Efficacy of an Online, Group-Based Internal Family Systems (IFS) Intervention on PTSD Symptom Clusters

Efficacy of an Online, Group-Based Internal Family Systems (IFS) Intervention on PTSD Symptom Clusters.

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Abstract

Background and Objectives

Posttraumatic stress disorder (PTSD) is a debilitating condition that often follows exposure to traumatic experiences. Its symptoms are defined in the Diagnostic & Statistics Manual, 5th edition, text revision (DSM-5-TR; American Psychiatric Association, 2022) and organized by specific criteria (intrusion Criterion B, avoidance Criterion C, negative cognition Criterion D, hyperarousal Criterion E). Current treatments show promise in alleviating PTSD symptoms but rarely fit all patients. There is, therefore, a need for continued development of new modalities. Internal Family Systems (IFS) is an innovative intervention that has gained popularity since its inception forty years ago. Preliminary studies have shown its potential in alleviating symptoms of traumatic stress, yet, evidence of its efficacy remains to be established. This individual participant data (IPD) meta-analysis aims to scrutinize the efficacy of an online, group-based IFS intervention on PTSD symptom clusters. It postulates that overall PTSD symptoms will improve, with greatest reductions seen in intrusion (Criterion B) and avoidance (Criterion C) symptoms.

Methods

Four studies (N = 76 participants) were included in this IPD meta-analysis. All involved an online, group-based IFS intervention for PTSD paired with individual IFS therapy sessions. Pre-/post-intervention PTSD CheckList for DSM-5 (PCL-5; Blevins et

al., 2015) data were collected via self-reported surveys. The primary aim of this work is to assess the efficacy of the IFS intervention by cluster of PTSD symptoms as defined by the DSM-5-TR. A two-stage individual participant data (IPD) meta-analysis with random effects, measuring differences in effect sizes followed by meta-regressions with and without moderating variables were performed.

Results

The meta-analysis by cluster showed large negative effect sizes for all symptom clusters (g_B= -1.17, g_D= -1.12, g_C= -1.04, g_E= -0.80, p<0.05, p_{HB} < 0.05), yet with low certainty around the estimates (wide 95% *CIs*). Heterogeneity statistics did not reveal any between-study variability, indicative of consistent study protocols and intervention designs. While intrusion (Criterion B) and negative cognition (Criterion D) appeared to have markedly higher effect sizes, a meta-regression using clusters as a moderator, disproved the significance of the effect size differences (p>0.05, p_{HB} > 0.05). Hence, clusters do not contribute differently to the reduction in PTSD symptoms.

Discussion and Conclusions

Overall, the IFS intervention showed significant efficacy in reducing overall PTSD severity (g = -1.13; p<=0.05, p_{HB} < 0.05, 95% *CI* [-1.50; -0.76]). Even though efficacy was not linear across PTSD clusters, and intrusion (Criterion B) and negative cognition (Criterion D) in particular showed observable reduction in gravity (g_B= -1.17, p<0.05, p_{HB} < 0.05, and g_D= -1.12, p<0.05, p_{HB} < 0.05), no cluster significantly differed in terms of effect sizes. These results indicate that IFS improves symptoms of PTSD homogeneously across symptom clusters. This aligns with empirical findings from the

existing literature regarding other PTSD treatment modalities (including CBT and EMDR), which show a lack of differentiation in efficacy amongst PTSD symptom clusters. All in all, this IPD meta-analysis adds to the emerging research showing the efficacy of IFS as a modality of psychotherapy to alleviate PTSD. It is encouraging as novel types of therapy are needed to complement existing interventions and support patients who do not benefit from them.

Scientific Significance

An innovative modality of psychotherapy, IFS could effectively alleviate symptoms of PTSD. The results of this IPD meta-analysis carry important implications for people suffering from PTSD. Adding a novel, evidence-based option for therapy that has the potential to holistically improve PTSD symptoms is encouraging for the many people who do not find relief with other existing modalities of treatment.

Frontispiece

I wish I could show you, when you are lonely or in darkness, the astonishing light of your own being.

—Khāwje Shams-od-Dīn Moḥammad Ḥāfeẓ-e Shīrāzī, a.k.a. Hafiz

Golgulsa, Gyeongju region, South Korea

Photo credit: Laure Tobiasz Veltz

Author's Biographical Sketch

Laure Tobiasz Veltz is a student researcher at the Harvard University Extension School. After a decade in corporate finance, she transitioned to psychological research focusing on trauma and meditative practices. A research assistant at the Cambridge Health Alliance, she completed her master's thesis under the guidance of Dr. Zev Schuman-Olivier, Director of the Center for Mindfulness & Compassion, and Dr. Dilara Ally, the inaugural Richard C. Schwartz Clinical Research Postdoctoral Fellow at the Center for Mindfulness and Compassion at the Cambridge Health Alliance/Harvard Medical School.

An avid meditator, Laure is also a certified yoga teacher (CYT 200) and has been guiding meditation practices for more than four years. She has witnessed how these practices can enhance mental health and support recovery from trauma.

She is a founding officer of the Harvard Extension School Psychology Student Club, where she keenly promotes mental wellbeing and awareness for her peers. She is always happy to strike up a discussion on mental health and psychological challenges that may affect fellow students.

Dedication

I dedicate this work to my father, Jean Paul Veltz (1942-2024), and my uncles Roger Veltz (1940-2024) and Germain Veltz (1938-2024). Their bond, however invisible to the living eye, ran so deep that they shortly joined each other in the afterlife.

May they rest in peace.

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Chapter I.

Introduction

The World Health Organization (WHO) estimates that 70% of the global population has been exposed to at least one traumatic experience in their lifetime, yet only a subset (~4%) develops lasting consequences such as posttraumatic stress disorder (PTSD; Kessler et al., 2017). In the United States, nearly 90% report exposure to traumatic events, with a lifetime PTSD prevalence of 8.3% (Kilpatrick et al., 2013). The risk of PTSD rises with cumulative exposure to adverse events, and individuals with more traumatic experiences have a higher likelihood of developing severe PTSD (Kessler et al. 2017). Given this high prevalence and complexity of PTSD, effective treatments are essential, especially when most PTSD patients report exposure to multiple adverse experiences (Kessler et al. 2017; Kilpatrick et al., 2013). Recent decades have seen the emergence of novel types of psychotherapy in the Western world. Cognitive behavioral therapies – such as Cognitive Behavioral Therapy (CBT), Eye Movement Desensitization & Reprocessing (EMDR), or Dialectical Behavioral Therapy (DBT), etc. – have parted ways with dominantly talked therapies (Monson et al., 2007). They leverage cognitive and/or behavioral techniques to address mental conditions and have shown promising results in reducing PTSD symptoms (Monson et al., 2007; Motta, 2024). Integrating acceptance, mindfulness and compassion, holistic modalities – dubbed third wave therapies – offer additional options to alleviate PTSD symptoms in a way that incorporates mind-body mechanisms (Monson et al., 2007). One such modality is Internal Family Systems (IFS), which combines acceptance and mindfulness-based techniques to

support recovery from PTSD. While IFS is growing in popularity, it has not yet been empirically researched, and evidence of its efficacy on PTSD symptoms is still to be determined.

An Overview of Traumatic Stress and PTSD

PTSD is a complex condition that often arises following exposure to adverse events. Such experiences are overwhelming and leave people stuck in a prolonged survival response even after the end of the event (Harnett et al., 2020). Common symptoms include flashbacks – unpredictable and vivid reminiscence of the trauma – hyper- or hypo-arousal in response to external triggers or internal stimuli (American Psychiatric Association, 2022). Such reactions are normal and often subside within three to thirty days, referred to as Acute Stress Disorder (ASD) in the DSM-5-TR (American Psychiatric Association, 2022). In some cases, however, symptoms persist, disrupting daily life and societal integration. When symptoms last beyond thirty days and meet specific diagnostic criteria, a PTSD diagnosis may be assigned.

The DSM-5-TR (American Psychiatric Association, 2022) classifies PTSD symptoms into five different categories, or criteria, grouped by similarity of characteristics. **Criterion A**, a prerequisite to the diagnosis of PTSD, establishes the exposure to an adverse event such as actual or threatened death, serious injury, or violence, whether directly experienced or witnessed. **Criterion B**, intrusion symptoms, includes flashbacks, recurring memories, distressing dreams, and other involuntary re-experiencing of traumatic events. **Criterion C**, avoidance symptoms, entails avoiding stimuli – both external (e.g., people, places, situations, etc.) or internal (e.g., thoughts,

emotions, sensations) – that could trigger memories of the event. **Criterion D**, negative alterations in mood and cognition, involves forgetfulness and memory issues, persistent negative beliefs about oneself or the world, and emotional numbing. Finally, **Criterion E**, alterations in arousal and reactivity, encompasses hypervigilance, anger outbursts, and self-destructive behaviors. A PTSD diagnosis requires at least one symptom from Criteria B (intrusion) and C (avoidance), and two or more symptoms from Criteria D (negative cognition) and E (hyperarousal), persisting for over thirty days. The compartmentalization of these symptoms into clusters has motivated research into the most efficient modalities to alleviate PTSD symptoms.

Research in PTSD symptom clusters has demonstrated the need for all-encompassing types of therapies. It is indeed common for patients to experience the prominence of one or more symptom clusters and studies demonstrate that the prevalence of specific symptoms may predict treatment outcomes. For instance, sexual assault survivors who exhibit intrusion (Criterion B) and avoidance (Criterion C) symptoms often experience higher treatment resistance and lower recovery rates (Fletcher et al., 2021). As psychotherapy interventions become evidence-based and their efficacy is supported, several specific modalities emerge as gold standards for PTSD treatment. The American Psychological Association (Kazak, 2019), the International Society for Traumatic Stress Studies (2018) and other referent agencies specifically recommend cognitive therapies – such as Cognitive Processing Therapy (CPT), Cognitive Therapy (CT), or Eye Movement Desensitization and Reprocessing (EMDR) – and behavioral therapies – such as prolonged exposure (PE), narrative exposure therapy (NET), or Cognitive Behavioral Therapy (CBT) (Melani et al., 2024). Adjunct treatments targeting

the somatic experience of traumatic stress have also become popular, with present-centered therapies such as Mindfulness-Based Stress-Reduction (MBSR) showing high adoption rates and efficacy in reducing PTSD severity (Liu et al., 2022). Yet, drop-outs remain high overall (Lewis et al., 2020, Varker et al., 2021) and patients do not respond uniformly to PTSD treatments (Rosen et al., 2020). Given these challenges, and even though modalities of psychotherapy do not impact PTSD symptom clusters in a differentiated way (Horesh et al., 2017; Melani et al., 2024), novel interventions are needed. IFS, an emerging integrative psychotherapy, offers a promising avenue for addressing PTSD symptoms across clusters.

The IFS Model

Internal Family Systems (IFS) is an innovative psychotherapeutic approach that offers a unique framework for addressing posttraumatic stress disorder (PTSD). Originally developed by Dr. Richard Schwartz in the 1980s, IFS is rooted in family and systems theories and conceptualizes the mind as inherently multiple, composed of discrete sub-personalities or "parts" (Schwartz, 1995). These parts collectively constitute an internal family system and may manifest as distinct personality traits (e.g., critical, analytical, jovial), cognitive patterns, emotional states, or even somatic experiences (e.g., tension headaches, digestive disturbances). Within the IFS paradigm, all parts are understood to contribute to the overall functioning of the system and are categorized into two primary roles: "protectors" and "exiles" (Schwartz & Morissette, 2021). Protectors serve to maintain psychological stability and are further divided into "managers" and "firefighters." Managers oversee daily operations and behavioral regulation, ensuring

order and control (e.g., a planning-oriented part responsible for maintaining to-do lists). Firefighters, in contrast, act as reactive agents that emerge in response to acute psychological distress, engaging in behaviors designed to suppress overwhelming affective states (e.g., a suicidal part that intervenes when despair becomes intolerable) (Schwartz, 1995). Exiles, conversely, embody the burdens of traumatic experiences, carrying unresolved memories that may be re-experienced as if occurring in the present (Schwartz, 1995). Protectors, in an effort to sustain psychological equilibrium, attempt to sequester exiles, thereby preventing them from destabilizing the system (Schwartz & Morissette, 2021). However, such suppression often leads to intrapsychic conflict and fragmentation, necessitating the mediating influence of the "Self."

Optimal psychological functioning, according to IFS, is achieved when all parts operate cohesively under the leadership of Self. Self, as conceptualized by IFS, represents an innate core consciousness that governs the internal system with qualities of compassion, clarity, courage, confidence, curiosity, connectedness, creativity, and calmness—collectively referred to as the "8Cs." Additionally, Self embodies five supplementary traits—playfulness, patience, perspective, presence, and persistence—collectively known as the "5Ps" (Schwartz, 1995). Self possesses the capacity to facilitate healing by offering corrective experiences to burdened parts, enabling them to relinquish maladaptive roles and resolve residual trauma (Schwartz & Morissette, 2021). In this way, Self functions analogously to a secure attachment figure, fostering internal cohesion and psychological resilience.

The therapeutic application of IFS entails a series of structured processes that promote internal integration and trauma resolution (Anderson, 2021). One critical

therapeutic milestone is "unblending," a process that enables individual parts to recognize and defer to Self as the primary agent of leadership within the internal system (Schwartz, 1995). This process facilitates engagement with Self's therapeutic presence, allowing burdened parts to relinquish their maladaptive protective strategies without overwhelming the system (Anderson, 2021). The principles of mindfulness, dual-awareness, and metacognition are integral to this process, enabling individuals to observe their internal experiences from a Self-led perspective rather than becoming enmeshed in them (Schwartz & Sparks, 2014). These techniques serve a regulatory function, mitigating hyperarousal and hypoarousal, thereby enabling the gradual processing of traumatic memories without psychological destabilization (Anderson, 2021). Another key milestone in IFS therapy is "unburdening," wherein Self establishes a secure and nurturing presence that engenders trust and promotes earned security (Anderson, 2021; Eckel, 2021). Once protective parts allow Self to establish direct contact with an exile, the exile is afforded the opportunity to reprocess traumatic experiences and integrate corrective emotional responses (Anderson, 2021). Through this process, the exile relinquishes its burden, effectively altering the emotional valence of traumatic memories. This structured approach underscores the potential of IFS as an effective modality for alleviating PTSD symptomatology, either as a standalone intervention or in conjunction with other therapeutic frameworks.

Given its structural and integrative nature, IFS is amenable to integration with other psychotherapeutic modalities. Case studies have demonstrated the efficacy of combining IFS with established trauma-focused therapies. For instance, Brown (2020) documented the benefits of integrating IFS with Eye Movement Desensitization and

Reprocessing (EMDR) in the treatment of PTSD and attachment-related disturbances. She observed that the IFS framework facilitated EMDR processes by helping clients identify "target memories" in a manner consistent with the parts-based conceptualization of exiles and burdens. This integration reportedly allowed for more regulated processing of traumatic material, reducing distress and enhancing treatment efficacy (Brown, 2020). Similarly, Turns et al. (2021) explored the integration of IFS with sand tray therapy, demonstrating how the use of miniature figurines can externalize internal parts, thereby enhancing client insight and facilitating the unburdening process. The ability to visually and physically manipulate representations of parts within a sand tray provided a novel means of engaging in internal work, particularly for individuals with aphantasia (i.e., an inability to visualize mental imagery). Additionally, Pagone and Choe (2023) examined the use of equine-assisted IFS therapy, highlighting the utility of horse-human attunement as a means of identifying and engaging internal parts. The relational dynamics between the client and the horse were observed to reflect intrapsychic patterns, allowing the therapist to discern which internal parts were active and influencing behavior. This method provided an alternative pathway for clients to access and process internal experiences that might otherwise be difficult to articulate. Taken together, these studies illustrate the versatility and efficacy of the IFS model in the treatment of trauma-related pathology. By offering a coherent framework for conceptualizing and resolving internal conflict, IFS holds considerable promise for facilitating psychological healing and reducing PTSD symptomatology.

