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Memory Reconsolidation Therapy for Police Officers with Post-Traumatic Stress Disorder

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Abstract

Police officers are frequently exposed to traumatic events and therefore are at elevated risk of developing post-traumatic stress disorder (PTSD) and other mental health conditions. While evidence-based treatments for PTSD such as prolonged exposure therapy demonstrate effectiveness, residual symptoms and relapse remain problematic outcomes. Improvements in outcomes may be enhanced by modifying psychotherapy processes based upon recent neuroscientific findings. The present study explored incorporating memory reconsolidation principles into evidence-based exposure therapy for PTSD to create memory reconsolidation therapy (MRT). MRT incorporates memory recall followed by a wait period to make memories liable for modification. Using a case series design, three police officers diagnosed with PTSD participated in a maximum of twelve 90-minute sessions of MRT and recorded weekly self-report measures of trauma symptoms and psychological distress. Results indicated participants experienced significantly reduced psychological distress with gains maintained over a three-month follow-up. A significant reliable reduction in trauma symptoms by post-therapy was identified in two of the three cases with the third narrowly missing the clinically significant cut-off. These significant changes were maintained over the three-month follow-up in one participant, while the maintenance of these improvements in trauma symptoms approached significance in the other two participants. These findings provide preliminary evidence to justify larger future studies to test the efficacy of MRT with police officers experiencing PTSD.

Keywords

Memory reconsolidation; trauma; post-traumatic stress disorder; police; psychological distress

Theoretical and Research Basis for Treatment

Police officers are routinely exposed to stressful experiences that may be potentially traumatic (Chopko & Schwartz, 2012). This includes witnessing events such as family violence or road fatalities, being threatened with or experiencing physical violence (Papazoglou, 2013), as well as experiencing large-scale potentially traumatic events such as natural disasters (Kerswell, Strodl, Johnson, & Konstantinou, 2019). It is also well established that police officers are a population at greater risk of developing post-traumatic stress disorder (PTSD): a disorder characterised by intrusive memories, thoughts, imagery and physiological states related to the traumatic event (American Psychiatric Association, 2013; Chopko & Schwartz, 2012; Papazoglou, 2013). Police officers experiencing PTSD report a range of difficulties in work and relationships and are also at elevated risk of suicide (Chopko & Schwartz, 2012; Papazoglou, 2013). Furthermore, approximately half of all individuals diagnosed with PTSD also meet diagnostic criteria for a mood or anxiety disorder or both conditions (Bowler et al., 2016); while there is also evidence that following trauma, the risk of police experiencing a standalone diagnosis of a mood or anxiety disorder is equal or more likely (Bowler et al., 2016; Faust & Vander Ven, 2014). Individuals experiencing comorbid PTSD and depression are at high risk of suicide, particularly where alcohol or substance abuse is observed (Krysinska & Lester, 2010). As comorbid depression and anxiety are common following trauma, therapy should aim to reduce broader psychological distress as well as targeting specific trauma symptoms (Roberts, Roberts, Jones & Bisson, 2015).

While typically considered the “gold standard” psychotherapy for PTSD, prolonged exposure therapy (PET) unfortunately is also associated with symptoms often returning, with relapse rates being as high as 50% (Bradley, Greene, Russ, Dutra, & Westen, 2005; Kar, 2011; Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008). As such, while recognising the

significant contribution that PET has provided to the treatment of PTSD, there is still a need to further enhance the effectiveness of PET in order to reduce relapse. An important distinction between psychotherapies for PTSD and other mental health conditions is a specific focus on trauma related memories (Lonergan, 2014). Incorporating neuroscientific understandings of trauma related memories into the further development of PET is one avenue for enhancing the effectiveness of PTSD for the treatment of PTSD (Johnson, McGuire, Lazarus & Palmer, 2012; Johnson, 2016).

Approaching PTSD from the perspective of clinical neuroscience, van Marle (2015) asserts that the acquisition and maintenance of traumatic memories and symptoms of PTSD can be understood as a function of disordered memory. This is consistent with an array of research indicating that following acquisition, traumatic memories become stored in subcortical regions of the brain, principally the amygdala within the limbic system, rather than the typical cortical regions (Johansen, Cain, Ostroff, & LeDoux, 2011; Kim & Jung, 2006; Schafe, Nader, Blair, & LeDoux, 2001; van Marle, 2015). Whereas the cortical regions associated with memory are predominantly autobiographical, the subcortical regions are associated with perceptual and autonomic components of memory (van Marle, 2015). Exposure to an internal or external trigger to the traumatic memory activates a memory trace that is disintegrated from its autobiographical context; on account of this, the memory is relived in the present, rather than recalled from the past (van Marle, 2015). This is exacerbated by the failure of the prefrontal cortex to fulfil its usual inhibitory function during memory extinction, owing to hyperactivation of the amygdala due to the potency of the traumatic memory (Schiller, Levy, Niv, LeDoux, & Phelps, 2008). The symptoms of PTSD may arise from the failure of this inhibitory function (Kim & Jung, 2006; Lee, Nader & Schiller, 2017). Essentially, in traditional exposure therapy an individual learns a new 'safe' memory contained within the prefrontal cortex which is used to inhibit the old 'fear'

memory contained within the amygdala, without change occurring to the original traumatic memory trace (Schiller, Kanen, LeDoux, Monfils, & Phelps, 2013; van Marle, 2015). As the inhibitory memory created during therapy decays relative to the enduring potency of the traumatic memory, the individual's symptoms may return (Hardt, Nader, & Nadel, 2013; Raio, Brignoni-Perez, Goldman, & Phelps, 2014). This finding helps to explain the relative high rate of relapse with traditional prolonged exposure therapy (Bradley, Greene, Russ, Dutra, & Westen, 2005; Kar, 2011; Schottenbauer et al., 2008).

