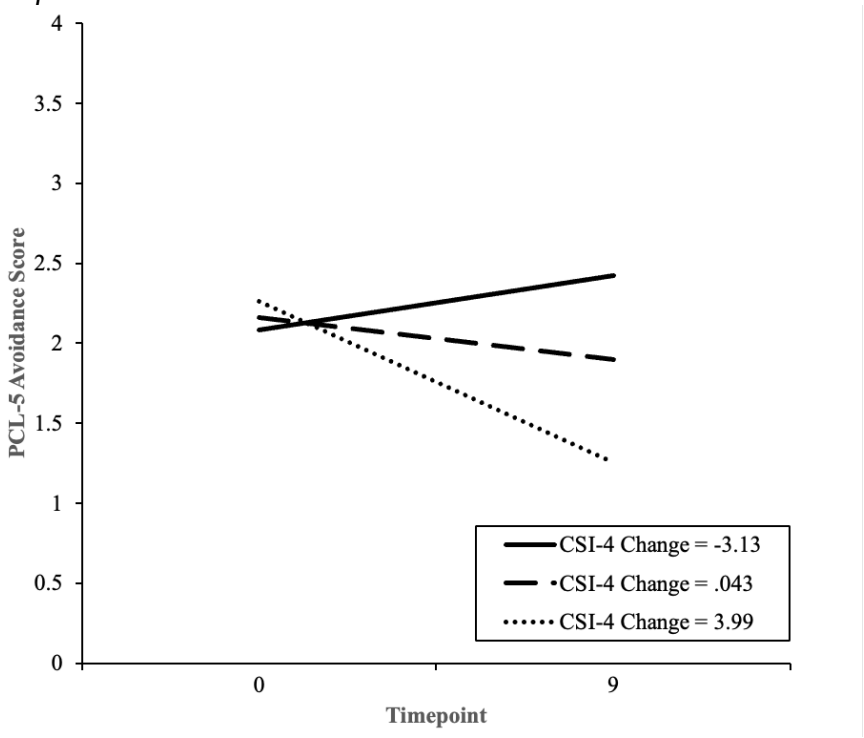
Mean CSI-4 scores across time



Note. CSI-4 = Couple Satisfaction Index-4

Figure 4

Effect of CH on avoidance at low, medium, and high levels of changes in relationship satisfaction



Note: CH = Couple HOPES