IFS and the Alleviation of PTSD

Although IFS therapy is popular among clinicians and patients, research on its efficacy remains in the early stages. Preliminary studies suggest its potential to improve overall well-being and mental health. In a clinical trial, Shadick et al. (2013) saw a decrease in depression amongst a population of patients suffering from rheumatoid arthritis (RA), while Haddock et al. (2017) showed the same trend in a group of female college students with depressive symptomatology. Looking at the outcomes of IFS therapy on interpersonal relationships, a series of studies consistently demonstrated the improvement in relationship satisfaction and quality both in young adults in college (Fitzgerald, 2022; Fitzgerald & Barton, 2022, Dolbier et al., 2001) and amongst working adults (Dolbier et al., 2001). These findings underscore IFS's promise as a therapeutic tool in various contexts. In one study, Fitzgerald & Barton (2021) showed that "Self-qualities" (i.e., the various characteristics of Self) were related to higher quality and satisfaction in interpersonal relationships in young college adults. In a subsequent project, Fitzgerald (2022) found that higher levels of "Self-leadership" (i.e., situational embodiment of Self qualities) amongst young adults (n = 303) recruited at two U.S. universities or on social media (Facebook) resulted in an increase in the perceived quality of interpersonal relationships (β= 0.42, p<0.01). In another population of college students (n = 270), Dolbier et al. (2001) found a positive correlation between Self-leadership and resilience, hardiness, and dispositional optimism. They additionally found increased work satisfaction, quality management and perceived wellness in a population of employed adults (n = 160) (Dolbier et al., 2001). These reports and studies are tale signs of promising applications of IFS in clinical settings.

Case studies from therapists' clients provide additional qualitative evidence of IFS's effectiveness in addressing PTSD symptoms. Lucero et al. (2018) described a patient's journey through individual, couple, and family IFS therapy, highlighting reductions in PTSD symptoms and enhanced interpersonal cohesion. The patient was indeed able to regain a sense of harmony both in his inner parts system and with his external family members, illustrating IFS' potential to reduce symptoms of PTSD and support interpersonal relationships. In another case study, Sweezy (2011) reported on a patient overcoming trauma-related shame and guilt through IFS, leading to the resolution of suicidal ideation and the unburdening of exiled parts. Once the traumatic material was released, the suicidal part became silent and did not return. Such accounts demonstrate the healing potential of IFS, which empirical studies have started to establish as well.

Preliminary clinical studies also support IFS's potential for alleviating PTSD symptoms. Indeed, studies that evaluate its efficacy for PTSD patients indicate significant improvements in symptoms after a few weeks of IFS therapy. Hogdon et al. (2022) conducted a 16-week IFS intervention with PTSD patients (n = 17) and observed significant reductions in PTSD severity, with effect sizes of d = -2.81 post-intervention and d = -4.46 at one-month follow-up. By the end of the intervention, up to 92% of participants no longer met PTSD diagnostic criteria. Similarly, Comeau et al. (2024) reported a significant decrease in PTSD severity (d = -0.7, p = .005) following a 16-week IFS program combining group and individual therapy sessions. Despite these promising results, the small sample sizes limit the generalizability of these findings, emphasizing the need for further research. Overall, the evidence indicates that IFS holds significant promise for alleviating PTSD symptoms. By addressing the root causes of trauma and

fostering Self-leadership, IFS may offer an effective, holistic approach to PTSD treatment. However, larger-scale studies are needed to confirm these findings and better understand the mechanisms underlying IFS's therapeutic benefits.

IFS and PTSD Clusters

The efficacy of Internal Family Systems (IFS) therapy on specific PTSD symptom clusters has not yet been systematically investigated, nevertheless, theoretical insights and preliminary findings suggest its potential effectiveness. IFS incorporates mindfulness and acceptance-based strategies, offering both present-centered and past-focused therapeutic approaches as demonstrated by existing studies showing its ability to increase self-compassion and decentering (Comeau et al., 2024; Hogdon et al., 2022). Rooted in Buddhist philosophy, IFS promotes decentering (Comeau et al., 2024) and mindful awareness of inner experiences through metacognition—the ability to observe thoughts, emotions, and sensations within one's core consciousness (Schwartz & Sparks, 2014). Böckler et al. (2017) demonstrate that practicing IFS as a meditative dyad fosters introspection, empathy, and awareness of parts, facilitating acceptance and understanding. In particular, the authors mention how metacognition of inner states enabled participants to identify and map various parts of their inner system, all the while not resisting the negative valence attached to them (i.e. acceptance strategy). Participants also exhibited enhanced theory of mind (ToM), or the ability to understand others' mental and emotional states (parts), which aligns with the IFS concept of connectedness—a quality of Self (Böckler et al. 2017). IFS also emphasizes self-compassion as a key healing mechanism (Comeau et al., 2024; Hogdon et al., 2022), aligning with Buddhist

contemplative traditions that link well-being to mindfulness and compassion (Anālayo, 2018). Practices such as observing inner experiences and cultivating loving-kindness facilitate compassion toward both oneself and others (Anālayo, 2018), mirroring the role of Self in unburdening parts and alleviating their suffering (Schwartz & Sparks, 2014). Since Self remains stable and unaffected by trauma-related distress (Anderson, 2021; Schwartz & Sparks, 2014), IFS presents a theoretically holistic framework for addressing PTSD symptom clusters.

Given its integrative features, including decentering, attentional focus, and self-compassion, IFS appears particularly well-suited to address PTSD symptom clusters, with its most pronounced effects expected in intrusion (Criterion B) and avoidance (Criterion C) symptoms. While mindfulness-based interventions have yielded mixed results across PTSD symptom clusters, the mechanisms of action within IFS suggest its strongest therapeutic effects will be on intrusion and avoidance symptoms. Intrusion symptoms (Criterion B) involve involuntary, distressing traumatic memories that repeatedly disrupt daily functioning. By fostering emotion regulation, IFS helps individuals remain anchored in the present moment, mitigating excessive mind-wandering, dissociation, and the re-experiencing of trauma—core issues for individuals with PTSD (Kummar et al., 2024). IFS facilitates healing by fostering metacognitive awareness and decentering (Comeau et al., 2024), allowing individuals to recognize intrusive thoughts and memories without over-identifying with them. This process reduces their emotional intensity and diminishes their disruptive impact. Additionally, IFS's emphasis on self-compassion provides individuals with an internal sense of safety, enabling them to process traumatic material without becoming overwhelmed. Studies on

mindfulness-based approaches have additionally reported reductions in intrusion symptoms (Criterion B), as shown by Martin et al. (2018), Chopko & Schwartz (2013), Wahbeh et al. (2011), and Vujanovic et al. (2009). Avoidance symptoms (Criterion C) encompass conscious and unconscious efforts to evade trauma-related stimuli, reinforcing maladaptive coping patterns. By fostering emotion regulation (Comeau et al., 2024), IFS mitigates dissociation and emotional numbing, allowing individuals to face traumatic material in a structured and less distressing way. In IFS, self-compassion and the development of a secure internal Self (Anderson, 2021; Schwartz & Sparks, 2014) offer an alternative to avoidance behaviors by creating a safe framework for engaging with exiled parts and unprocessed trauma. This process disrupts avoidance patterns and fosters emotional integration, leading to reduced PTSD-related dissociation and emotional numbing. Research further supports the efficacy of mindfulness-based approaches in addressing avoidance symptoms (Criterion C), with studies by Somohano et al. (2022) and Au et al. (2024) demonstrating notable improvements in this symptom cluster. While other research indicates improvements in hyperarousal (Criterion E) and emotional numbing/cognition (Criterion D) symptoms (Stephenson et al.,2017; Sylvia et al.,2024), there is no consensus on which symptom cluster benefits the most from mindfulness-based modalities due to variations in study designs, populations, and assessment tools. Given the unique characteristics of IFS, which combines decentering, concentration, and self-compassion, its potential to alleviate PTSD symptoms holistically, with a specific focus on intrusion (Criterion B) and avoidance (Criterion C), merits systematic investigation. Addressing this gap will provide valuable insights into the therapeutic efficacy of IFS and guide future research, which is why this analysis is needed.

Conclusion

There is a pressing need for customizable interventions to address the diverse consequences of traumatic experiences. Internal Family Systems (IFS) therapy has demonstrated promise in alleviating PTSD symptoms through its conceptualization of the human mind as an inherently multiple system of parts, guided by a core Self capable of fostering healing. This review of the current literature highlights growing enthusiasm for IFS among patients and therapists worldwide, as evidenced by the thousands of trained practitioners and the increasing demand for training programs (IFS Institute, 2024).

However, the body of research remains limited. Existing studies, such as those by Shadick et al. (2013), Hogdon et al. (2022), Comeau et al. (2024), and Ally et al. (2024) have shown encouraging results but are constrained by small sample sizes and the lack of statistical power needed to generalize findings. Most other available evidence stems from case studies (e.g., Lucero et al., 2018; Sweezy, 2011) or theoretical explorations, which, while insightful, lack systematic investigation. Additionally, much of the existing knowledge derives from IFS user manuals and speculative essays, which provide insightful hypotheses but remain untested empirically.

Despite these limitations, the reviewed evidence suggests that IFS holds significant potential to address PTSD symptoms, particularly through its emphasis on fostering self-compassion and decentering mechanisms (Comeau et al., 2024; Hogdon et al., 2022). This study proposes to bridge the existing research gap by evaluating the impact of an IFS intervention on PTSD symptom clusters, offering further insights into its clinical efficacy. Such research will not only expand the evidence base for IFS but also

inform its application in diverse therapeutic settings, ultimately providing a more nuanced understanding of its potential to support PTSD recovery.

Gap in Research

Recent clinical studies suggest the efficacy of IFS in alleviating PTSD symptoms (Ally et al., 2024; Comeau et al., 2024; Hogdon et al., 2022). However, these studies have not investigated the differential impact of IFS therapy on specific PTSD symptom clusters. This omission leaves a significant gap in understanding which symptom categories, if any, are most improved through IFS therapy. For instance, mindfulness-based modalities have shown to affect PTSD symptom clusters variably, often improving intrusion (Criterion B) and avoidance (Criterion C) symptoms while demonstrating inconsistent effects on other clusters. This variability underscores the importance of systematically assessing how IFS engages with the nuanced presentations of PTSD.

Addressing this gap, this IPD meta-analysis evaluates the specific effects of IFS on PTSD symptom clusters, informed by detailed data collection from studies conducted at the Cambridge Health Alliance. By analyzing the four symptom clusters delineated in the DSM-5-TR (American Psychiatric Association, 2022), using validated tools such as the PTSD Checklist for DSM-5 (PCL-5) (Blevins et al., 2015), this research aims to determine the cluster-specific impacts of a group-based, online IFS intervention. The findings will inform future clinical applications and research designs, providing a deeper understanding of IFS's potential as a holistic therapeutic approach.

Purpose of the Study

This Individual Patient Data (IPD) meta-analysis aims to complement the existing body of research and identify the symptom clusters most impacted by an IFS intervention, thereby offering insights into the efficacy of IFS for PTSD treatment. The findings will not only address the existing gap in cluster-specific research but also guide future clinical applications and research designs.

Research Questions

This meta-analysis seeks to answer the following research questions:

1. RQ1: Does participation in an IFS intervention reduce overall PTSD severity?
2. RQ2: Which DSM-5-TR criteria—Criterion B (intrusion), Criterion C (avoidance), Criterion D (negative cognition), or Criterion E (hyperarousal)—are most significantly improved?

This study aims to provide valuable insights into the efficacy of IFS in addressing PTSD symptoms, informing future research and therapeutic applications.

Hypotheses

This analysis investigates whether participation in an IFS intervention predicts reductions in symptom severity across clusters.

The hypotheses for each research question posed in this analysis are as follows:

Hypothesis 1 (H1): Answering RQ1, the IFS-based PARTS intervention will predict significant reductions in overall PTSD severity. This hypothesis aligns with findings by Ally et al. (2024), Comeau et al. (2024) and Hogdon et al. (2022).

Hypothesis 2.1 (H2.1): Answering RQ2, symptoms of intrusion (Criterion B) and avoidance (Criterion C) will show notable reductions, driven by IFS' emphasis on fostering emotion regulation, decentering and self-compassion as shown by Comeau et al. (2024) and Hogdon et al. (2022).

Hypothesis 2.2 (H2.2): Answering RQ2, reductions in negative cognition (Criteria D) and hyperarousal (Criterion E) will occur but will be less pronounced due to the nature of these symptom domains (cognitive processes for Criterion D and physiological reactions for Criterion E) and the limited evidence directly linking IFS mechanisms to their improvement.

These hypotheses aim to provide a nuanced understanding of how IFS interventions address the multifaceted nature of PTSD symptoms, offering insights into its therapeutic potential and paving the way for future research.

Post-Hoc Hypothesis (H3): Hyperarousal symptoms (Criterion E) exhibit less reduction compared to other symptom clusters following IFS intervention. This post-hoc hypothesis (which was not part of the initial hypotheses) emerged from meta-analytic findings indicating that Criterion E consistently showed a smaller effect size than other criteria, despite still demonstrating a large overall effect.

In retrospect, this trend aligns with theoretical expectations. Criterion D, which includes symptoms of rumination and self-loathing, is likely influenced by IFS through mechanisms such as decentering and self-compassion, as suggested by preliminary

studies (Comeau et al., 2024; Hodgdon et al., 2022). In contrast, hyperarousal (Criterion E) is primarily physiologically driven, which may explain its comparatively lower response to IFS. Given this observed pattern, a post-hoc analysis was conducted to explore the extent of this differential impact.

Study Significance

Due to the limited research projects completed so far, it is challenging to assert with confidence the effectiveness of IFS therapy. However, initial clinical studies indicate encouraging results in alleviating PTSD symptoms (Ally et al., 2024; Comeau et al., 2024; Hogdon et al., 2022). Building on this foundation, the current IPD meta-analysis aims to provide a detailed examination of IFS's impact on PTSD symptom clusters. By leveraging a larger combined sample size from four studies (N = 76), this study seeks to address the limitations of previous research, such as small sample sizes and limited generalizability.

This analysis holds the potential to inform future research efforts by shedding light on the cluster-specific efficacy of IFS interventions. It may also pave the way for exploring the mechanisms of action that render IFS effective in trauma recovery. Ultimately, these findings could inform the development of further assumptions and hypotheses, enhancing the broader understanding and application of IFS therapy in clinical settings.

Chapter II.

Methods

A two-stage individual patient data meta-analysis with mixed-effects design was chosen to address the research questions and test the hypotheses outlined in the preceding chapter.

Eligibility Criteria

The studies included in this meta-analysis adhered to the following criteria:

1. **Type of Studies:** Single-arm studies focused on alleviating and reducing PTSD symptoms and/or comorbidities leveraging a group-based IFS intervention. Due to the limited number of existing control trial studies about IFS, any randomized controlled trial (RCT) is included as a single-arm study for the purposes of this IPD meta-analysis.

2. **Type of Intervention:** A group-based, online IFS intervention shall be used in each study, as possible following the PARTS framework and curriculum developed at the Cambridge Health Alliance (CHA) (see details in the "Intervention" section).

3. **Type of Participants:** Patients referred internally to the PARTS studies and/or PARTS Clinical Service within CHA's Outpatient Psychiatry Department (OPD). Eligible participants were:

- Aged 18 years or older.
- Diagnosed with PTSD symptoms based on a formal CAPS-5 assessment (Clinician Administered PTSD Scale for DSM-5; Weathers et al., 2018).

4. **Outcome Measures:** PTSD symptom severity was assessed using the PCL-5 scale (Blevins et al., 2015) at various stages of the intervention. Both pre-program and post-program measures were consistently collected across all studies, enabling a pre-/post-intervention design for this IPD meta-analysis.

These inclusion criteria ensured a standardized approach to data collection and analysis, enhancing the reliability of the meta-analysis findings.

Search Process

For this IPD meta-analysis, a step-process was employed to collect relevant studies. Initially, five studies (completed or on-going) conducted at the Cambridge Health Alliance (CHA) on the feasibility and efficacy of an online, group-based IFS intervention for PTSD were identified. Subsequently, a comprehensive database search was conducted to complete the information and identify additional relevant studies. This search yielded one potential study to consider for inclusion.

In total, six studies were reviewed for eligibility, and those meeting the inclusion criteria outlined above were selected and analyzed.

Design

This study utilizes a two-stage Individual Patient Data (IPD) meta-analysis design with random-effect model to evaluate the efficacy of an online, group-based IFS

intervention in alleviating PTSD symptoms across DSM-5-TR-defined symptom clusters (American Psychiatric Association, 2022). By aggregating data from multiple existing studies, this IPD meta-analysis aims to provide a comprehensive understanding of the intervention's impact on PTSD symptom severity and symptom clusters (Criteria B to E).