Memory Consolidation and Memory Reconsolidation

Learning involves protein synthesis within brain regions associated with the creation of a memory trace; following a brief period of lability, the trace becomes consolidated in long-term memory (Nader, 2003). Consolidated memories were traditionally thought unchangeable, with each recall accessing the original memory trace (Lewis, 1979; Misanin, Miller, & Lewis, 1968). Contradicting this line of thinking, earlier work by Bartlett (1932) demonstrated the constructive nature of memory in which one's own experiences, knowledge, and expectations change previously consolidated memories when recalled. A prime example illustrating the malleability of memory is the recall of false memory after exposure to misinformation and suggestive memory retrieval techniques (Cochran, Greenspan, Bogart, & Loftus, 2016; Shaw & Porter, 2015). Despite such evidence, it has commonly been thought that memory is fixed. Evidence to overturn this assertion was initially provided by a rodent study conducted by Nader, Schafe, & Le Doux (2000) which employed Pavlovian fear conditioning and drug administered amnesia. The results indicated that activation of the memory was required to observe the amnesic effect, thereby demonstrating that memory recall can create memory lability (Nader et al., 2000). When a memory is recalled it can be altered, such as through presenting new information or changing the affective intensity of the memory via extinction training, with each

subsequent recall activating the version last reconsolidated into long-term memory (Schiller & Phelps, 2011; Schiller et al., 2013). This process is called memory reconsolidation (Nader et al., 2000).

Though the precise ‘window’ in which memory reconsolidation occurs remains a subject of ongoing research, current evidence suggests it commences within ten minutes of recall and activation, and completes after six hours (Lee et al., 2017). Therefore, as extinction training in traditional exposure therapy commences immediately following recall, it does not occur during the reconsolidation window, and therefore the original memory does not change but rather is inhibited by the prefrontal cortex (Schiller et al., 2013). Without changing the emotional component of fear attached to the original traumatic memory, the symptoms of PTSD may perpetuate as the inhibitory function of the new memory trace decays (Schiller et al., 2008; Schiller et al., 2010; Schiller & Phelps, 2011).

Memory Reconsolidation Therapy

Memory Reconsolidation Therapy (MRT) represents an evolution of PET. That is, in traditional exposure therapy extinction training typically occurs immediately following recall (McLean & Foa, 2014). In contrast, MRT involves extinction training occurring during a window of time when the trauma memory has become labile as identified by neuroscientific research (e.g. Schiller et al., 2013). In practice this involves having a participant vividly recall a traumatic memory followed by engaging in an unrelated activity for a short period of time before engaging in extinction during the window period of memory reconsolidation (Lee et al., 2017). After this wait time has elapsed, treatment proceeds as per traditional exposure therapy until extinction of fear is achieved. As the target memory may remain labile for up to six hours before

completing consolidation (Schiller et al., 2013), participants were encouraged to avoid stressful experiences or engaging with the memory during this window.

In contrast to traditional exposure therapy processes, inducing extinction during the window of memory reconsolidation may permanently weaken the conditioned fear response associated with traumatic memories (Quirk et al., 2010; Schiller et al., 2010). In the context of policing, an officer's declarative memories would remain intact, thus enabling them to provide testimony, however recall would no longer be associated with strong emotional or physiological arousal (Schiller et al., 2010). Furthermore, as the therapeutic mechanism acts upon memory rather than inhibitory function residual symptoms should be less prominent (Quirk et al., 2010; Schiller et al., 2013). Despite preliminary support for MRT under experimental conditions, application to a human, clinical population remains largely unexplored (Schiller et al., 2013) and the few studies that have attempted to apply memory reconsolidation therapy to humans have involved the use of pharmaceutical interventions (i.e. propranolol) to disrupt reconsolidation principles (Beckers & Kindt, 2017), rather than modifying prolonged exposure therapy to align with memory reconsolidation. Specifically, to date no study has aimed to apply memory reconsolidation principles to the treatment of PTSD in serving police officers. The present study therefore involved a case series of three police officers who engaged in a course of MRT in order to develop preliminary evidence for the effectiveness of MRT for the treatment of PTSD.

Method

Participants

The participants in this study were members of the Queensland Police Service (QPS) operating within the Brisbane Region and South Eastern Region. To be eligible for inclusion in the treatment phase, participants must have experienced a traumatic event in the course of service as a police officer, and to currently meet DSM-5 diagnostic criteria for PTSD.

Participants identified to be at high risk of harm or reporting significant comorbid symptoms were to be excluded from the study, with alternative treatment arrangements to be made. One participant elected to withdraw before proceeding, resulting in a final sample of three participants. All participants met criteria for a diagnosis of PTSD through the administration of the Structured Clinical Interview for DSM Disorders (SCID-I). Additionally, William and Adam were also found to meet DSM-5 diagnostic criteria for major depressive disorder. No participants were found to meet diagnostic criteria for any other disorder at the time of assessment.

Joan

Joan reported a history of traumatic experiences extending prior to joining the QPS and spanning across more than 25 years of service. According to Joan, she first began to experience symptoms of PTSD approximately 10 years prior to the study following a particularly harrowing case involving the death of an infant. According to Joan her health and wellbeing deteriorated at this time, including problematic use of alcohol to cope with symptoms. She expressed ongoing symptoms of PTSD, particularly intrusive memories and hyperarousal remain highly distressing.

Joan detailed a warm environment in her family of origin and indicated no traumatic events until becoming a victim of crime in early adulthood. She indicated having one appointment with a psychiatrist at this time, however she did not return, describing him as appearing 'uninterested'. After completing post-graduate studies Joan entered the police academy and indicated having performed many police roles since this time.

William

William reported that he first experienced symptoms of PTSD approximately six years into his career as a police officer, following a period of working in crime investigation, and for 21 years prior to participating in this study. He attributed this to a succession of cases where he

was exposed to deceased persons. For many years William experienced limited trauma symptoms, until he was called to attend a major motor vehicle accident with multiple fatalities. He reported that this experience was overwhelming and described a marked increase in trauma symptoms and functional impairment, in addition to being diagnosed with major depressive disorder. William also reported significant symptoms of depression and social isolation. William denied current misuse of alcohol or other substances.