Primary Outcome

The primary outcome of this IPD meta-analysis is to evaluate the efficacy of an online, group-based IFS intervention in reducing PTSD symptoms across DSM-5-TR-defined clusters (American Psychiatric Association, 2022). PTSD symptom severity is assessed using the PCL-5 scale (Blevins et al., 2015) at two points: pre-intervention and post-intervention. Pre-intervention is defined as PCL-5 data collected at baseline, prior to the start of the group-based IFS program. Post-intervention is defined as the data collection point that immediately follows the end of the group-based IFS intervention.

Additionally, this IPD meta-analysis accounts for potential moderating variables. The impact of study design – such as the duration of the intervention, or randomized-control trial – on symptom severity is evaluated by conducting analyses with these varying study designs as moderators. It ensures that the findings are robust and reflect the specific effects of various study designs. Overall, the analysis seeks to elucidate the clinical effectiveness of IFS in addressing PTSD symptoms and their nuanced presentation across different symptom clusters.

Measures & Materials

This IPD meta-analysis utilizes the PTSD Checklist for DSM-5 (PCL-5) (Blevins et al., 2015) as the primary measure to evaluate the efficacy of an online, group-based

IFS intervention in alleviating PTSD symptoms. The PCL-5 is a 20-item self-report questionnaire developed by the Veterans Affairs National Center for PTSD. It is widely recognized for its reliability and validity in assessing PTSD symptom severity.

The PCL-5 questionnaire measures the presence and severity of PTSD symptoms across four DSM-5-TR-defined clusters:

- **Intrusion (Criterion B):** Items 1-5
- **Avoidance (Criterion C):** Items 6-7
- **Negative Cognition (Criterion D):** Items 8-14
- **Hyperarousal (Criterion E):** Items 15-20

Each item is rated on a 5-point Likert scale ranging from "0 – Not at all" to "4 – Extremely," with questions such as:

- "In the past month, how often have you had repeated, disturbing dreams of the stressful experience?"
- "In the past month, how often have you felt distant or cut off from other people?"

Variables

This IPD meta-analysis examines the effects of an online, group-based IFS intervention on PTSD symptom clusters using the following variables:

1. **Independent Variable:**
    - The IFS intervention: whether or not participants went through the group-based IFS program.

- Operationalized as a categorical variable with two possible values – "pre-intervention" vs. "post-intervention" for the same group of participants.

2. **Dependent Variables:**
    - **PTSD Symptom Severity:** Measured as the total score on the PCL-5 questionnaire. This score reflects the cumulative severity of PTSD symptoms across four DSM-5-TR-defined clusters, operationalized as a continuous variable with values ranging from 0 to 80.
    - **PTSD Symptom Clusters:** The PCL-5 scores for each of the four DSM-5-TR criteria:
        - Intrusion Criterion B (Items 1–5), operationalized as a continuous variable with values ranging between 0 and 20.
        - Avoidance Criterion C (Items 6–7), operationalized as a continuous variable with values ranging between 0 and 8.
        - Negative Cognition Criterion D (Items 8–14), operationalized as a continuous variable with values ranging between 0 and 28.
        - Hyperarousal Criterion E (Items 15–20), operationalized as a continuous variable with values ranging between 0 and 24.
3. **Moderators:**
    - **Study-Specific Design:** Accounting for variations in study design. In particular, the impact of intervention duration (number of weeks of the group-based IFS intervention), and of intervention type (single arm vs. randomized control trial).

By analyzing changes in pre- and post-intervention PCL-5 scores, this study aims to identify the symptom clusters most affected by the IFS-based intervention. The inclusion of moderators allows for a nuanced understanding of how participant characteristics and intervention design influence outcomes.

Individual Patient Data Collection

A structured data extraction sheet was created to aggregate individual patient data (IPD) across the selected studies. The data collected included:

1. **Participant Characteristics:** Demographics (e.g., age, gender, relationship status, etc.), and PTSD severity levels (as assessed by the PCL-5 scale).
2. **Outcome Measures:** Pre- and post-intervention PCL-5 scores categorized by symptom clusters (Criteria B to E).

To ensure consistency and accuracy, the data collection process involved cross-referencing records from multiple sources, including attendance reports and self-reported survey data via the REDCap platform. Missing or incomplete data were identified and flagged for follow-up verification and treatment, while participants who did not complete any on-going intervention were excluded from the dataset. All identifying information was de-identified to protect participant privacy.

1. **Data Inclusion and Preprocessing:**

   Individual datasets were harmonized to ensure consistency in variables, measures, and data structure. Key variables included PCL-5 scores (categorized by symptom clusters), and demographic data.

2. **Baseline Data Collection:**

   Participants completed baseline assessments using the PCL-5 questionnaire,

which evaluates PTSD symptom severity across twenty questions. Demographics were collected at study entry or gathered from patients records when not collected in the study. Data was de-identified prior to integration into the meta-analysis dataset.

3. **Intervention Monitoring:**

   Participants engaged in an online IFS program, including weekly group sessions and biweekly individual IFS therapy sessions. Attendance and engagement data were tracked and verified for all participants.

4. **Post-Intervention Data Collection:**

   Post-intervention PCL-5 assessments were completed within two to five weeks following the final intervention session to measure changes in PTSD severity. For studies with follow-up periods beyond the intervention, only data from the immediate post-intervention period were included to standardize comparisons.

5. **Data Integration and Analysis:**

   The harmonized datasets were integrated into a single IPD dataset. A random-effects model was used to evaluate changes in PCL-5 scores across symptom clusters, accounting for within-study and between-study variability.

This standardized approach ensures the robustness and validity of the meta-analysis findings, providing a nuanced understanding of the IFS intervention's effects on PTSD symptom clusters.

Sample, Participants, and Intervention

Individual patient data (IPD) was gathered from four studies conducted or in-progress at CHA.

Sample

1. **Sampling Method:** Participants were selected through purposive sampling from CHA's outpatient psychiatric services. The inclusion criteria ensured a homogenous sample of patients diagnosed with PTSD as assessed by CAPS-5. Recruitment prioritized logistical feasibility, requiring participants to be residents of Massachusetts with access to necessary technology for online participation.
2. **Sample Characteristics:** The dataset encompassed diverse demographic profiles, including variations in age, gender, and socio-economic background, allowing for a broad analysis of intervention efficacy. However, the exclusion of individuals with severe psychotic or depressive symptoms ensured safety and alignment with the program's therapeutic goals.

Participants

Participants were recruited from the Cambridge Health Alliance (CHA) Outpatient Psychiatry Department (OPD) and were required to meet the following criteria:

1. **Eligibility Requirements:** Participants had to be at least 18 years old, proficient in English, and diagnosed with PTSD. Additional logistical requirements included access to a reliable electronic device with internet connectivity for online

sessions, physical presence in Massachusetts for the duration of the study, and availability to participate consistently without long absences.

2. **Exclusion Criteria:** Individuals were excluded if they exhibited severe psychotic symptoms or severe depressive presentations during a clinical baseline assessment.

3. **Logistics:** Participants were required to ensure they could complete both group and individual sessions without disruptions from life events such as childbirth, incarceration, or extended vacations.

This careful vetting ensured that the study population was homogenous in PTSD severity and suitable for the structured online format of the intervention.

Intervention

Selected studies utilized the PARTS Clinical Service (Program for Alleviating and Reducing Trauma and Stress; Cambridge Health Alliance, n.d.). It is a 16-week, group-based intervention developed at the Cambridge Health Alliance (CHA) to address PTSD and related conditions, such as substance use disorders. The program is delivered online in cohorts of up to 12 participants, with new cohorts starting every two months. Each participant attends weekly group sessions supplemented by biweekly individual therapy sessions, resulting in up to eight individual IFS sessions over the course of the program.

The intervention emphasizes psychoeducation and practical application of the Internal Family Systems (IFS) model. Early sessions focus on introducing participants to the IFS framework, including key concepts like parts, Self, and unblending techniques.

As the intervention progresses, participants engage in structured practices designed to enhance emotional regulation and self-leadership. Two primary activities structure each group session:

1. **Guided Meditation:** Each session begins with a "going inside" meditation, allowing participants to unblend from their parts. This practice fosters Self-like qualities such as compassion, curiosity, and calmness.
2. **Fishbowl Exercise:** One participant each session receives support from the group to explore and address specific parts in their inner system. The group contributes Self-energy to the process, creating a shared environment of collective healing.

The PARTS SUD study (Ally et al., 2024), an adaptation of the intervention for individuals with PTSD and substance use comorbidity, shortens the program to 12 weeks with six individual sessions. This adjustment reflects the unique needs of this population, which often experiences higher dropout rates.

Overall, the PARTS program leverages the IFS model to provide a supportive and structured therapeutic environment, addressing the multifaceted challenges of PTSD while fostering personal growth and resilience.

Data Analysis Plan

This meta-analysis employs rigorous statistical techniques to evaluate the efficacy of the PARTS intervention on PTSD symptom clusters using individual patient data (IPD) from four studies conducted at the Cambridge Health Alliance (CHA). The analysis follows these steps:

1. **Data Preparation and Cleaning:**

   Data were pooled from all eligible studies into a harmonized dataset. Only data

from enrolled participants (i.e., signed informed consent form) who attended the IFS intervention (one or more sessions) was included. Demographic variables (e.g., age, gender, relationship status, etc.), and PCL-5 scores (pre- and post-intervention) were standardized. Outlier detection was conducted via various methods, including plots (both scatterplot and boxplot) to visually inspect the dataset and a z-score analysis to evaluate the data distribution and spread (in particular, datapoints beyond three standard deviations from clusters' means). Missingness of data was identified using visualizations through a dataset aggregation graph and summary table. Missing data was then addressed using multiple imputations and a comparative regression analysis was performed on imputed vs original data to evaluate model fit and potential impact of the imputed data on the quality of the analysis.

2. **Descriptive Statistics:**

   To conduct descriptive analyses, participant demographics were grouped in standardized categories (Table 1).

   PTSD severity (pre- and post-intervention) using PCL-5 data was aggregated by cluster and summarized using means, standard deviations, standard errors, weight, pre-/post- correlation.

   Sample sizes were defined as baseline number of enrolled participants.

3. **Effect Size Calculation:**

   Changes in PTSD symptom severity pre- and post-intervention were analyzed. Meta-analyses of effect sizes for individual symptom cluster (Criteria B to E) amongst studies were calculated using Hedge's g with pre-/post- correlation

adjustment, 95% confidence intervals (*CIs*) to quantify the magnitude of change. Using the pre-/post- correlation adjustment for Hedge's *g* reflects the dependence of the PCL-5 measures in these repeated measures study designs, accounting for shared variance. Accounting for differences in sample sizes, studies were assigned weights (inverse of the variance) to ensure that the combined estimate reflects the variance across studies. The weighting helps reduce bias and provide a robust measure of the overall effect size.

Then, a meta-regression was run to test whether the effect sizes differ significantly between clusters. This is especially useful as the study examined whether certain symptom clusters responded better to the PARTS intervention than others. The meta-regression modeled the relationship between the effect sizes (Hedge's *g*) and the categorical moderator (PCL-5 clusters) in order to explain which portion of the variability in effect sizes it explains.

4. **Heterogeneity:**

   A random-effects model was employed to account for between-study variability (differences in sample populations, interventions and settings). Three different measures of heterogeneity were calculated:

   - *Q* statistics with p-value: to test if heterogeneity is greater than would be expected by chance, and how significantly so (p-value)
   - I^2 statistics: to estimate the proportion of total variability due to between-study differences, expressed in %
   - τ^2: to estimate between-study variance in the mixed-effects model

5. **Moderating Variables:**

   To assess the possible factors influencing differences in effect sizes, a set of moderating variables were analyzed. First, to account for differences in IFS intervention duration and target population, the meta-regression was performed with the PARTS SUD study (Ally et al., 2024) as moderator (which only encompassed 12 weeks of group-sessions, vs. 16 weeks in other PARTS studies, and where 100% of participants had a SUD co-morbidity, which was not a necessary criterion in other studies). Second, to account for differences in study type and design, the meta-regression was run with the PARTS RCT as moderator. The PARTS RCT study was designed as a randomized control trial but used a single arm in this meta-analysis. Running the meta-regression to account for this difference as a moderator would also inform whether it is impactful in the observed effect sizes differences.

6. **Post-Hoc Hypothesis Testing**

   In addition to the a-priori analyses, a post-hoc analysis was conducted to examine the consistently lower impact observed on hyperarousal (Criterion E). This analysis was exploratory and aimed at assessing whether hyperarousal (Criterion E) played a moderating role in the observed effect sizes. To test this additional hypothesis, a mixed-effects meta-regression was employed. The model used the combined effect size of Criteria B (intrusion), C (avoidance), and D (negative cognition) as the reference group and assessed Criterion E (hyperarousal) in comparison. Given the post-hoc nature of this analysis, the results should be

interpreted cautiously and considered hypothesis-generating rather than confirmatory.

7. Power Analysis

To ensure the robustness of the findings of this IPD meta-analysis, especially in the light of the unplanned post-hoc analysis that was performed, a power analysis was conducted. A Monte-Carlo simulation method was employed, running one thousand iterations, and using the parameters observed in the a-priori analyses (for pooled effect size Hedge's g, variance, heterogeneity τ^2, etc.). Power was estimated as the proportion of simulations (in %) that yielded a statistically significant overall effect ($p < 0.05$).

8. Multiple Comparison Adjustment

Given the array of statistical tests performed – including separate analyses for total effects, individual symptom clusters, moderator analyses, and a post-hoc test – an adjustment for multiple comparisons was applied to account for the increased risk of type I errors. The Holm-Bonferroni method was chosen because it effectively controls the familywise error rate while preserving statistical power, which is appropriate for the moderate number of comparisons in this IPD meta-analysis. Both unadjusted (p) and Holm-Bonferroni-adjusted (p_{HB}) p-values are reported to provide a comprehensive and transparent view of the results.

9. **Publication Bias Risk**

A formal publication bias risk analysis was not conducted in this meta-analysis due to the nature of the included studies. Specifically, three of the four studies are either unpublished or still in progress at the time of analysis. Traditional methods

for assessing publication bias, such as funnel plot asymmetry tests or Egger's regression, rely on the assumption that included studies represent a fully published body of literature, making their application inappropriate in this context. Given the inclusion of ongoing and unpublished studies, the risk of selective publication is mitigated to some extent, though future updates to this meta-analysis should reassess this consideration once all studies reach completion and/or publication.

10. **Software and Significance Thresholds:**

    All analyses were conducted using R (version 4.2.2)[1]. A significance level of $p<0.05$ was applied, with results reported as point estimates and 95% confidence intervals (*CI*s).

This comprehensive approach ensures that the analysis captures both the general and cluster-specific effects of the PARTS intervention, contributing to a nuanced understanding of IFS's efficacy in treating PTSD.

[1] Note: the author acknowledges that AI tools (ChatGPT) were utilized to assist with R code development and editing of this report for conciseness. Final analytical decisions and interpretations were made solely by the author.

Chapter III.

Results

The efficacy of IFS as an intervention to alleviate symptoms of trauma has been tested in a limited number of studies (Ally et al., 2024; Comeau et al., 2024; Hogdon et al., 2022), none of which scrutinized effectiveness at the PTSD symptom cluster level. This IPD meta-analysis of the PARTS studies conducted at the Cambridge Health Alliance (CHA) aims to bridge this gap by analyzing the effect of the PARTS intervention on PTSD symptom clusters as self-reported by participants in the PCL-5 questionnaires administered pre- and post-intervention.

The research questions of this IPD meta-analysis were: (RQ1) does participation in the PARTS intervention reduce PTSD symptom severity across specific clusters? And (RQ2) which DSM-5-TR criteria are most significantly improved?

The hypotheses associated with the above-mentioned research questions were tested statistically. Answering RQ1, H1 posits that the IFS-based PARTS intervention will predict significant reductions in PTSD symptoms across clusters, with the largest decrease observed in intrusion symptoms (Criterion B) due to the decentering mechanisms facilitated by IFS. This hypothesis aligns with findings by Comeau et al. (2024) and Hogdon et al. (2022), which suggest improvements in emotional regulation and trauma reprocessing. Answering RQ2, H2.1 states that avoidance symptoms (Criterion C) will show notable reductions, driven by IFS's emphasis on fostering connectedness and self-compassion, which supports patients in approaching previously avoided stimuli. Answering RQ2 as well, H2.2 speculates that reductions in negative cognition (Criteria D) and hyperarousal (Criterion E) will occur but will be less

pronounced due to the nature of these symptom domains (cognitive and physiological processes) and the limited evidence directly linking IFS mechanisms to their improvement. The following sections elaborate on the results from the relevant analyses performed to test these hypotheses.