William reported no particularly remarkable events from his childhood or early experiences, while noting that ‘toughness’ was a value encouraged by his father. After graduating high school, he enlisted in the military. William reported having worked in a technical role and denied any traumatic experiences in this context. After discharging from the military, he entered the police academy, having served as a police officer since this time.

Adam

Adam reported experiencing symptoms of PTSD after a decade of service following a debilitating injury while pursuing an offender and for 12 years prior to participating in this study. He expressed that these symptoms increased following the murder of a close friend some years later. Since this time, he indicated ongoing symptoms of PTSD, depression and limited life satisfaction. Adam also reported significant symptoms of depression and social isolation. Adam indicated a belief that his physical condition had been negatively impacted by their trauma symptoms, focusing on a loss of motivation to maintain physical fitness. Adam denied current misuse of alcohol or other substances.

Adam reported that his early experiences were largely unremarkable, however he detailed an extensive history of mental health concerns within his family. According to Adam he adjusted well to school, and upon graduating he worked briefly in several casual roles before joining the police academy.

Measures

Outcome Questionnaire 45.2 (OQ45)

Participants' general psychological wellbeing was measured using the Outcome Questionnaire 45. The OQ45 consists of 45 questions measured on a five-point Likert scale, ranging from 1 *Never*, 2 *Rarely*, 3 *Sometimes*, 4 *Frequently*, and 5 *Always*. Twenty-five items measure an individual's current symptoms of psychological distress through questions such as 'I feel worthless' and 'I have thoughts of ending my life'. Eleven items measure an individual's satisfaction and functioning within interpersonal relationships through questions such as 'I have frequent arguments' and 'I feel lonely'. Nine items measure an individual's functioning at work, study and leisure through questions such as 'I am not working/studying as well as I used to' and 'I feel angry enough at work/school to do something I might regret'. The OQ45 is designed to be administered regularly to measure change in symptoms. A total score greater than 64 falls within the clinical range. The OQ45 has been demonstrated to possess good validity and reliability (Boswell, White, Sims, Harrist, & Romans, 2013; Lambert et al., 1996).

Impact of Event Scale – Revised (IES-R)

Participants' symptoms of post-traumatic stress disorder were measured using the Impact of Event Scale – Revised (IES-R). The IES-R consists of 22 items measured on a five-point Likert scale, ranging from 0 *Not at all*, 1 *A little bit*, 2 *Moderately*, 3 *Quite a bit*, and 4 *Extremely*. The IES-R consists of three subscales which measure the three major groups of symptoms associated with post-traumatic stress disorder, with eight items associated with intrusion, eight items associated with avoidance and six associated with hyperarousal (Weiss & Marmar, 1997). Examples of items associated with intrusion include 'Any reminder brought back feelings about it' and 'Pictures about it popped into my mind'. Items associated with avoidance include 'I stayed away from reminders of it' and 'I tried not to think about it'. Items

associated with hyperarousal include 'I was jumpy and easily startled' and 'I felt watchful and on-guard'. The IES-R has been demonstrated to possess good internal consistency, and discriminant validity between individuals with and without post-traumatic stress disorder (Beck et al., 2008).

Procedure

Ethical approval was obtained prior to commencing the study. Recruitment was conducted through advertising the study via email to all operational commands within these regions, with participants self-selecting. The study was advertised via email within the QPS, providing information to potential participants on the purpose of the study, what participation would involve, potential risks and benefits, and contact details for the study team. No inducements were provided to participants other than receiving a course of psychological therapy without charge via study participation. Informed consent was obtained followed by an intake interview conducted using the format of the SCID-I. Participants meeting diagnostic criteria for PTSD were invited to participate in the treatment arm of the study. In the treatment phase, participants were eligible for twelve weekly ninety minute sessions of MRT. At the start of each session, participants completed the OQ45 and IES-R. Therapy followed a manualised program of memory reconsolidation therapy.

Data Analysis

The first research question was whether participants completing the course of MRT would demonstrate significantly improved psychological wellbeing, was explored using the reliable change index (Jacobson & Truax, 1991). Normative and test-retest scores were derived from the scoring and administration manual of the OQ45 (Lambert, Kahler, Harmon, Burlingame, & Shimokawa., 2011). The second research question was whether participants completing the course of MRT would demonstrate significantly reduced trauma symptoms was,

explored using the reliable change index (Jacobson & Truax, 1991). Normative and test-retest data were derived from a study exploring trauma symptoms in motor vehicle accident survivors (Beck et al., 2008) and Vietnam War veterans (Creamer, Bell, & Failla, 2003).

Therapy Conceptualisation

The MRT treatment manual was developed by two of the authors of this article (ES and LJ) based upon memory reconsolidation principles being integrated with prolonged exposure therapy, cognitive therapy and emotion therapy principles and strategies. As such it is considered an integrative psychotherapeutic approach by the authors. Key PET principles involved in the case conceptualisation are the understanding that fear conditioning is central to the acquisition of traumatic memories, and that the prevention of extinction and thus the maintenance of symptoms occurs through the conditioned fear response of avoidance (Kim & Jung, 2006; Lonergan, 2014). In alignment with these principles, extinction is a core therapeutic strategy involved in MRT. This strategy however was modified to be consistent with memory reconsolidation research findings of the need to engage in extinction when the trauma memory is labile during a window of 10 minutes to 6 hours following initial recall (Alberini & Ledoux, 2013; Lee et al., 2017). Associated with the knowledge of a reconsolidation window, the therapy also involves discussions about aftercare at the end of each extinction session. During these brief discussions, the client is reminded about the window of reconsolidation and encouraged to minimise recalling the fear memory during stressful or distressing experiences for a period of 6 hours following the psychotherapy session. For example, when appropriate sessions were scheduled towards the end of business hours so that the client could go home rather than returning to work. In addition, the participants were encouraged to engage in pleasant non-stressful experience during the time period associated with the memory reconsolidation window.

Based upon our preliminary work, we have noticed that due to these procedures being so successful, the rapid reduction in the fear memory often resulted in the emergence of secondary emotions. The conceptualisation of secondary emotions was taken from Emotion Focused Therapy (Greenberg, 2006). That is, as the fear memory is extinguished, the expected reduction in inhibitory function results in participants gaining greater access to more complex secondary emotions such as anger, grief, guilt, or symptoms of depression as the primary emotion of fear subsides (Greenberg, 2006; Schiller et al., 2013). As such these emotions emerge in response to having an increased capacity to think about violation of rights, experiences of loss, or perceptions of self-criticism/self-loathing associated with the traumatic experience or the subsequent debilitation to their lives arising from the trauma.

While the primary focus of MRT is the extinction of the fear memory, we have found that these secondary emotions can be so strong that they hinder the client from engaging in the next step of the fear hierarchy. We have therefore found it useful to spend the minimum time required to help the client to conceptualise these emotions as secondary emotions, to normalise and validate these emotions, and then to reframe the trauma and the consequences of the trauma from a post-traumatic growth perspective. We try to facilitate a post-traumatic growth perspective by encouraging the clients to first self-validate their trauma response and secondary emotions, and then to reflect upon what they have learned from these experiences as well as creating meaning in a manner authentic to their experience (Zoellner, Rabe, Karl, & Maercker, 2011). In some instances, this process is not required following an extinction session, and at other times it can require one to two sessions of addressing the secondary emotions before the client is ready to progress to the next level of the fear hierarchy. No other content is addressed in these sessions other than what is needed to help the client reduce their secondary emotions as quickly as possible to a level where they feel ready to progress to the next level of the fear hierarchy.

Therapy Outline

Participants completed weekly measures of psychological distress (OQ45) and trauma symptoms (IES-R) to monitor their progress. Following the initial assessment, participants were engaged in up to twelve sessions of MRT. The first session of MRT involved psychoeducation about MRT, developing a shared formulation of the presenting problems based upon the MRT framework, developing a fear hierarchy of traumatic memories, and very briefly introducing the client to an abdominal breathing exercise and a simplified progressive muscle relaxation exercise (Barlow, 2014; McLean & Foa, 2014). The goal of introducing the client briefly to abdominal breathing and progressive muscle relaxation was not to facilitate mastery in these strategies, but to facilitate the process of introducing these activities as filler tasks to occupy the attention of the participant during the period following the initial recall of the traumatic memory and the start of the memory consolidation window.

The remaining sessions of MRT focused on the memories constituting the fear hierarchy. Participants' fear memories were addressed using two complementary, evidence-based processes (Lonergan, 2014; McLean & Foa, 2014). The first was exposure therapy, with extinction training timed to occur within the memory reconsolidation window (McLean & Foa, 2014; Schiller et al., 2013). These sessions consisted of three phases which reflected the phases outlined by Schiller et al. (2010). These included: (a) an initial stage where the fear memory was reactivated by instructing the participant to recall and describe the target memory as clearly as possible for 5-10 minutes; (b) a delay period, when the participants were not actively focused on the memory so that the memory had time to enter an unstable state (in our therapy this involved engaging the client in abdominal breathing or progressive muscle relaxation for approximately 20 minutes); and (c) standard extinction training where the participant was instructed to repeatedly recall the fear memory from earlier in the session until their subjective

units of distress (SUDS) decreased significantly. The second process involved discussing previously targeted memories and exploring secondary emotions that emerged after the primary emotion of fear reduced, in addition to restructuring maladaptive cognitions and exploring narratives of post-traumatic growth (Zoellner et al., 2011). The final session of MRT involved consolidating gains and discussing strategies to identify and prevent relapse. All sessions were conducted by the principal author, who was supervised by the other authors.

Results

Assessment of Progress

Participants' progress in therapy was assessed subjectively by participant self-report, and objectively using the OQ45 and IES-R, being detailed in Figure 1. Regarding the subjective experience of participants, it was observed that after completing extinction training for the first memory on their fear hierarchy, confidence in achieving their goals increased. This was however offset by a growing apprehension regarding the final memories in participants' hierarchies, representing in most instances extremely aversive memories.

INSERT FIGURE 1 ABOUT HERE

Regarding the objective measures, symptoms of psychological distress, as measured by the OQ45 across the time-points in the study, are detailed in Table 1. Initial scores were averaged from the first three sessions, representing baseline measures completed before commencing extinction training. Change was measured using the reliable change index (Jacobson & Truax, 1991). Joan, William and Adam demonstrated significant improvement on the measure of psychological wellbeing at the conclusion of treatment, with this change being maintained at follow-up.

INSERT TABLE 1 ABOUT HERE

Participants' trauma symptoms on the IES-R across three time-points are detailed in Table 2. Initial scores were averaged from the first three sessions, representing measures completed before commencing extinction training. Change was measured using the reliable change index (Jacobson & Truax, 1991). Both Joan and William experience a significant reliable change index from pre-therapy to post-therapy, while Adam narrowly missed reaching the clinically significant cut-off. William maintained the significant reliable change index over the three-month follow-up, while Joan and Adam both approached the significance cut-off but did not meet it.

INSERT TABLE 2 ABOUT HERE

Joan

Joan's initial score on the OQ45 fell within the clinical range, and her score on the IES-R indicated significant trauma symptoms. She disclosed concerns that participating could exacerbate her symptoms, however after engaging in psychoeducation on MRT and practice of the relaxation strategies she felt confident to participate in the process. A fear hierarchy consisting of seven traumatic experiences was developed in collaboration. Fortunately, despite Joan's initial concerns, the first session of extinction training proceeded well. Of note, it emerged that a song playing during the traumatic event had become encoded as a highly aversive auditory conditioned stimulus. Despite the enduring popularity of this song, Joan reported that hearing it remained very distressing for her. Joan related that despite extinction training being exhausting, and being unsettled the following day, recalling previously traumatic memories

without distress was remarkable for her. She expressed that working through earlier traumatic experiences increased her confidence to address the more aversive memories, and that her memories had become more distinct and manageable, rather than a 'mass of trauma'. However, after successfully completing extinction training of four memories, Joan reported a marked increase in trauma symptoms. She attributed this to approaching the memories at the top of her fear hierarchy, which she asserted were the core of her symptoms. Additionally, she related a concern that sharing her experiences could be damaging to the therapist and offered to conclude treatment. These concerns were resolved, and the client continued with the therapy. Following a brief period of deterioration, Joan's scores on the IES-R and OQ45 demonstrated a trajectory of improvement.