Study Selection

For this meta-analysis, five studies conducted at the Center for Mindfulness & Compassion (CMC) at the Cambridge Health Alliance (CHA) were initially identified. To supplement this data, a database search was conducted, which resulted in one additional potential study (Hogdon et al., 2022). However, the Hogdon et al. (2022) study did not use an online, group-based IFS intervention consistent with the CHA PARTS program and was excluded. Of the five CHA studies reviewed, one was excluded due to its long-term follow-up design rather than a group-based IFS intervention. The remaining four studies were selected for inclusion in this individual participant data (IPD) meta-analysis (Figure 1).

Most of the included studies shared a consistent intervention framework, namely the 16-week, online, group-based PARTS (Program for Alleviating and Reducing Trauma and Stress) program, paired with up to 8 individual IFS therapy sessions. All studies targeted CHA patients diagnosed with PTSD, using baseline scores of 58 or higher on the PTSD module of the computerized adaptive test – mental health (CAT-MH, which leverages PCL-5 questions adaptively to assess PTSD likelihood) as a prerequisite for inclusion.

Three studies adhered to the standard PARTS curriculum. The fourth study, the PARTS-SUD (substance use disorder) study, adapted the intervention for a population

with co-occurring PTSD and substance use disorders (Ally et al., 2024). This version was shortened to a 12-week program with 6 individual IFS sessions to address the unique needs of participants prone to lower engagement and higher dropout rates (Roberts et al., 2015; Imel et al., 2013). Across all studies, pre- and post-intervention PTSD symptom severity was measured using the PCL-5 (Blevins et al., 2015) to ensure consistent assessment across different cohorts.

The inclusion of diverse cohorts and adaptations enhances the robustness of this meta-analysis by capturing variations in intervention outcomes. The selected studies provide valuable insights into the cluster-specific impacts of IFS therapy, laying the foundation for future research.

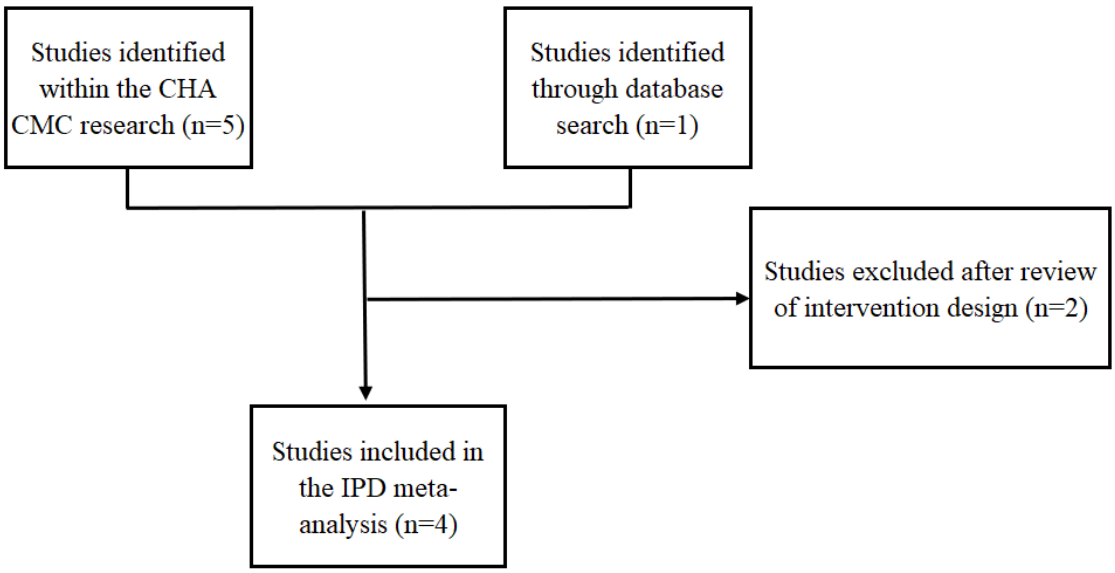

Figure 1. Study Selection Flow Diagram

Study Characteristics

Study Overview

All four studies included in the analysis (Table 2) were conducted at the Cambridge Health Alliance, and approved by the CHA Institutional Review Board (IRB):

- **PARTS 1 (Pilot)** (Comeau et al., 2024) – this completed IRB approved study was designed as an exploratory project testing the feasibility of the 16-week PARTS curriculum for the alleviation of PTSD symptoms. It was a single-arm design, and participants completed the PCL-5 scale at baseline (n = 15) as well as post-intervention (n = 12).
- **PARTS 2 (RCT)** – this completed IRB approved study developed from the PARTS 1 pilot study (Comeau et al., 2024) and included a control group. Enrolled participants filled surveys at baseline, weeks 4, 8, 12, and 16. This IPD meta-analysis will use the PCL-5 data collected at baseline (pre-intervention) (n = 30) and at week 16 (post-intervention) (n = 24) for the intervention group only (single-arm study).
- **PARTS-SUD** (Ally et al., 2024) – this completed IRB approved study spun off from the original PARTS intervention and assessed the feasibility of a shortened PARTS curriculum for a PTSD population suffering of a substance use co-morbidity. Encompassing a 12-week group-based, online PARTS intervention paired with 6 individual IFS therapy sessions delivered by CHA trained therapists, the study gathered PCL-5 data at baseline (n = 10) as well as at week 12 (conclusion of the PARTS intervention) (n = 7).

- **PARTS CPP (Centering Patients Perspectives)** – this on-going IRB-approved study aims to understand the mechanisms of change underlying PTSD symptom reduction and explore the feasibility of Natural Language Processing to discover these mechanisms. The CPP study aims to enroll at least half of the participants in each PARTS Clinical Service cohort. At the time of writing, the CPP study is still on-going and has enrolled a total of 39 participants. This IPD meta-analysis will use the records from cohorts who completed the PARTS Clinical Service program and study activities and gather PCL-5 data collected at baseline (pre-intervention) (n = 21) and at week 16 (post-intervention) (n = 15).

Participant Overview

The sample included 76 participants across four studies, with a mean age of 42.2 years (SD = 11.5) (Table 3). The majority identified as non-male (78.9%), non-Hispanic (81.2%) White (59.2%). They were not partnered (61.3%) – meaning single-never-married, divorced, separated or widowed – and employed (60.5%) whether full-time or part-time. They also were more likely to belong to one or more religious groups or faiths (45.9%).

Analyzing demographics further (Table 4), in terms of gender identity, nonbinary people (n = 4) accounted for 5.3% of the total sample, men (n = 16) for 21.1%, while women (n = 54) reached 71.1% (gender identity was not collected for 3% of participants, n = 2). Subsequently, women represented a majority in all other sociodemographic variables collected. In terms of age, participants ranged from 22 years old to 73 years old (information was not available for 20% of participants, n = 15). With an average of 42.2

years old over the total sample. With respect to race, participants were majorly white (59.2%, *n* = 45), while people of color represented 30.3% (*n* = 23) of the total sample (10.5% of participants, *n* = 8, chose not to disclose their race identity or data was not collected). In terms of relationship status, 60.5% (*n* = 46) of participants were non-partnered, i.e., single-never-married, divorced, separated, or widowed, 34.2% (*n* = 26) were partnered (married, living with a partner, or in a relationship), and 5% of data (*n* = 4) was not available or undisclosed. With regards to employment (a marker of socio-economic status), half of the participants (50.0%, *n* = 38) were employed, either full-time or part-time, 39.5% (*n* = 30) were unemployed, i.e., unemployed, on disability benefits, retired, or at-home parent, while 10.5% of information (*n* = 8) was unavailable or undisclosed. Finally, regarding religion (a factor deemed possibly relevant in the context of IFS), 43.4% (*n* = 33) of participants reported belonging to a religious group or faith, 2.6% (*n* = 2) stated being of spiritual inclination, but not religious, and 28.9% (*n* = 22) reported being non-religious. The information was not consistently collected across studies, however, with 25% of data missing (*n* = 19), making any moderator analysis biased.

Data Cleaning Results

The robustness of the raw data was scrutinized to identify outliers and missing data in the raw datasets obtained from the four studies selected. It revealed no significant outliers, and missing data (25%) were addressed using multiple imputations with predictive mean matching. The imputed dataset improved model generalizability ($R^2_{imputed} = 0.22$).

Outliers were examined in two different ways. First, a boxplot (Figure 2) was graphed to assess the distribution of the pre-intervention vs. post-intervention data and see whether there are any large shifts (differences in medians), change in spread (interquartile range, IQR, and whiskers showing data range within 1.5 × IQR), or extreme values, i.e., outliers, that stand out within each cluster (plotted as individual points beyond the whiskers). The boxplot suggested the presence of outliers in negative cognition (Cluster D) pre-intervention (low scores), which did not seem to carry to the Total plot. A z-score analysis (Figure 3) was run to investigate further but showed that no datapoint lay beyond three standard deviations from clusters' means. These pieces of information lead to the inclusion of all original data points in the final dataset used for analysis.

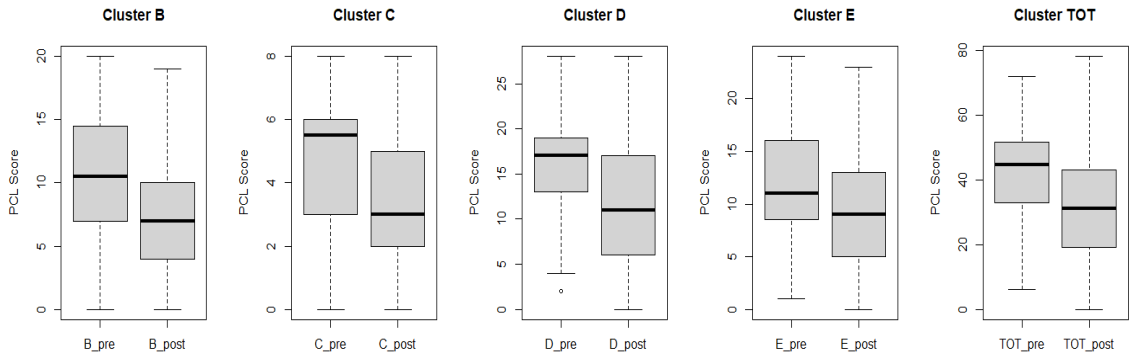

Figure 2. Boxplot Outlier Visualization by Cluster

		Cluster				
		PCL_B	PCL_C	PCL_D	PCL_E	PCL_TOT
Event	Pre-Intervention	2.10	1.41	2.15	2.39	1.95
	Post-Intervention	2.31	1.94	2.26	2.59	2.65

Max Z-Score Values by Cluster and Event

Figure 3. Summary Z-Score Values for Outliers Analysis

Assessing missingness of data, a visual inspection using a scatterplot (Figure 4) of the original dataset revealed the presence of missing datapoints in the dataset. In particular, the post-intervention plots hinted to a lower number of points than in pre-intervention plots. To better scrutinize missingness, a bar graph of missing records was created (Figure 5), which revealed a substantial proportion of missingness (25%, n = 19) in post-intervention records. An aggregation plot (Figure 6) displaying the position and percentage of missing values in the entire data frame confirmed that 12.5% of all datapoints were absent, specifically in post-intervention records. Missing data was then identified by study in order to evaluate if particular studies contributed most to the missingness. A scatterplot by study did not demonstrate a greater proportion of missingness in any study (Figure 7).

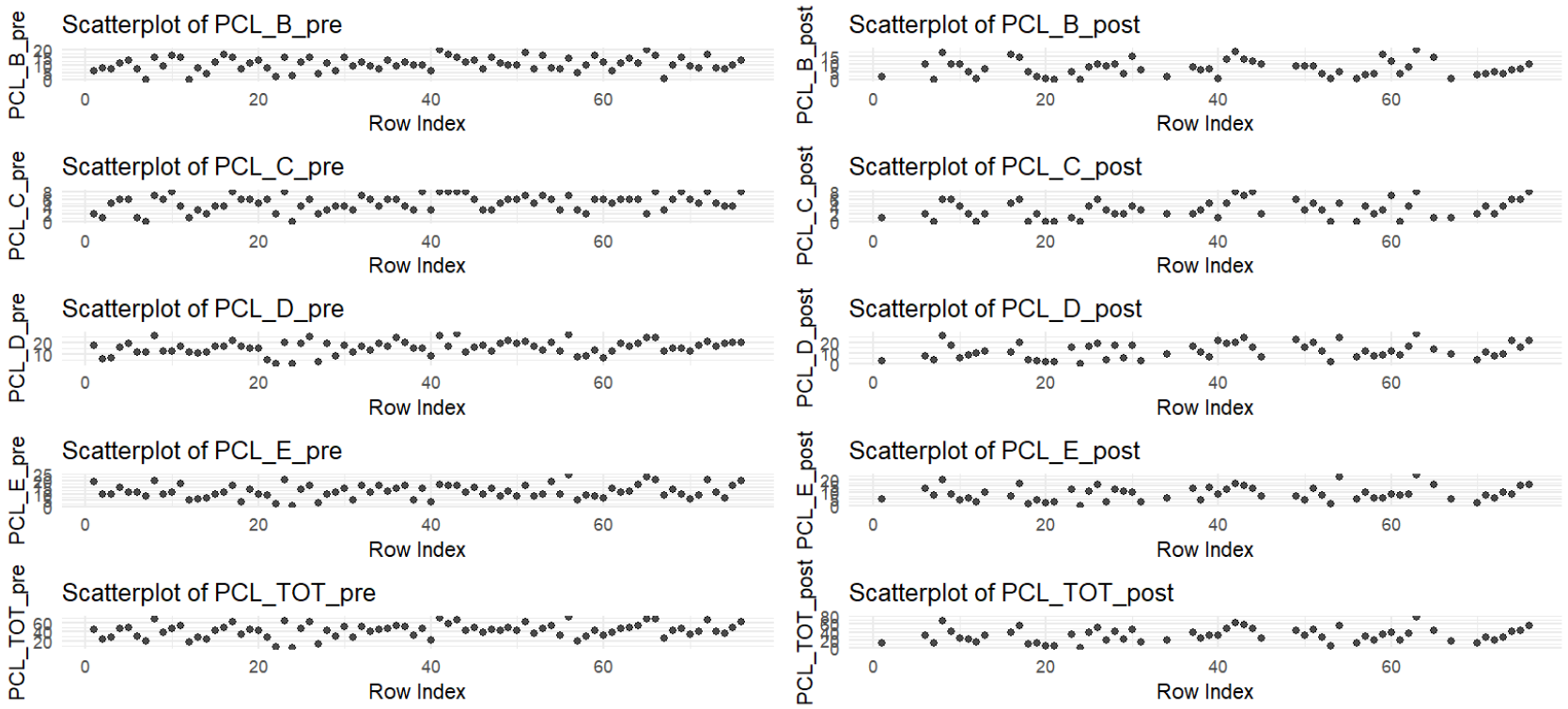

Figure 4. Scatterplot of the Raw Dataset

The scatterplot of the raw data by cluster reveals a considerable amount of missing data post-intervention. Indeed, a sparser repartition of records suggests fewer data points are available.

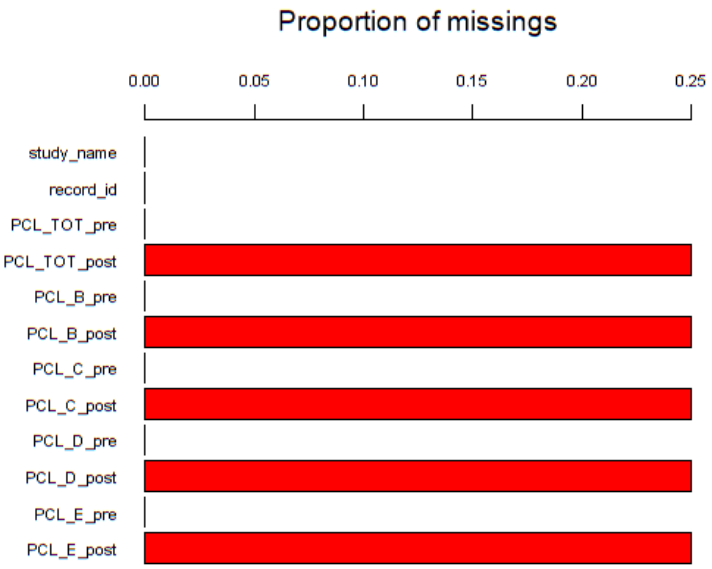

Figure 5. Proportion of Missing Records in the Dataset

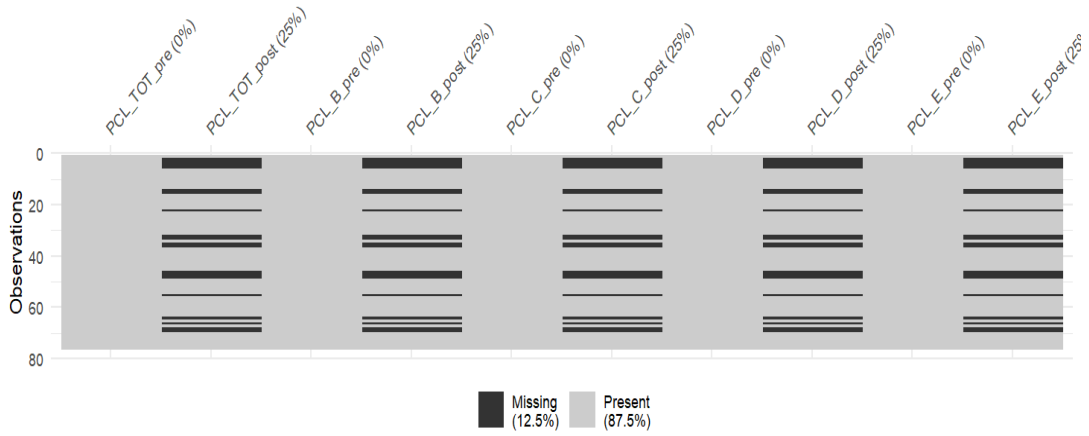

Figure 6. Missing Data Repartition within the Full Dataset

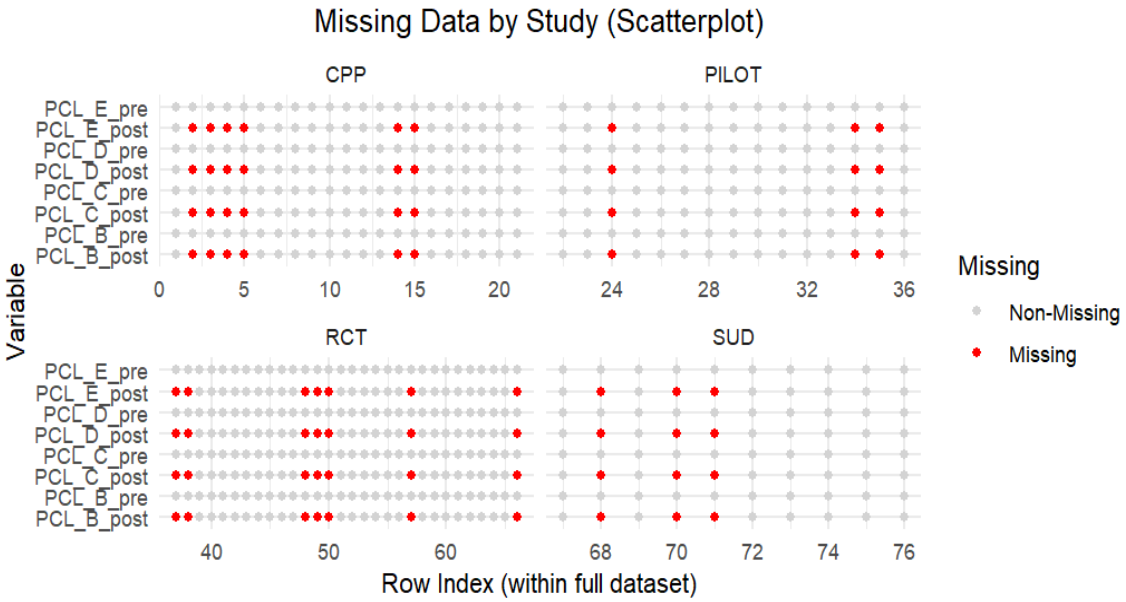

Figure 7. Missing Data by Study

Excluding records without post-intervention data would have unnecessarily and overly reduced the sample size, which was already small initially (N = 76). Additionally, excluding participants with missing data would have introduced bias, as those who drop out or provide incomplete data may differ systematically from those who complete the study (Chakraborty & Gu, 2009). To avoid adding uncertainty to the analysis, the decision was made to keep the records with empty post-intervention data and to use intent-to-treat (ITT) methods to estimate the results. Multiple imputations allow for predictions based on available data, assuming available data is sufficient to run several imputation iterations. This study leveraged a parametric approach suitable for smaller datasets, which created multiple reasonable datasets (imputations) where missing values were replaced with estimates. The method used ran five imputation iterations in a chained manner (i.e., a model imputes scores for the first variable with missing data, and missing values for the next variable with missing data are imputed using the updated data from

the first variable, etc.), and following a predictive mean matching technique to preserve the distribution and realistic range of the imputed values (well-fitted for continuous variables such as survey scores). The imputation models were then pooled to extract the final estimated values and append them to the original dataset. A regression analysis was performed to compare the imputed vs. original data and assess how imputed data might affect the analysis. The results showed a decrease in the magnitude of the regression coefficients (Figure 8). This is consistent with a more unbiased and representative model, as the imputed dataset captures a broader range of values than the complete-case sample. A goodness of fit (using R^2 statistics) analysis further showed an increase in model stability ($R^2_{\text{not-imputed}} = 0.33$; $R^2_{\text{imputed}} = 0.22$). Although a lower R^2 suggests a weaker model fit, it can also reflect a more representative sample. In contrast, a high R^2 obtained from a small participant sample may be artificially inflated and, therefore, less generalizable. With these considerations in mind, the imputed model was used for the rest of the analysis.

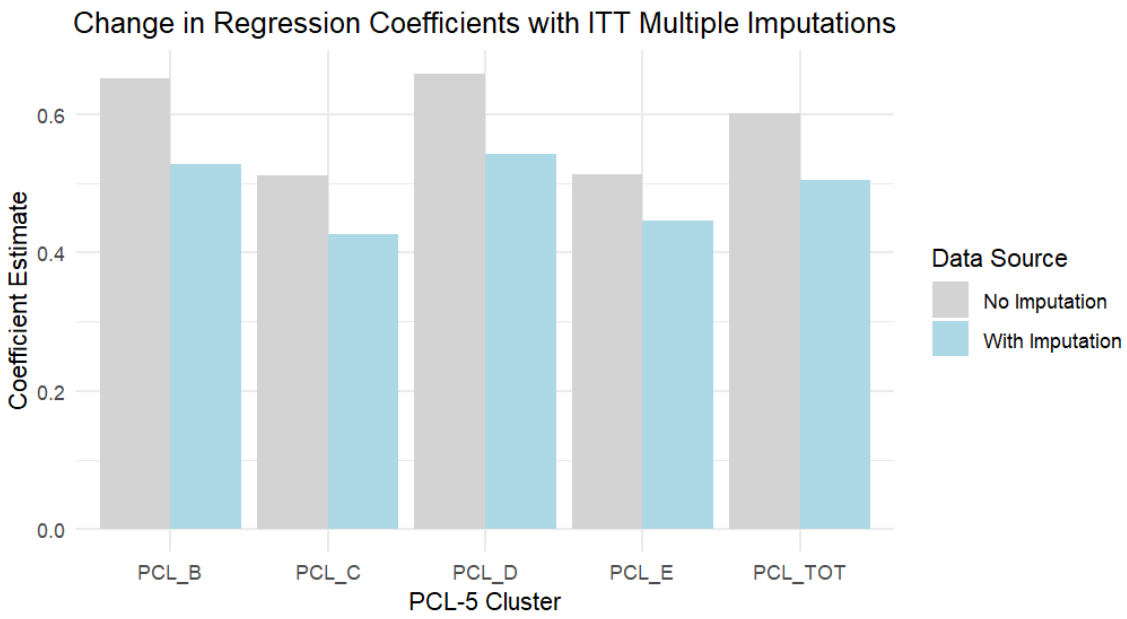

Figure 8. Intent-To-Treat Multiple Imputations Regression Analysis

The imputed model shows a less biased and more representative dataset, characterized by a decreased model fit that reflects under-inflated results that are more generalizable.

Individual Studies Results

In order to assess the individual outcomes of each study, a meta-analysis is performed. Hedge's *g*, adjusted for pre-/post-intervention correlation and study weights, was calculated to estimate effect sizes. An adjustment to Cohen's *d*, Hedge's *g* is a better fit for smaller sample sizes. Assigning weights to each study accounts further for discrepancies in sample sizes as they are combined into the meta-analysis model. The pre-/post-intervention correlation accounts for the dependency of post-intervention measures on pre-intervention scores. In this meta-analysis, negative values for Hedge's *g* indicate a decrease in PCL-5 scores from pre- to post-intervention.

All Hedge's *g* results (Table 5) were negative, ranging from -0.55 to -1.87, suggesting improvement in PTSD symptoms after the IFS intervention. This range is indicative of moderate to large magnitude of the effect sizes, by conventional benchmarks ($|g| = 0.2$ is a small effect; $|g| = 0.5$ is medium; and $|g| = 0.8$ is large). Standard errors (SE), however, ranged from 0.27 to 0.63, suggesting varying degrees of precision. By conventional standards, a small standard error (e.g., SE = 0.27) suggests more precise estimates and a narrow confidence interval (95% *CI*), while larger standard errors (e.g., SE = 0.62) implies greater uncertainty around the effect size and a wider confidence interval (95% *CI*). An assessment of the 95% *CIs* confirmed this prediction, with all of them excluding zero, suggesting significant improvements.

On an individual study level, PARTS SUD (Ally et al., 2024) yielded the strongest effect size ($g = -1.68$, SE = 0.60, 95% *CI* [-2.85; -0.51]). These results indicate a strong improvement in PTSD symptoms in general and across clusters, but with uncertainty around the estimates. This study also had the smallest sample size ($n = 10$), which contributes to these high results. Within the PARTS SUD study (Ally et al., 2024), negative cognition (Criterion D) ($g_D = -1.87$, $SE_D = 0.63$, 95% *CI* [-3.10;-0.64]) and intrusion (Criterion B) ($g_B = -1.82$, $SE_B = 0.62$, 95% *CI* [-3.04;-0.61]) showed the greatest improvements. While still indicative of substantial reduction in symptoms, avoidance (Criterion C) ($g_C = -1.30$, $SE_C = 0.54$, 95% *CI* [-2.36; -0.23]) and hyperarousal (Criterion E) ($g_E = -1.16$, $SE_E = 0.52$, 95% *CI* [-2.18; -0.13]) showed more moderate results. The PARTS 1 (Pilot) study (Comeau et al., 2024) showed the next set of substantial results, with an average effect size of $g = -1.32$ (SE = 0.44, 95% *CI* [-2.18; -0.45]), suggesting large reductions in PTSD symptoms with medium levels of estimate

precision. Within this study (Comeau et al., 2024), negative cognition (Criterion D) (g_D = -1.41, SE_D = 0.45, 95% *CI* [-2.29;-0.52]) and intrusion (Criterion B) (g_B = -1.12, SE_B = 0.42, 95% *CI* [-1.95;-0.29]) also showed the greatest improvements. While hyperarousal (Criterion E) (g_E = -1.01, SE_E = 0.41, 95% *CI* [-1.82; -0.20]) and avoidance (Criterion C) (g_C = -0.98, SE_C = 0.41, 95% *CI* [-1.78; -0.18]) showed moderate results. The PARTS CPP study displayed medium to large effect sizes, averaging at g = -1.22 (SE= 0.36, 95% *CI* [-1.93; -0.51]), indicating nonetheless improvements in symptoms with moderate certainty. Within the CPP study, negative cognition (Criterion D) (g_D = -1.22, SE_D = 0.36, 95% *CI* [-1.93; -0.50]) and intrusion (Criterion B) (g_B = -0.96, SE_B = 0.34, 95% *CI* [-1.63; -0.29]) also showed the greatest improvements. While hyperarousal (Criterion E) (g_E = -0.91, SE_E = 0.34, 95% *CI* [-1.58; -0.24]) and avoidance (Criterion C) (g_C = -0.84, SE_C = 0.34, 95% *CI* [-1.50; -0.18]) showed even more moderate results. Finally, the PARTS RCT results were the most moderate (g = -0.88), yet offer greater certainty (SE= 0.28, 95% *CI* [-1.43; -0.32]). Within this study, intrusion (Criterion B) (g_B = -1.21, SE_B = 0.30, 95% *CI* [-1.80;-0.62]) and avoidance (Criterion C) (g_C = -1.16, SE_C = 0.30, 95% *CI* [-1.75;-0.57]) showed the greatest improvements, differing from the other three studies. Negative cognition (Criterion D) (g_D = -0.62, SE_D = 0.27, 95% *CI* [-1.15; -0.09]) and hyperarousal (Criterion E) (g_E = -0.55, SE_E = 0.27, 95% *CI* [-1.08; -0.03]) showed smaller results with more accuracy.

Looking at the overall cluster level, clusters for all studies showed negative effect sizes. This observation pointed to a consistent direction of improvement across PTSD symptoms, with scores for negative cognition (Criterion D) and intrusion (Criterion B) most substantially reduced in most studies except for PARTS RCT. Given that every

effect was negative, each cluster saw a decrease in post-interventions scores compared to pre-intervention measures. And with absolute effect sizes near or above 1, the results showed a meaningful reduction in all PTSD symptom clusters. However, the precision of these results varied greatly, with effect sizes showing particularly large standard errors (SE>=0.50) and wide 95% *CIs*, suggesting a large magnitude of uncertainty around the effect size estimates.

In conclusion, the large and negative Hedge's *g* values indicate a strong likelihood of PTSD symptom reductions in the post-intervention measures. There is, however, some variation in the magnitude of the standard errors, from small to large uncertainty around the estimates. This is emphasized by varying width in the 95% *CIs*. Yet, across the board, the *CIs* exclude zero, indicative of significantly beneficial change.

Meta-Analysis Results

Individual study analyses revealed substantial effect sizes yet lacking certainty of estimates. In order to assess the effect of the IFS intervention at the symptom cluster level, a meta-analysis pooling the various effect sizes was conducted. A random effect model was used to account for between-study heterogeneity (different settings, times of intervention and populations), and ensure generalizability of findings to other populations or contexts.

At the overall level (Table 6), a large negative effect (g = -1.13; p<0.05, p_{HB} < 0.05) with a 95% *CI* below zero [-1.50; -0.76] signified considerable improvements in overall PTSD symptoms. Heterogeneity tests suggested the absence of detectable between-study heterogeneity (τ^2=0; I^2 = 0%; Q-statistic = 1.87; p=0.60).

Diving into individual clusters, starting with intrusion (Criterion B), a large and statistically significant effect size was observed (g_B = -1.17; p<0.05, p_{HB} < 0.05), which was further paired with a 95% *CI* well below zero [-1.55; -0.80]. The width of the 95% *CI* however indicated a low precision of the effect size estimate. A *Q*-statistic of 1.52 (p=0.68), paired with null I^2 and τ^2, suggested no true variability between studies' effect sizes. Avoidance (Criterion C) showed a large and statistically significant effect size as well (g_C = -1.04; p<0.05, p_{HB} < 0.05), which was further paired with a 95% *CI* well below zero [-1.40; -0.68]. The width of the 95% *CI* however indicated uncertainty around the effect size estimate. A *Q*-statistic of 0.75 (p=0.86), paired with null I^2 and τ^2, suggested no true variability between studies' effect sizes. When it comes to negative cognition (Criterion D), a large and statistically significant effect size was, once again, observed (g_D = -1.12; p<0.05, p_{HB} < 0.05), especially as it was paired with a 95% *CI* well below zero [-1.64; -0.61]. The width of the 95% *CI* however indicated low levels of precision around the effect size estimate. A *Q*-statistic of 5.03 (p=0.17) suggested no true variability between studies' effect sizes. However, the estimates of other heterogeneity statistics (I^2 = 41.5%; τ^2 =0.11) suggested that moderate heterogeneity could exist between studies. More than 40% of the variation could be due to between-study differences, but the lack of significance (p>0.05, p_{HB} > 0.05) reflected the low statistical power, and the few studies included in this meta-analysis. Finally, hyperarousal (Criterion E) showed a large and statistically significant effect size by conventional benchmarks (g_E = -0.80; p<0.05, p_{HB} < 0.05), which was further paired with a 95% *CI* well zero [-1.15; -0.46]. The width of the 95% *CI* however indicated uncertainty around

the effect size estimate, there again. A *Q*-statistic of 1.68 (p=0.64), paired with null I^2 and τ^2, suggested no true variability between studies' effect sizes.