At three-month follow-up Joan indicated that despite maintaining a strong emotional response to trauma related stimuli, she could cope effectively with these emotions, and she had ceased experiencing intrusive traumatic images or memories. Joan asserted that the therapy was beneficial, while acknowledging that the final sessions were highly distressing, and the days following extinction training were difficult. Joan asserted that understanding and resolving her secondary emotions was also of great therapeutic benefit to her.

William

William's initial score on the OQ45 fell in the clinical range, with his score on the IES-R being marginally below the clinical cutoff. He responded well to the exercises covered in the first session and detailed four memories when completing the fear hierarchy. At the start of the following session he indicated having felt 'disturbed' following the previous session, however this passed within 24 hours. It was agreed to proceed with the first episode of extinction training, with William demonstrating a marked reduction in SUDS throughout the process.

Following the first two sessions of extinction training, both of which related to attending murder scenes, William recognised a tendency to strongly identify with deceased individuals and their families, and that this caused him significant distress. The impact of this became more apparent when exploring the final two memories of his hierarchy. The third memory involved the disappearance and subsequent discovery of a deceased family friend. Due to his remote deployment he was required to coordinate the investigation and liaise with the family in the aftermath. His final memory involved attending a multiple-fatality motor vehicle accident, in which he detailed that one victim closely resembled his son. William asserted this was the first instance in which he lost composure on duty. By reducing the primary emotion of fear attached to this final memory, it became possible to access powerful secondary emotions of grief and guilt, with William disclosing a belief that the individual may have been saved if he had responded more effectively.

Over the course of therapy, William reported improvements in his mood and relationships with others, alongside a greater openness to discussing his experiences. William elected to discontinue treatment after his ninth session, having addressed all memories on his fear hierarchy, and he reported being satisfied with his progress, with his scores on the OQ45 and IES-R falling below the clinical range.

William's score on the OQ45 at follow-up fell in the normal range, representing maintenance from his final session. Similarly, his follow-up score on the IES-R fell below the clinical range and indicated ongoing improvement from his final session. He asserted satisfaction with his progress, indicating it had been helpful albeit challenging to explore his experiences in depth, and subsequently to explore secondary emotions and contributing contextual factors. William also indicated his engagement in treatment had strengthened his resolve to encourage junior police officers to seek support for mental health conditions.

Adam

Adam's initial scores on the OQ45 and IES-R both fell within the clinical range. Adam included three memories in his fear hierarchy, asserting that the last was much higher than the two preceding. Adam also disclosed a further two memories regarding events in which he was severely injured by offenders using weaponry, however he denied having developed significant trauma symptoms following these events and asserted that this remained so. These memories were discussed at length after the first two memories on his fear hierarchy were addressed to ensure that Adam was not avoiding genuinely aversive trauma memories. Adam spoke at length and in detail without distress and following discussion in supervision it was agreed that these memories did not require further attention.

Adam responded well to the first session of extinction training, reporting a marked reduction in anxiety, in addition to the image of the memory becoming less 'vivid', allowing him to observe rather than relive an experience in which he was assaulted and faced a period of uncertainty regarding transmissible disease. Following this he ceased taking Effexor in collaboration with his general practitioner and denied experiencing any significant side effects. It was agreed at this time to postpone the next step on the hierarchy with Adam being away on holidays. By contrast, Adam reported limited fear during the session targeting his second memory, being an incident in which he sustained a serious injury to his mobility during a pursuit. However, a range of secondary emotions and negative cognitions were observed, principally centered on self-blame and anger toward colleagues perceived as being unhelpful and unsupportive. These secondary emotions were briefly addressed to allow Adam to progress to the next level on his fear hierarchy.

The final memory from Adam's fear hierarchy related to the murder of a close friend. Again, Adam engaged in the MRT extinction procedure and then his secondary emotions of guilt, anger and grief were briefly addressed. Adam reported a growing sense of acceptance during the following session. In addition, he detailed a range of behaviours he had engaged in throughout the aftermath of the traumatic event and into the present that were consistent with a trajectory of post-traumatic growth. Adam elected to conclude therapy following eight sessions, having addressed all memories on his fear hierarchy and asserting that he was satisfied with his progress.

Adam's score at follow-up on the OQ45 fell at the upper limit of the normal range, indicating a small improvement from the final session. His score on the IES-R also fell below the clinical range, being consistent with the final session. According to Adam he was feeling more optimistic regarding the final years of his career, and he asserted a renewed desire to pursue career progression rather than early retirement. Adam further detailed having found the opportunity to explore his experiences in depth, rather than 'skimming over them', to have been a most helpful component of the therapy beneficial. He indicated that he was arranging to recommence his engagement with a private psychologist to continue his current trajectory.

Discussion

The purpose of this study was to establish preliminary evidence for the effectiveness of MRT for the treatment of PTSD in serving police officers. The first research question explored whether participants completing the course of MRT would demonstrate significantly improved psychological wellbeing. This study found evidence that this was the case. The three participants completing the course of therapy demonstrated a reliable change on the OQ45 at the end of therapy and this was maintained at three-month follow-up. The second research question

explored whether participants completing the course of MRT would demonstrate significantly reduced trauma symptoms. The findings from this study provide a mixed answer to this research question. Two of the three participants completing the course of therapy demonstrated a clinically significant reduction of trauma symptoms, while only one of these participants maintained a clinically significant change at three-month follow-up.

Participants who completed therapy indicated the approach was acceptable and that their engagement was beneficial. One of the participants reported feeling drained after the initial therapy sessions and experiencing disrupted sleep, however these effects did not persist. Participants typically reported that while memories targeted in therapy remained unpleasant, they no longer experienced physiological arousal or distress upon recalling them, nor did they experience intrusive thoughts or imagery. This appears consistent with memory reconsolidation, suggesting change occurring at the level of the original traumatic memory (Schiller et al., 2013; Schiller et al., 2010). Participants also reported that having reduced the level of fear and anxiety attached to their traumatic experiences, they were often surprised by new perspectives and emotions associated with their experiences.

Strengths and Limitations

The purpose of this case series design was to provide preliminary evidence of the effectiveness of MRT for psychological trauma/PTSD in police officers. While this aim was achieved, a particular strength of the study was that the participants all had quite high levels of trauma even compared to serving police officers following a natural disaster (Surgenor, Snell, & Dorahy, 2015). In addition, the study included three participants with relatively long durations of PTSD (10, 12 and 21 years). This is encouraging given that there is evidence that the duration of PTSD can be predictive of poor treatment outcome (Tarrier, Sommerfield, Pilgrim, & Faragher,

2000). As such the intensity and duration of the trauma provide a good test of MRT in more severe and chronic cases of psychological trauma.

While case series studies by nature only have a small number of participants, given that these preliminary findings are based on only three case studies, caution is warranted in not overstating the generalisability of these findings which need to be replicated in a larger pilot study and then in a larger randomised control trial. In addition, the traumatic experience participants were exposed to some form of mortality (death of an infant, multiple fatalities due to a motor vehicle accident and the murder of a close friend). The results are therefore limited in providing preliminary evidence if this treatment may be effective with reducing distress associated with memories stemming from other traumatic experiences commonly associated with policing. In addition, the findings were limited in the decision to have a maximum number of 12 sessions in order to keep the dosage consistent across the participants. While two of the three participants elected to complete therapy after 8 and 9 sessions respectively due to having made significant gains in that time, it is possible that the third participant may have made further gains had more than 12 sessions been offered. The ideal dosage of course is likely to be client specific, but future pilot studies and randomised control trials may consider extending the number of sessions.

Finally, the study was limited in its measurement of traumatic memories. We used the Impact of Event Scale-Revised due to it being a published measure with a large amount of evidence supporting its psychometric properties (Weiss, 2007). While the participants reported improvements in PTSD symptoms, and in two cases significant improvements with the third case narrowly missing a reliable change (cut-off =1.96), we found that the IES-R did not fully capture the improvement in traumatic memories that the participants were verbally reporting to the research team. A recognised shortcoming of the IES-R is its inadequate specificity to track

symptoms relating to individual traumatic events (Wilson & Keane, 2004). Participants often reported reduced reactivity to the specific memory most recently addressed by extinction training, however their scores on the IES-R still indicated no improvement or even a decline. On enquiry, participants asserted that were they to record their symptoms for traumatic events addressed earlier in therapy, the score would be markedly lower compared to their current level of trauma symptoms. Participants also reported that despite maintaining gains for previous memories, approaching those highest on their fear hierarchy increased their trauma symptoms and psychological distress. These observations indicate memory reconsolidation through extinction training may have occurred, however future studies incorporate more measures of a reduction of specific traumatic memories that are addressed in therapy. This could include subjective measures of subjective units of distress scores (SUDS) or psychophysiological measures when recalling extinguished memories, rather than using general trauma questionnaires.

Implications for treatment and future research

As existing evidence-based treatments for PTSD demonstrate a non-response rate exceeding 50% on some measures of distress (Schottenbauer et al., 2008), and with relapse rates being as high as 50% (Bradley et al., 2005; Kar, 2011; Schottenbauer et al., 2008), there is a need to explore options for improving current evidence based therapies for trauma. These relatively poor outcomes are explainable through the unique neurobiological nature of traumatic memories, indicating a need for treatments that overcome this challenge by translating theoretical insights from neuroscience into the clinical practice of psychotherapy (Schiller et al., 2013). Though the results of laboratory studies of memory reconsolidation demonstrate considerable promise for developing more effective treatments for PTSD, greater effort needs to be directed into well-resourced clinical trials that incorporate neuroimaging across a larger sample of participants

(Alberini & LeDoux, 2013; Nader et al., 2000). The findings from this study give preliminary evidence that this might be the case. Certainly, the three participants in this study reported significant reductions in distress following MRT which appeared to be maintained over a three-month follow-up. These preliminary findings support the next step of a pilot pre-post study followed by a randomised control trial.

In addition, there is an emerging question of what are the boundary conditions in memory reconsolidation (Auber, Tedesco, Jones, Monfils, & Chiamulera, 2013)? That is, what are the characteristics of the trauma experience and the individual that influences the success of post-retrieval extinction. While this question has been attempted to be answered via meta-analysis of basic research using animals and humans (Kredlow, Unger, & Otto, 2016), methodological differences continue to make the answer to this question challenging. Moreover the relative paucity of translational research applying memory reconsolidation principles to interventions for human clinical populations means that the field is too young to currently answer this question. There is a need therefore for more clinical trials applying memory reconsolidation principles to psychotherapy for PTSD in humans in order to not only answer the question of whether such interventions are effective, but also what are the boundary conditions for when they are most effective?

Finally, the auditory contextual component of trauma memories also presented as an area of note in Joan's case. The successful treatment of a traumatic memory with a strong auditory component appeared successful, despite the auditory stimulus not being employed in the therapy. Joan's experience suggests memory reconsolidation could extend to the sensory components contained in cortical regions, despite using imaginal exposure without external

auditory stimuli (Johansen et al., 2011). Further investigation is warranted to explore therapeutic possibilities in this area.