Overall, all clusters showed statistically significant (p<0.05, p_{HB} < 0.05) negative effects, ranging from -0.80 to -1.17. These typically large effects indicate substantial PTSD symptoms reduction across all clusters. Intrusion (Criterion B, g_B = -1.17) and negative cognition (Criterion D, g_D= -1.12) presented with the greatest effects. All 95% *CIs* were below zero, reaffirming improvements in each symptom cluster. The width of the *CIs* was indicative of low levels of precision around the effect size estimates. Little to no heterogeneity between studies was observed, indicating that effect sizes differences were most likely due to expected sampling error. Negative cognition (Criterion D) presented an exception, showing a possible between-study variability, which lacks statistical significance, however. These results implied robust pre- to post-intervention improvements in all PTSD symptom clusters, with a strong magnitude of effect. Lack of heterogeneity in most of the clusters indicated that the effect was stable across studies, with the exception of negative cognition (Criterion D), which hinted to a variation across studies, yet not significant. A forest plot (Figure 9) gives a visual representation of the results, with an additional breakdown by study.

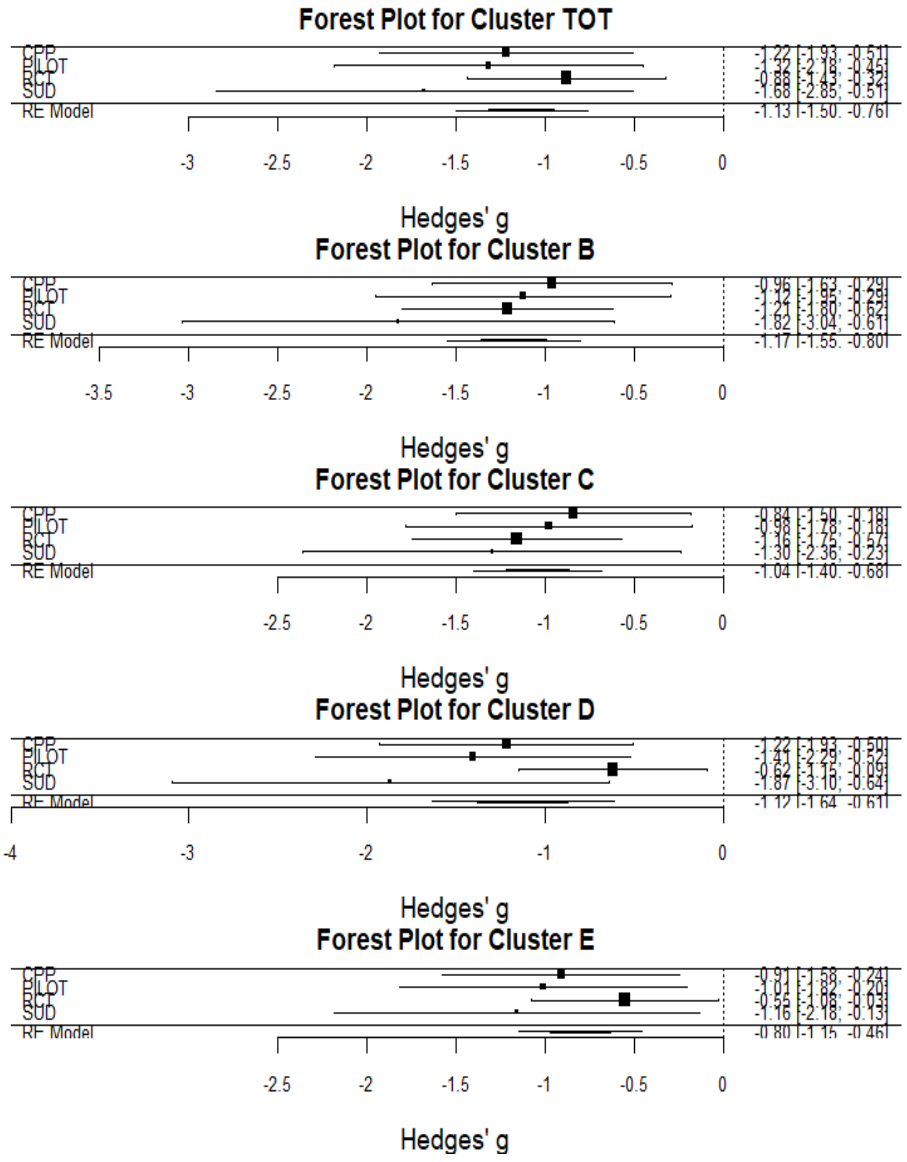

Figure 9 Forest Plots of the Meta-Analysis by Clusters

Meta-Regression Results

In order to further assess the impact of the IFS intervention on symptom clusters, a meta-regression was performed to model the relationship between the effect sizes and symptom clusters.

First, a null meta-regression was calculated, representing the pooled effect size when no moderators were specified. A high negative value was returned for the intercept (g = -1.03), which confirmed a large reduction in PTSD symptoms overall (Table 7). The 95% *CI* ([-1.19; -0.86]) was below zero and the p-value (p<0.05, p_{HB} < 0.05) was extremely small, both reaffirming the significance of the positive impact of the IFS intervention on PTSD symptoms. Heterogeneity statistics showed no detectable between-studies random-effect variability (τ^2= 0; I^2 = 0%), meaning that the effect sizes across studies were consistent. The Cochran's Q test for residual heterogeneity was non-significant (Q = 13.37; p>0.05), reinforcing that there was no evidence of systematic heterogeneity among the included studies. In summary, the null meta-regression indicated a large, statistically significant pooled effect, with no evidence that the true effects varied across studies. Hence, the selected studies appeared highly consistent, and the average effect was strongly negative and indicative of a meaningful reduction in PTSD symptoms.

Second, a meta-regression including individual clusters as moderators was performed to compare effect sizes across clusters (Criteria B, C, D, and E) (Table 8, Figure 10). In the light of the results of the meta-analysis by cluster, which showed intrusion (Criterion B) as a high and consistent contributor across studies, this cluster was used as the reference group. As the meta-regression intercept, it showed effect size g = -

1.17 (p<0.05, p_{HB} < 0.05), 95% *CI* [-1.55; -0.80], which is consistent with the meta-analysis by cluster computed in the preceding step and indicated a significant and large effect, hence the IFS intervention led to a meaningful reduction in intrusion symptoms (Criterion B). The other clusters were then compared to Criterion B. The analysis revealed that their effect sizes differed only slightly from cluster B: from +0.13 for cluster C, to +0.15 for negative cognition (Criterion D), and up to +0.37 for hyperarousal (Criterion E). Typically, none of the clusters' effect sizes were statistically different from Criterion B (p>0.05, p_{HB} > 0.05). In accordance with other results, no between-study heterogeneity was detected, and the random-effects variance was null (τ^2= 0; I^2 = 0%). The *Q*-test for residual heterogeneity was non-significant (p>0.05), confirming that there was no statistically significant between-study heterogeneity left unexplained by the model. In sum, none of the clusters statistically differed from reference Criterion B.

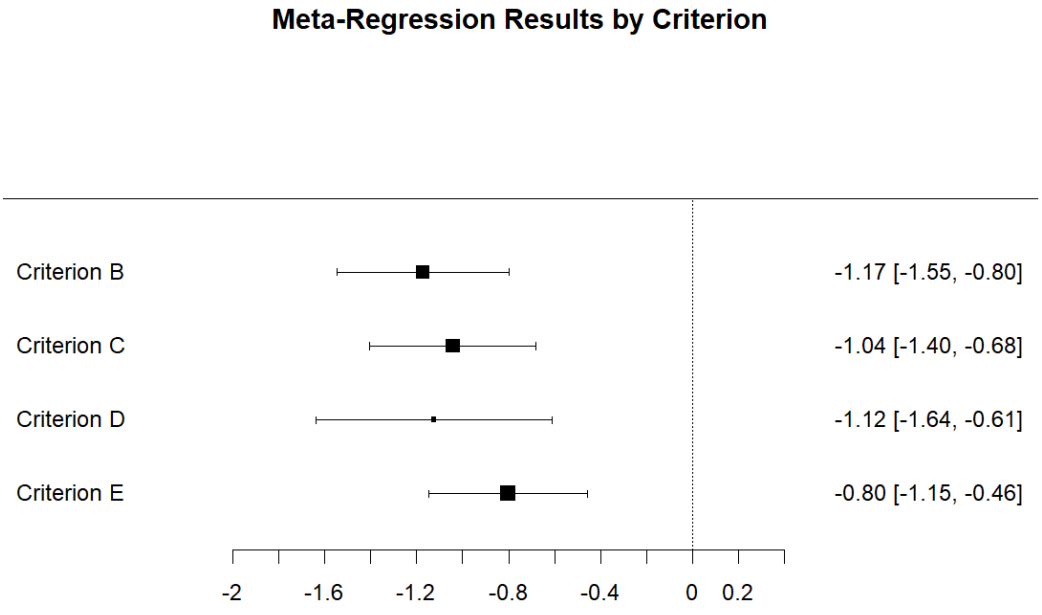

Figure 10 Forest Plot of the Meta-Regression Across Clusters.

Moderator Variables Results

In order to assess the impact that study design had on the results, additional meta-analyses were performed. The first one verified if the inclusion of the PARTS SUD study (Ally et al., 2024) influenced results in a significant manner (Table 9). As a reminder, this study had a shorter duration (12 weeks vs. 16 weeks) and targeted a specific population of PTSD participants with a substance use comorbidity (SUD). Running the meta-regression with this study as a moderator statistically changed the effect size ($p<0.05$, $p_{HB} < 0.05$). Adding the PARTS SUD study (Ally et al., 2024) decreased the effect size by -0.54 relative to the pooled effects of the other studies ($g = -0.95$; $p<0.05$, $p_{HB} < 0.05$), suggesting that the PARTS SUD study (Ally et al., 2024) showed even stronger effects than the other studies. Looking at heterogeneity statistics however, there was little to no detectable between-study variability ($\tau^2= 0.05$; $I^2 = 0\%$). The Cochrane's *Q*-test of moderators ($QM = 3.18$, $p>0.05$) suggested that PARTS SUD study (Ally et al., 2024) was not a statistically significant moderator of effect size. The model with PARTS SUD (Ally et al., 2024) as moderator presented a good fit (AIC = 13.15; BIC = 15.07) and was a significant predictor of stronger effects. Hence, the PARTS SUD study (Ally et al., 2024) contributed significantly to the large reduction in PTSD symptoms observed in the meta-analysis, it was a predictor of stronger effects, yet it was not a significant moderator of effect size.

Next, the PARTS RCT study was used as a moderator due to its differing design type (Table 10). As a reminder the PARTS RCT study was a randomized control trial study that was used as a single arm study for the purposes of this meta-analysis. The meta-analyses by clusters (Figure 9) revealed shifted results in negative cognition

(Criterion D) and hyperarousal (Criterion E), as well as in total, driving the need for further investigation. Running the meta-regression with this study as a moderator did not statistically change the effect size (p>0.05, p_{HB} > 0.05). Adding the PARTS RCT study increased the effect size by +0.26 relative to the pooled effects of the other studies (g = -1.11; p<0.05, p_{HB} > 0.05), suggesting that the PARTS RCT study tempered the other studies' effects down. Looking at heterogeneity statistics, there was little to no detectable between-study variability (τ^2= 0.05; I^2 = 0). The Cochrane's Q-test of moderators (QM = 1.95, p>0.05) suggested that the PARTS RCT study was not a statistically significant moderator of effect size. Adding RCT did not improve model fit significantly (AIC = 15.34; BIC = 17.26). All in all, the PARTS RCT study did not significantly alter the large reduction in PTSD symptoms observed in the meta-analysis and was not a significant moderator of effect size.

All in all, the PARTS SUD study (Ally et al., 2024) increased the pooled effect size significantly, even though it was short of being a statistically significant moderator. The PARTS RCT study did not significantly explain additional variability in effect sizes. Because the studies within each group were highly consistent, there was no detectable heterogeneity (τ^2=0; I^2=0%) that random effects would need to account for.

Post-Hoc Analysis Results

The findings of the cluster-level meta-analysis showed that while the IFS intervention produced a large, statistically significant reduction in overall symptoms, hyperarousal (Criterion E) was the least affected. Specifically, hyperarousal had an effect size of approximately g_E = –0.80 (p < 0.05, p_{HB} < 0.05), compared to g_B = –1.17 for intrusion (Criterion B), g_D = –1.12 for negative cognition (Criterion D), and g_C = –1.04

for avoidance (Criterion C). This prompted a post-hoc meta-regression comparing hyperarousal to the combined effect of the other clusters, which yielded no statistically significant differences in efficacy of the IFS intervention on hyperarousal compared to other symptom clusters (Figure 11). Specifically, the pooled effect for intrusion (Criterion B), avoidance (Criterion C), and negative cognition (Criterion D) was –1.08 (SE = 0.11, 95% *CI* [–1.29, –0.87], $p<0.05$, $p_{HB} < 0.05$), while hyperarousal (Criterion E) remained at –0.80 (see Figure 11). The meta-regression coefficient was 0.28 ($SE_E = 0.21$, 95% *CI* [-0.13; 0.68], $p>0.05$, $p_{HB} > 0.05$) indicating that hyperarousal (Criterion E) has a larger effect size than other symptom clusters (less reductions in symptoms of hyperarousal), but the difference is not statistically meaningful ($p=0.18$, $p_{HB} =1.00$). Additionally, because the 95% *CI* range includes 0, the difference could be due to chance. Given the exploratory, post-hoc nature of this analysis, these results should be interpreted with caution and require further investigation in future pre-registered studies.

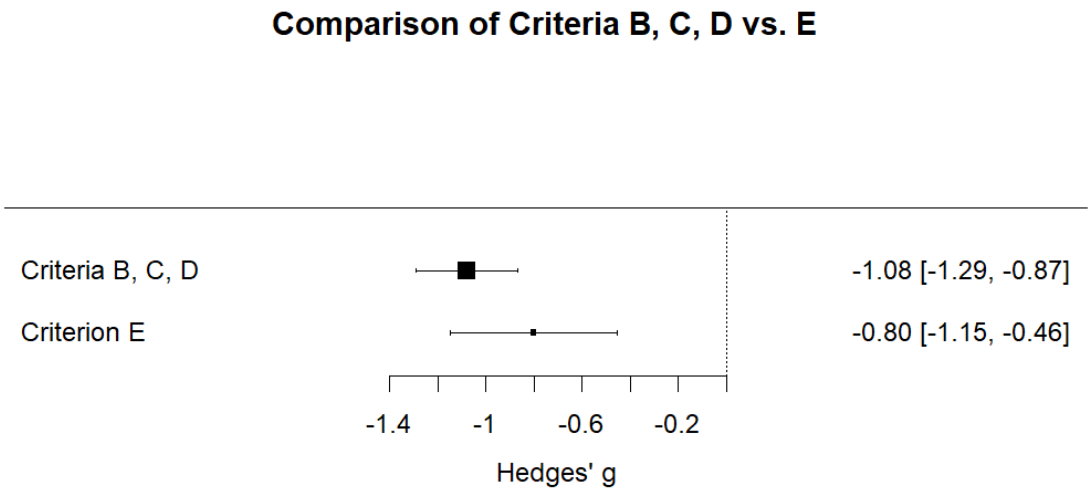

Figure 11 Forest Plot of the Post-Hoc Meta-Regression Comparing Hyperarousal to Other Symptom Clusters

Power Analysis Results

In order to assess the robustness of the findings, especially given the small number of studies (four) and limited combined sample size (N = 76) included in this work, along with the inclusion of a post-hoc analysis, a power analysis was conducted. A Monte-Carlo simulation with 1,000 iterations was used, which employed the parameters observed in the various statistical tests performed (notably the pooled effect size g = -1.13, heterogeneity measure $\tau^2 = 0.0$, and the average of variances (SE^2) across clusters and studies. The simulation yielded an estimated power of 1 (i.e. 100% likelihood of detecting a true effect if the parameters used in the simulation hold true), meaning nearly every simulation produced a statistically significant effect (p<0.05). This high estimate should however be interpreted with caution due to the limited number of studies and the low variability in both within-study variances and between-study heterogeneity, which may inflate the power estimate. Notably, even when more conservative parameters are applied, the estimated power remains above 80%, indicating a high probability of detecting a true effect according to common benchmarks.