Conclusion

This case series study provided preliminary evidence for the implementation of Memory Reconsolidation Therapy for the treatment of PTSD in serving police officers. Memory Reconsolidation Therapy is an integrative psychotherapy that modifies PET using principles from memory reconsolidation studies, together with principles and strategies drawn from Emotion Focused Therapy and Cognitive Therapy. All three participants in this case series study experienced significant reductions in distress by the end of therapy which was maintained at three-month follow-up. The impact of the therapy upon trauma was more difficult to clearly determine due to the challenges of using the IES-R to measure reductions in arousal associated with specific individual traumatic memories. Nonetheless a significant reliable reduction in trauma symptoms by post-therapy, as measured by the IES-R, was identified in two of the three cases with the third narrowly missing the clinically significant cut-off. These significant changes were maintained over the three-month follow-up in one participant, while the maintenance of improved trauma symptoms approached the significance cut-off in the other two participants. Given the high prevalence of PTSD in police officers, and the limitations of current best practice therapies for PTSD, there is a strong need to explore ways to enhance the effectiveness of psychotherapy for the treatment of PTSD in police officers. The results from this case series study provide confidence to further examine the efficacy and effectiveness of Memory Reconsolidation Therapy for the treatment of PTSD in police officers.

References

- Alberini, C. M., & LeDoux, J. E. (2013). Memory reconsolidation. *Current Biology*, 23(17), 746-750. doi:10.1016/j.cub.2013.06.046
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: Author.
- Auber, A., Tedesco, V., Jones, C. E., Monfils, M. H., & Chiamulera, C. (2013). Post-retrieval extinction as reconsolidation interference: methodological issues or boundary conditions?. *Psychopharmacology*, 226(4), 631-647.
- Barlow, D. H. (2014). *Clinical handbook of psychological disorders: A step-by-step treatment manual*. Guilford publications.
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge University Press.
- Beck, J. G., Grant, D. M., Read, J. P., Clapp, J. D., Coffey, S. F., Miller, L. M., & Palyo, S. A. (2008). The Impact of Event Scale-Revised: Psychometric properties in a sample of motor vehicle accident survivors. *Journal of Anxiety Disorders*, 22(2), 187-198. doi:10.1016/j.janxdis.2007.02.007
- Beckers, T., & Kindt, M. (2017). Memory reconsolidation interference as an emerging treatment for emotional disorders: strengths, limitations, challenges, and opportunities. *Annual review of clinical psychology*, 13, 99–121.
- Boswell, D. L., White, J. K., Sims, W. D., Harrist, R. S., & Romans, J. S. C. (2013). Reliability and validity of the Outcome Questionnaire–45.2. *Psychological Reports*, 112(3), 689-693. doi:10.2466/02.08.PR0.112.3.689-693

- Bowler, R. M., Kornblith, E. S., Li, J., Adams, S. W., Gocheva, V. V., Schwarzer, R., & Cone, J. E. (2016). Police officers who responded to 9/11: Comorbidity of PTSD, depression, and anxiety 10-11 years later. *American Journal of Industrial Medicine*, *59*(6), 425-436. doi: 10.1002/ajim.22588
- Bradley, R., Greene, J., Russ, E., Dutra, L., & Westen, D. (2005). A Multidimensional Meta-Analysis of Psychotherapy for PTSD. *The American Journal of Psychiatry*, *162*(2), 214-227. doi: 10.1176/appi.ajp.162.2.214
- Chopko, B. A., & Schwartz, R. C. (2012). Correlates of career traumatization and symptomatology among active-duty police officers. *Criminal Justice Studies: A Critical Journal of Crime, Law & Society*, *25*(1), 83-95. doi: 10.1080/1478601x.2012.657905
- Cochran, K. J., Greenspan, R. L., Bogart, D. F., & Loftus, E. F. (2016). Memory blindness: Altered memory reports lead to distortion in eyewitness memory. *Memory & Cognition*, *44*(5), 717-726. doi: 10.3758/s13421-016-0594-y.
- Creamer, M., Bell, R., & Failla, S. (2003). Psychometric properties of the Impact of Event Scale—Revised. *Behaviour Research and Therapy*, *41*(12), 1489-1496. doi: 10.1016/j.brat.2003.07.010
- Faust, K. L., & Vander Ven, T. (2014). Policing Disaster: An Analytical Review of the Literature on Policing, Disaster, and Post-traumatic Stress Disorder. *Sociology Compass*, *8*(6), 614-626. doi: 10.1111/soc4.12160
- Greenberg, L. (2006). Emotion-focused therapy: A synopsis. *Journal of Contemporary Psychotherapy*, *36*(2), 87-93. doi: 10.1007/s10879-006-9011-3
- Hardt, O., Nader, K., & Nadel, L. (2013). Decay happens: The role of active forgetting in memory. *Trends in Cognitive Sciences*, *17*(3), 111-120. doi: 10.1016/j.tics.2013.01.001

- Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*(1), 12-19. doi:10.1037/0022-006X.59.1.12
- Johansen, J.P., Cain, C.K., Ostroff, L.E., & LeDoux, J.E. (2011). Molecular mechanisms of fear learning and memory. *Cell, 147*(4), 948. doi:10.1016/j.cell.2011.10.034
- Johnson, L. R., McGuire, J., Lazarus, R., & Palmer, A. A. (2012). Pavlovian fear memory circuits and phenotype models of PTSD. *Neuropharmacology, 62*(2), 638-646.
- Johnson, L. R. (2016). How fear and stress shape the mind. *Frontiers in behavioral neuroscience, 10*, 24.
- Kar, N. (2011). Cognitive behavioral therapy for the treatment of post-traumatic stress disorder: a review. *Journal of Neuropsychiatric Disease and Treatment, 7*, 167-181. doi:10.2147/ndt.s10389
- Kerswell, N. L., Strodl, E., Johnson, L., & Konstantinou, E. (2019). Mental Health Outcomes Following a Large-Scale Potentially Traumatic Event Involving Police Officers and Civilian Staff of the Queensland Police Service. *Journal of Police and Criminal Psychology, 1*-11. doi:10.1007/s11896-018-9310-0
- Kim, J. J., & Jung, M. W. (2006). Neural circuits and mechanisms involved in Pavlovian fear conditioning: A critical review. *Neuroscience and Biobehavioral Reviews, 30*(2), 188-202. doi: 10.1016/j.neubiorev.2005.06.005
- Kredlow, M. A., Unger, L. D., & Otto, M. W. (2016). Harnessing reconsolidation to weaken fear and appetitive memories: A meta-analysis of post-retrieval extinction effects. *Psychological Bulletin, 142*(3), 314.
- Krysinaka, K., & Lester, D. (2010). Post-traumatic stress disorder and suicide risk: A systematic review. *Archives of Suicide Research, 14*(1), 1-23. doi:10.1080/13811110903478997