Multiple Comparison Adjustment Results

Given the number of tests and comparisons performed in this IPD meta-analysis, and particularly following the inclusion of the post-hoc meta-regression, a multiple comparisons adjustment was applied. The Holm-Bonferroni method was used due to its ability to control for familywise error rate, while preserving statistical power. The

adjustment did not change the statistical significance of any of the tests performed; results that were significant ($p < 0.05$) remained significant ($p_{HB} < 0.05$), and results that were not ($p > 0.05$) remained non-significant ($p_{HB} > 0.05$) (see Table 11).

Summary of Results

In order to answer the research questions around the efficacy of an online, group-based IFS intervention on PTSD symptoms, this IPD meta-analysis collected data from four studies ($N = 76$). Participants' demographics showed a fair diversity of representation in terms of race, age, gender identity, ethnicity, employment, relationship status and religious affiliation. A raw data analysis did not indicate the presence of significant outliers in the dataset. Missingness was, however, substantial (25%) and restricted to post-intervention scores. An ITT method of multiple imputations was used to avoid reducing the sample size further and introduce supplemental bias in the analysis. The imputed dataset was analyzed, and while it did reveal a weaker model fit, it increased the stability of the model in terms of real-life representation of population and generalization of the results. Individual studies were assessed for effect sizes using Hedge's *g*, which is appropriate when individual studies' sample sizes are small. The results showed large and negative Hedge's *g* values across studies, indicating a substantial improvement in PTSD symptoms post-intervention, despite some uncertainty around the effect sizes estimates. Combining the effect sizes into a meta-analysis of PTSD symptom clusters, the results demonstrated robust pre- to post-intervention improvements in all PTSD symptom clusters, with a strong magnitude of effect. Lack of heterogeneity in most of the clusters showed that the effect was stable across studies,

with the exception of negative cognition (Criterion D), which hinted to a variation across studies, yet not statistically significant.

A second stage of analysis included various meta-regressions, to model the relationship between clusters. These models helped answer the research questions originally posed in this IDP meta-analysis. First, a null meta-regression (without moderators) indicated a large, statistically significant pooled effect, with no evidence that the true effects varied across studies. This outcome corroborated with individual study findings showing that the selected studies were highly consistent, and the strong negative effect was indicative of a meaningful reduction in PTSD symptoms. It also brought an answer to RQ1, showing that participation in an IFS intervention reduced PTSD symptom severity across clusters. Then, another meta-regression model was performed to define if the impact between clusters varied, i.e., if one or more clusters showed greater reduction in symptom severity. Intrusion (Criterion B) was used as a referent for this analysis as it is the only cluster that showed high and consistent reduction across studies. The meta-regression demonstrated that none of the clusters statistically differed from intrusion symptoms (Criterion B). This disproved the assumption made in RQ2 that the IFS intervention is better able to reduce symptoms of intrusion (Criterion B) and avoidance (Criterion C). Furthermore, in the light of the meta-analysis results, which showed that the PARTS RCT results varied from other studies, and that the results of the PARTS SUD study (Ally et al., 2024) spread a wider range, another set of regressions was run to account for differences in study designs. First, using the PARTS SUD study (Ally et al., 2024) as a moderator, the regression model showed that this study did significantly increase the pooled effect size, yet it was not a significant moderator. Hence

excluding it from the analysis did not lead to divergent conclusions. Then, in a similar fashion, the regression model using the PARTS RCT study as a moderator failed to demonstrate a significant change in pooled effect size. Excluding the PARTS RCT study from the analysis did not yield different results.

A post-hoc analysis was conducted to evaluate the lower effect observed for hyperarousal (Criterion E). Given the physiological nature of hyperarousal, it was important to determine whether the smaller reduction following the IFS intervention was meaningful. A meta-regression comparing Criterion E with the combined effect of Criteria B, C, and D did not reveal a statistically significant difference in the intervention's impact.

To assess the robustness of these findings, especially considering the limited number of studies and overall small sample size (N = 76), and the inclusion of an unplanned post-hoc analysis, a power analysis was performed using a Monte Carlo simulation. Despite using actual (and possibly inflated) parameters, the estimated power was high (100%), indicating a strong likelihood of detecting a true effect if one exists (Type I error).

Furthermore, due to the multiple comparisons made in this study, an adjustment for multiple testing was applied using the Holm-Bonferroni method. This adjustment did not change the significance levels of any tests, confirming the consistency of the results observed in the various analyses.

All in all, this IPD meta-analysis demonstrated that the online, group-based IFS intervention significantly improved symptoms of PTSD across clusters, in a uniform manner, i.e., no cluster was more significantly improved than another.

Chapter IV.

Discussion

Leveraging a two-stage individual patient data meta-analysis with mixed-effects brought insights into the research questions and hypotheses outlined in this work.

Findings of the Data Cleaning

The outlier detection process did not reveal an impactful presence of outliers, but the missing data identification process did show substantial patterns of missing datapoints. In order to avoid reducing the sample size unnecessarily and introducing greater bias and/or reducing statistical power, an intent-to-treat (ITT) method of multiple imputations was used to replace missing data with estimates. The process reduced the model fit, which was interpreted as increasing stability and generalizability of the results. Indeed, A high model fit driven by small sample sizes suggests a misalignment with the broader population. This would artificially inflate the results of the analysis, making any conclusion unreliable and non-generalizable.

Findings of the Demographics Analysis

Participants' demographics were analyzed and revealed a diversity of representation with regards to race, gender, ethnicity, age, employment status, relationship status and religion. Having such diversity ensures a better representation of the actual population that the sample represents, yet this IDP meta-analysis did not run regressions to assess the possible moderating effect of demographics on the results.

Future studies would benefit from performing such analyses as to better inform effect across demographic groups and minorities.

Findings of the Individual Study Analyses

Calculating Hedge's *g* for each study showed a significant impact of the online, group-based IFS intervention on PTSD symptoms as a whole, and within each cluster. Effect sizes were negative and large by statistical benchmarks, indicative of strong improvements in PTSD severity and within individual clusters. The 95% *CIs* were all below zero, confirming the significance of the results. Yet, they presented a wide spread, which, paired with a wide range of standard errors, cast some uncertainty around these estimates' precision. Heterogeneity statistics failed to demonstrate the presence of between-study variability, which means that future replications of this work can leverage a fixed-effect model instead of the random-effect model used in this IPD meta-analysis.

Looking at the study level, the PARTS SUD study (Ally et al., 2024) showed the strongest results, triggering the need for further analysis of the study as a moderator. The PARTS 1 (Pilot) (Comeau et al., 2024) and the PARTS CPP studies followed in magnitude of effect sizes, while the PARTS RCT study showed the most moderate results. This study was hence, also scrutinized in meta-regression to assess its moderating potential on the overall results.

At the cluster level, negative cognition (Criterion D) and intrusion (Criterion B) showed the most significant post-intervention improvements in three of the studies, while avoidance (Criterion C) and hyperarousal (Criterion E) seemed less influenced. An exception to these results, the PARTS RCT study saw the greatest reduction post-intervention in intrusion (Criterion B) and avoidance (Criterion C), with more moderate

results in negative cognition (Criterion D) and hyperarousal (Criterion E). A meta-analysis was therefore conducted to scrutinize any significant differences within clusters.

All in all, the analysis of individual studies confirmed that the online, group-based IFS intervention yields significant reductions in PTSD symptom severity as postulated in Hypothesis 1 (H1) of research question 1 (RQ1), and within each symptom cluster. However, a pattern seemed to emerge, suggesting that negative cognition (Criterion D) and intrusion (Criterion B) benefited most from the IFS intervention, disproving hypotheses H2.1 and H2.2 made in research question RQ2 that Criteria B and C would see greatest effect sizes, while Criteria D and E would be less meaningfully impacted. This emerging pattern was analyzed in a later meta-regression to assess the validity of these effect sizes differences and showed no statistical ground.

Findings of the Meta Analysis

A meta-analysis was performed to combine the effect sizes by clusters. Overall, all clusters showed significant reduction in PTSD symptoms, with substantial uncertainty around the estimates (large 95% *CI*s). Criteria D and B demonstrated the highest effect sizes, signaling a strong influence of the online, group-based IFS intervention on symptoms of negative cognition and intrusion. The absence of notable heterogeneity between studies was telling of consistent study designs. An exception shaped up with negative cognition (Criterion D) that hinted to some between-study heterogeneity, but which did not reach statistical significance, confirming that a fixed-effect model can be leveraged in future replications of this work. These results implied robust pre- to post-intervention improvements in all PTSD symptom clusters, with a strong magnitude of effect.

Findings of the Meta Regression

A meta-regression was then conducted, to assess the dependency between clusters. An initial null meta-regression was performed (without moderators), which confirmed a large negative pooled effect size, indicative of a strong reduction in PTSD symptom severity. A p-value ($p<0.05$, $p_{HB} < 0.05$) confirmed the pooled result was statistically significant. Heterogeneity statistics failed to show between-study variability, suggesting consistent designs as previously seen. These results helped affirm the hypotheses under RQ1 which stated that an online, group-based IFS intervention would significantly help alleviate symptoms of PTSD across clusters.

In a subsequent step, another meta-regression was performed, which included clusters as moderators. The results showed that none of the clusters statistically differed from one another, meaning that the online, group-based IFS intervention improved all PTSD symptom clusters uniformly. This conclusion refutes the hypotheses made under RQ2, which forecasted a greater reduction in intrusion symptoms (Criterion B) and avoidance (Criterion C). It is also in line with prior findings (Horesh et al., 2017; Melani et al., 2024) showing that PTSD treatments do not affect symptom clusters in a differentiated and systematic way. Hence, the results of the IPD meta-analysis support the observation, that despite the specificity of the mechanisms used in the IFS modality (such as decentering, self-compassion, etc.), PTSD symptoms are reduced across the board in an undifferentiated way. This is particularly meaningful as it attests to the efficacy potential of IFS therapy for patients regardless of prominent symptom presentations as well as its homogeneous impact in line with leading-edge, referent modalities such as

CBT, NET and EMDR (International Society for Traumatic Stress Studies, 2018; Kazak, 2019; Melani et al., 2024).

Findings of the Moderators Analysis

With individual studies' results showing some discrepancies in the magnitude of effect sizes, another meta-regression was performed to assess the influence of study design on the results. In particular, the PARTS SUD (Ally et al., 2024) and the PARTS RCT studies were scrutinized for moderating effects. The PARTS SUD study (Ally et al., 2024) showed a statistically significant negative effect ($p<0.05$, $p_{HB} < 0.05$), decreasing the negative pooled results more than other studies (i.e., strongly contributing to the reduction in PTSD symptom severity seen post-intervention). The PARTS RCT study did not reveal any statistical significance as an influencing factor of pooled effect sizes ($p>0.05$, $p_{HB} > 0.05$). In all cases, a subsequent meta-regression did not demonstrate any significant influence of the PARTS SUD study (Ally et al., 2024), nor the PARTS RCT study, as moderators of the pooled effect, meaning that excluding either or both studies from the analysis would not lead to more accurate results or differing conclusions.

Demographics data were collected and utilizing them to assess how belongingness to minority groups could influence the efficacy of the IFS intervention would have been insightful. Along the same lines, scrutinizing the possible moderating effect of religiosity would have been insightful in the context of the spiritual practice that IFS is. Due to time constraints however, these meta-regressions were not conducted. Future replications of this work would benefit from running these analyses to better inform factors that can influence and possibly emphasize the efficacy of the IFS modality.

Findings of the Post-Hoc Analysis

The results of the post-hoc analysis suggest that, despite its physiological basis, hyperarousal (Criterion E) responds to IFS-based treatment similarly to other PTSD symptom clusters. This finding is consistent with previous findings for established PTSD treatments like CBT and EMDR (Horesh et al., 2017; Melani et al., 2024), suggesting that IFS show comparable improvements in PTSD severity across symptom clusters. While this post-hoc analysis provides preliminary insights, its exploratory nature requires cautious interpretation. The possibility of a Type I error remains, and these results require replication in independent, pre-registered studies to establish their robustness and generalizability.

Findings of the Power Analysis

A Monte Carlo simulation with 1,000 iterations using parameters from previously performed analyses estimated power at 100%. This high result should however be interpreted prudently, as the parameters used may inflate the estimate. This said, even with more conservative parameters, power remains above 80%, indicating a high likelihood of detecting a true effect. These findings suggest that the meta-analytic results are reliable, and the conclusions are generalizable.

Findings of the Multiple Comparison Adjustment

Applying a Holm-Bonferroni adjustment for multiple comparisons did not alter the statistical significance of any of the tests performed. In other words, tests that were significant before adjustment remained significant, and those that were not significant continued to show non-significance. This outcome indicates that the risk of Type I error

was adequately controlled, reinforcing that the observed effects are robust rather than artifacts of multiple testing. Consequently, this confirmation strengthens confidence in the validity and generalizability of the findings reported in this IPD meta-analysis.

Implications

The findings of this IPD meta-analysis have implications for people suffering from traumatic stress, and particularly those afflicted by PTSD. The empirical findings of this work bring evidence to the efficacy of the IFS modality on PTSD symptoms, reducing severity of symptoms across PTSD clusters. While symptoms of intrusion (Criterion B) and negative cognition (Criterion D) show the greatest improvements, all clusters benefit from the intervention uniformly.

This conclusion is meaningful for patients and therapists alike, making IFS therapy a useful tool for PTSD patients, regardless of symptom cluster dominance. It is also meaningful as IFS has the ability to induce holistic recovery. Indeed, both a present-centered and past-focused therapy, IFS help patients grow mindful awareness of the present moment and self-compassion (Hogdon et al., 2022) which support healing both from a mental standpoint but also physical and somatic standpoints. This is encouraging for people suffering from PTSD, as no modality works universally, hence, the more options of intervention exist, the greater number of people can be helped.

Another key implication of this work is its value in complementing the emerging literature and making IFS an evidence-based modality of psychotherapy. As mentioned at various points in this document, IFS has taken the therapy room by storm, hence investigating its efficacy across various conditions and populations (mostly PTSD patients in this analysis, but on-going research also encompasses substance use disorders

and victims of interpersonal violence) helps legitimize the modality, with all the possible benefits that stem from empirical evidence – especially as it relates to insurance coverage, ethics, funding for future research, scholarly acceptance within the psychiatric and medical communities, etc.

Finally, the homogeneous efficacy of IFS across symptom clusters aligns with current gold-standard modalities for PTSD treatment (such as CBT, NET or EMDR), positioning it a strong candidate as a referent PTSD treatment. Existing literature on these therapies indicates no significant differences in efficacy across symptom clusters (Horesh et al., 2017; Melani et al., 2024), and IFS appears to follow a similar pattern. This similarity places IFS on par with cognitive, behavioral, and cognitive-behavioral therapies.

Research Limitations

This IPD meta-analysis has several limitations that should be acknowledged. First, the small number of studies included (four total) and limited sample size across these studies (N = 76) reduce the statistical power of the analysis and limit the generalizability of the findings. Hence, this analysis relied on a correlation adjusted Hedge's g, Intent-to-Treat method with multiple imputations for missing values, and random-effects model to alleviate some of the uncertainty driven by small sample sizes and low statistical power.

Second, the studies were conducted within a single health system, the Cambridge Health Alliance (CHA), which may not reflect broader populations. Future research should aim to include data from multiple institutions to enhance external validity.

Third, while the PCL-5 questionnaire provides robust measures of PTSD symptom severity across DSM-5-TR-defined clusters, it is a self-reported instrument. The reliance on self-reported data introduces potential biases, including social desirability and recall bias, which may affect the accuracy of responses (Boskovic et al., 2024). Combining self-reported measures with clinician-administered assessments, such as CAPS-5, could mitigate this limitation in future studies.

Fourth, there are inherent challenges in harmonizing datasets from studies with slight procedural differences. For instance, the PARTS SUD study (Ally et al., 2024) leveraged a 12-week intervention format compared to the standard 16-week format used in all other studies. Although moderators' regressions were conducted to account for these design and procedural differences, they introduce variability that may affect the comparability of the results.

Another important limitation is the absence of control groups in the selected studies. While the PARTS RCT study was effectively a randomized control trial, it was not leveraged as such in this meat-analysis. Including control groups in future replications of this work would enable meaningful comparison of the IFS intervention to the placebo effect.

Some drawbacks of this analysis, which the author could have mitigated if time had allowed, are the lack of bias analyses (within studies, publication bias, etc.) to assert the validity and legitimacy of individual study results. Conducting these analyses would have strengthened the robustness of the conclusions. As stated before, demographic information could have been used to further scrutinize the efficacy of the IFS intervention on minority groups (ethnicity, race, gender identity, employment and relationship status,

religious affiliation). Adding this layer of analysis would have been relevant and insightful given the fair diversity of representations in the overall sample.

Lastly, the intervention's online delivery format, while increasing accessibility, may not capture the nuances of in-person therapy sessions. The effectiveness of online IFS-based interventions compared to traditional in-person formats remains an open question and a potential avenue for future exploration.

Despite these limitations, this meta-analysis represents a significant step toward understanding the efficacy of IFS-based interventions on PTSD symptom clusters and provides a foundation for larger, more comprehensive studies.

Future Directions

This IPD meta-analysis provides insight into the efficacy of the IFS modality on PTSD and traumatic stress. Future efforts would benefit from replicating this work with additional data (e.g., complete dataset from the PARTS CPP study) and/or studies (e.g., IRB approved PARTS IPV – interpersonal violence – study debuting at the time of writing), etc. Expanding the scope to assess efficacy on complex PTSD using the information collected via the International Trauma Questionnaire (ITQ) (Cloitre et al., 2018), which incorporates questions related to the disturbance of self-organization (DSO) typical of complex trauma presentations could also bring insights on the usefulness of the IFS intervention for those suffering from developmental trauma. Replications of this work would benefit from registering and confirming post-hoc, exploratory findings, and/or using more nuanced approaches to within-study variances and heterogeneity measures while conducting sensitivity analyses.

This IPD meta-analysis focused on an online, group-based IFS intervention, and did not scrutinize the contributions of individual vs. group sessions and/or the amount of exposure to the IFS model (i.e. moderating effect of the number of sessions attended). Future efforts should compare and contrast efficacy in various therapy settings, such as individual therapy only (Hogdon et al., 2022), in-person therapy, intensive therapy (sessions lasting over four or more hours), and/or collective retreats spanning over several days. The IFS modality relies heavily on Self-energy to foster the release of traumatic material, and collective Self-energy (from a group of people combined) is often referenced as facilitating the unburdening process. Looking at different settings can inform the validity of these anecdotal observations and offer guidance on how IFS can be most helpful.

Finally, while this study contributes to the emerging body of evidence that supports the efficacy of IFS as a PTSD intervention, little is known about the mechanisms of action at the core of its usefulness. Future studies should aim to understand the processes (cognitive, behavioral, neural, etc.) underlying the symptom reductions observed in this analysis and greater literature. The PARTS CPP and PARTS LTF/U (long term follow up to the PARTS RCT) studies aim to begin answering this question by gathering patients' input into the components of the IFS model that they perceive contributed most to their improvements. The upcoming Neuro-IFS study at CHA aims to analyze the feasibility of neuro-imagining techniques in the study of the neural correlates of IFS – if conclusive, it could give insights into the neural mechanisms of action that drive PTSD improvements following IFS therapy. Additionally, a deeper dive into the concept of Self, and its action in trauma recovery would also clarify how

IFS supports recovery from adverse experiences. Currently, two scales have been designed to evaluate the development of Self during IFS (IFS Scale; DeLand, 2006) as well as the development of Self-leadership (Self-Leadership Scale, Steinhardt et al., 2003). Their validity as research instruments has, however, not yet been established, making any conclusion unreliable.

All in all, this IPD meta-analysis continues to build evidence for the efficacy of the IFS modality of therapy, but continued work is needed to understand which populations can benefit from the intervention, and/or how IFS supports recovery from traumatic experiences.

Conclusion

As exposure to adverse and traumatic events continues to rise worldwide (Kessler et al. 2017; Kilpatrick et al., 2013), effective treatments to alleviate symptoms of PTSD are crucial to the good functioning of individuals and societies as a whole. A novel modality of psychotherapy, IFS has rapidly grown in popularity. Preliminary studies have shown promising results (Hogdon at al. ,2022; Comeau et al., 2024, Ally et al., 2024), but as research is just emerging, evidence of its efficacy is yet to be fully established.

Offering complementary insights into existing literature, this IPD meta-analysis brings evidence of the efficacy of IFS as a modality of psychotherapy for PTSD alleviation. It demonstrates that an online, group-based IFS intervention, paired with individual therapy sessions reduces symptoms of PTSD across clusters. While intrusion (Criterion B) and negative cognition (Criterion D) show the most improvements, all clusters seem to benefit from the intervention in an undifferentiated way, despite the heterogenous natures of the various symptom clusters (e.g., physiological basis of

hyperarousal – Criterion E). We can, hence conclude, that IFS is an effective type of therapy in the alleviation of PTSD symptoms, which presents opportunities for patients across symptomatology.

This conclusion has considerable implications for people suffering from PTSD. Adding a supplemental modality to a panel of opportunities, IFS offers a new option for recovery to people who do not seem to benefit from other existing interventions. Its efficacy as a group-based intervention opens further opportunities to help more patients in an effective way given the current levels of burnout and long waitlists in the psychiatric world (Tran, 2024). Future studies should continue to develop on these findings to expand evidence of efficacy across various populations and begin to understand mechanisms of action.

While no psychotherapy is a universal solution that supports all patients, establishing IFS as a legitimate, evidence-based type of PTSD intervention can have substantial positive repercussions on those who struggle to find healing with other existing modalities. This IPD meta-analysis can, hopefully, serve as a stone on the path towards this goal.

Appendix 1.

PTSD Checklist for DSM-5 (PCL-5)

PCL-5

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Keeping your worst event in mind, please read each problem carefully and then select one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

Your worst event: _____

In the past month, how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	0	1	2	3	4
10. Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	0	1	2	3	4
15. Irritable behavior, angry outbursts, or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17. Being "superalert" or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4
20. Trouble falling or staying asleep?	0	1	2	3	4

Table 1.

Demographics Grouping

Table 1. Demographics Grouping for Analysis

Confounding variable	Raw data categories	Grouping for analysis
Age	Numerical values	N/A
Ethnicity	Hispanic Non-Hispanic Other Undisclosed	Hispanic Non-Hispanic Other
Race	Asian BIPOC Black Multiracial Native American Native Islander White Other Undisclosed	BIPOC White Other
Gender	Female Male Nonbinary	Female Male Nonbinary
Employment Status	At-home Disability Full-time Part-time Retired Unemployed	Employed Unemployed Other

Confounding variable	Raw data categories	Grouping for analysis
	Other Undisclosed	
Relationship Status	Divorced Married Separated Single Widowed Other	Non-Partnered Partnered Other
Religion	Buddhist Christian Hinduist Jewish Multireligion None Pagan Spiritual Other Undisclosed	None Religious Spiritual Other

Aggregation of answers in demographics questions – to minimize multicollinearity and overfitting, and to preserve statistical power and meaningful categorization of moderators

Table 2.

Studies Overview

Table 2. Studies Overview

Study	Sample size	Non-male (%)	Non-white (%)	Condition	PTSD measure	Intervention type
PARTS 1 (Pilot)[1]	*n* = 15	87%	40%	PTSD	PCL-5	PARTS 16-wk
PARTS RCT	*n* = 30	83%	47%	PTSD	PCL-5	PARTS 16-wk
PARTS SUD[2]	*n* = 10	60%	40%	PTSD + SUD	PCL-5	PARTS 12-wk
PARTS CPP	*n* = 21	81%	33%	PTSD	PCL-5	PARTS 16-wk

Descriptive information of the studies included in this IPD meta-analysis.

[1] Comeau et al., 2024 [2] Ally et al., 2024

Table 3.

Participant Demographics Proportions

Table 3. Participant Demographics Proportions

Study	Sample size	Average age (in years)	Non-male (%)	Non-white (%)	Hispanic (%)	Non-partnered (%)	Unemployed (%)	Non-religious (%)
PARTS 1 (Pilot)[1]	*n* = 15	43.9	86.7	40.0	20.0	60.0	60.0	N/A
PARTS RCT	*n* = 30	39.0	80.0	46.7	14.3	63.3	36.7	40.0
PARTS SUD[2]	*n* = 10	44.5	60.0	40.0	40.0	60.0	40.0	60.0
PARTS CPP	*n* = 21	44.6	81.0	33.3	14.3	60.0	28.6	47.6

Study	Sample size	Average age (in years)	Non-male (%)	Non-white (%)	Hispanic (%)	Non-partnered (%)	Unemployed (%)	Non-religious (%)
PARTS Combined	*N* = 76	42.2	78.9	40.8	18.8	61.3	39.5	45.9

Proportions of participants demographics

[1] Comeau et al., 2024

[2] Ally et al., 2024

Table 4.

Participant Demographics

Table 4. Participant Demographics

Variables	Categories	*n* (%)
Ethnicity	Hispanic	17 (22.4%)
	Non-Hispanic	56 (73.7%)
	Other/Undisclosed	3 (3.9%)
Race	BIPOC	23 (30.3%)
	White	45 (59.2%)
	Other/Undisclosed	8 (10.5%)
Gender Identity	Female	54 (71.1%)
	Male	16 (21.1%)
	Nonbinary	4 (5.3%)
	Other/Undisclosed	2 (2.6%)
Relationship Status	Partnered	26 (34.2%)
	Non-Partnered	46 (60.5%)
	Other/Undisclosed	4 (5.3%)
Employment Status	Employed	38 (50.0%)
	Unemployed	30 (39.5%)
	Other/Undisclosed	8 (10.5%)
Religion	Religious	33 (43.4%)
	Spiritual	2 (2.6%)
	None	22 (28.9%)
	Other/Undisclosed	19 (25.0%)
Age	Mean (in yrs)	42.2

Variables	Categories	*n* (%)
	Total	76 (100.0%)

Descriptive demographics of participants in this IPD meta-analysis

Table 5.

Individual Studies' Effect Sizes

Table 5. Individual Studies' Effect Sizes

Study	Cluster	Hedge's *g*	Standard Error (SE)	95% *CI*
CPP	Total	-1.22	0.36	[-1.93; -0.51]
	Intrusion	-0.96	0.34	[-1.63; -0.29]
	Avoidance	-0.84	0.34	[-1.50; -0.18]
	Negative Cognition	-1.22	0.36	[-1.93; -0.50]
	Hyperarousal	-0.91	0.34	[-1.58; -0.24]
PILOT[1]	Total	-1.32	0.44	[-2.18; -0.45]

Study	Cluster	Hedge's *g*	Standard Error (SE)	95% *CI*
	Intrusion	-1.12	0.42	[-1.95; -0.29]
	Avoidance	-0.98	0.41	[-1.78; -0.18]
	Negative Cognition	-1.41	0.45	[-2.29; -0.52]
	Hyperarousal	-1.01	0.41	[-1.82; -0.20]
RCT	Total	-0.88	0.28	[-1.43; -0.32]
	Intrusion	-1.21	0.30	[-1.80; -0.62]
	Avoidance	-1.16	0.30	[-1.75; -0.57]
	Negative Cognition	-0.62	0.27	[-1.15; -0.09]
	Hyperarousal	-0.55	0.27	[-1.08; -0.03]

Study	Cluster	Hedge's *g*	Standard Error (SE)	95% *CI*
SUD[2]	Total	-1.68	0.60	[-2.85; -0.51]
	Intrusion	-1.82	0.62	[-3.04; -0.61]
	Avoidance	-1.30	0.54	[-2.36; -0.23]
	Negative Cognition	-1.87	0.63	[-3.10; -0.64]
	Hyperarousal	-1.16	0.52	[-2.18; -0.13]

[1] Comeau et al., 2024

[2] Ally et al., 2024.

Table 6.

Meta-Analysis by Cluster

Table 6. Meta-Analysis by Cluster

Cluster	Hedge's *g*	95% *CI*	*p*-value	*Q*-Stat.	*Q*-Stat. *p*-value	I^2 (%)	τ^2
Total	-1.13	[-1.50; -0.76]	2.20E-09	1.87	0.60	0	0
Intrusion	-1.17	[-1.55; -0.80]	7.51E-10	1.52	0.68	0	0
Avoidance	-1.04	[-1.40; -0.68]	1.62E-08	0.75	0.86	0	0
Negative Cognition	-1.12	[-1.64; -0.61]	1.65E-05	5.03	0.17	41.50	0.11
Hyperarousal	-0.80	[-1.15; -0.46]	5.69E-06	1.68	0.64	0	0

Table 7.

Meta-Regression (No Moderator)

Table 7. Meta-Regression Results Without Moderators

Predictor	Estimate	SE	95% *CI*	*p*-value	τ^2	I^2 (%)	*Q*-Stat.	*Q*-Stat. *p*-value
Intercept	-1.03	0.08	[-1.19; -0.86]	2.87E-35	0	0	13.37	0.82

Table 8.

Meta-Regression by Clusters

Table 8. Meta-Regression Results with Clusters as Moderators

Predictor	Estimate	SE	95% *CI*	*p*-value
Intercept (Intrusion Criterion B)	-1.17	0.19	[-1.55; -0.80]	7.51e-10
Avoidance (Criterion C)	0.13	0.27	[-0.39; 0.65]	0.62
Negative Cognition (Criterion D)	0.15	0.27	[-0.37; 0.67]	0.57
Hyperarousal (Criterion E)	0.37	0.26	[-0.14; 0.88]	0.15

This table shows the effect size of reference group Criterion B (intercept) and how other clusters (Criteria C, D, and E) vary in effect size compared to Criterion B. Notably, they all show a smaller reduction in symptoms from the online, group-based IFS intervention compared to Criterion B

Table 9.

Meta-Regression PARTS SUD Study

Table 9. Meta-Regression Results with PARTS SUD Study[1] as Moderator

Predictor	Estimate	SE	95% *CI*	*p*-value
Intercept	-0.95	0.10	[-1.14; -0.76]	2.54E-22
PARTS SUD[1] Study	-0.54	0.30	[-1.13; 0.05]	0.07

[1] Ally et al., 2024.

Table 10.

Meta-Regression PARTS RCT

Table 10. Meta-Regression Results with PARTS RCT Study as Moderator

Predictor	Estimate	SE	95% *CI*	*p*-value
Intercept	-1.11	0.12	[-1.35; -0.87]	4.49E-20
PARTS RCT Study	0.26	0.19	[-0.11; 0.63]	0.16

Table 11.

Holm-Bonferroni Adjustment for Multiple Comparisons

Table 11. Holm-Bonferroni Adjustment for Multiple Comparisons

Test	Parameter	Original/Unadjusted *p*-value	Holm-Bonferroni Adjusted *p*-value
Cluster Meta-Analysis	Clusters Total	2.19634E-09	2.63561E-08
Cluster Meta-Analysis	Criterion B	7.50751E-10	1.05105E-08
Cluster Meta-Analysis	Criterion C	1.62374E-08	1.78612E-07
Cluster Meta-Analysis	Criterion D	1.6509E-05	0.000148581
Cluster Meta-Analysis	Criterion E	5.68548E-06	5.68548E-05
Null Meta Regression	Intercept	2.87004E-35	5.45308E-34
Meta-Regression by Clusters	Criterion B (Reference Group)	7.50751E-10	1.05105E-08
Meta-Regression by Clusters	Criterion C	0.622638893	1.00

Test	Parameter	Original/Unadjusted *p*-value	Holm-Bonferroni Adjusted *p*-value
Meta-Regression by Clusters	Criterion D	0.572455452	1.00
Meta-Regression by Clusters	Criterion E	0.152912135	1.00
Moderators Analysis	Study Design SUD Intercept	2.54468E-22	4.32595E-21
Moderators Analysis	Study Design SUD Study	0.074675796	0.597406365
Moderators Analysis	Study Design RCT Intercept	4.4935E-20	7.1896E-19
Moderators Analysis	Study Design RCT Study	0.162389086	1.00
Moderators Analysis	Study Design SUD-RCT Intercept	1.31811E-14	1.97717E-13
Moderators Analysis	Study Design SUD-RCT - SUD Study	0.150167287	1.00

Test	Parameter	Original/Unadjusted *p*-value	Holm-Bonferroni Adjusted *p*-value
Moderators Analysis	Study Design SUD-RCT - RCT Study	0.357897458	1.00
Post-Hoc Analysis	Criteria B, C, and D Combined	2.12288E-23	3.82118E-22
Post-Hoc Analysis	Criterion E	0.182415	1.00

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