- Lambert, M., Burlingame, G., Umphress, V., Hansen, N., Vermeersch, D., Clouse, G., & Yanchar, S. (1996). The Reliability and Validity of the Outcome Questionnaire. *Clinical Psychology and Psychotherapy*, 3(4), 249-258. doi:10.1002/(SICI)1099-0879(199612)3:4<249::AID-CPP106>3.0.CO;2-S
- Lambert, M., Kahler, M., Harmon, C., Burlingame, G., & Shimokawa, K. (2011). *Administration and Scoring Manual for the Outcome Questionnaire-45.2*. Salt Lake City: OQMeasures.
- Lee, J. C., Nader, K., & Schiller, D. (2017). An Update on Memory Reconsolidation Updating. *Trends in Cognitive Sciences*, 21(7), 531-545. doi:10.1016/j.tics.2017.04.006
- Lewis, D. J. (1979). Psychobiology of active and inactive memory. *Psychological Bulletin*, 86(5), 1054-1083. doi:10.1037/0033-2909.86.5.1054
- Lonergan, M. (2014). Cognitive Behavioral Therapy for PTSD: The Role of Complex PTSD on Treatment Outcome. *Journal of Aggression, Maltreatment & Trauma*, 23(5), 494-512. doi:10.1080/10926771.2014.904467
- McLean, C. P., & Foa, E. B. (2014). The use of prolonged exposure therapy to help patients with post-traumatic stress disorder. *Clinical Practice*, 11(2), 233. doi: 10.2217/cpr.13.96
- Misanin, J. R., Miller, R. R., & Lewis, D. J. (1968). Retrograde amnesia produced by electroconvulsive shock after reactivation of a consolidated memory trace. *Science*, 160(3827), 554-555. doi: 10.1126/science.160.3827.554
- Nader, K. (2003). Memory traces unbound. *Trends in Neurosciences*, 26(2), 65-72. doi: 10.1016/S0166-2236(02)00042-5
- Nader, K., Schafe, G. E., & Le Doux, J. E. (2000). Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval. *Nature*, 406(6797), 722-726. doi:10.1038/35021052

- Papazoglou, K. (2013). Conceptualizing Police Complex Spiral Trauma and its applications in the police field. *Traumatology*, *19*(3), 196-209. doi: 10.1177/1534765612466151
- Quirk, G. J., Paré, D., Richardson, R., Herry, C., Monfils, M. H., Schiller, D., & Vicentic, A. (2010). Erasing fear memories with extinction training. *The Journal of Neuroscience*, *30*(45), 14993-14997. doi: 10.1523/JNEUROSCI.4268-10.2010
- Raio, C. M., Brignoni-Perez, E., Goldman, R., & Phelps, E. A. (2014). Acute stress impairs the retrieval of extinction memory in humans. *Neurobiology of Learning and Memory*, *112*, 212-221. doi:10.1016/j.nlm.2014.01.015
- Roberts, N. P., Roberts, P. A., Jones, N., & Bisson, J. I. (2015). Psychological interventions for post-traumatic stress disorder and comorbid substance use disorder: a systematic review and meta-analysis. *Clinical Psychology Review*, *38*, 25-38. doi: 10.1016/j.cpr.2015.02.007
- Schafe, G. E., Nader, K., Blair, H. T., & LeDoux, J. E. (2001). Memory consolidation of Pavlovian fear conditioning: A cellular and molecular perspective. *Trends in Neurosciences*, *24*(9), 540-546. doi: 10.1002/chin.200151267
- Schiller, D., Kanen, J. W., LeDoux, J. E., Monfils, M.-H., & Phelps, E. A. (2013). Extinction during reconsolidation of threat memory diminishes prefrontal cortex involvement. *PNAS Proceedings of the National Academy of Sciences of the United States of America*, *110*(50), 20040-20045. doi: 10.1073/pnas.1320322110
- Schiller, D., Levy, I., Niv, Y., LeDoux, J. E., & Phelps, E. A. (2008). From fear to safety and back: Reversal of fear in the human brain. *The Journal of Neuroscience*, *28*(45), 11517-11525. doi: 10.1523/JNEUROSCI.2265-08.2008

- Schiller, D., Monfils, M.-H., Raio, C. M., Johnson, D. C., LeDoux, J. E., & Phelps, E. A. (2010). Preventing the return of fear in humans using reconsolidation update mechanisms. *Nature*, *463*(7277), 49-53. doi:10.1038/nature08637
- Schiller, D., & Phelps, E. A. (2011). Does reconsolidation occur in humans? *Frontiers in Behavioral Neuroscience*, *5*. doi: 10.3389/fnbeh.2011.00024
- Schottenbauer, M. A., Glass, C. R., Arnkoff, D. B., Tendick, V., & Gray, S. H. (2008). Nonresponse and dropout rates in outcome studies on PTSD: Review and methodological considerations. *Psychiatry: Interpersonal and Biological Processes*, *71*(2), 134-168. doi:10.1521/psyc.2008.71.2.134
- Shaw, J., & Porter, S. (2015). Constructing rich false memories of committing crime. *Psychological Science*, *26*(3), 291-301. doi: 10.1177/0956797614562862
- Surgenor, L. J., Snell, D. L., & Dorahy, M. J. (2015). Posttraumatic stress symptoms in police staff 12–18 months after the Canterbury earthquakes. *Journal of traumatic stress*, *28*(2), 162-166.
- Tarrier, N., Sommerfield, C., Pilgrim, H., & Faragher, B. (2000). Factors associated with outcome of cognitive-behavioural treatment of chronic post-traumatic stress disorder. *Behaviour research and therapy*, *38*(2), 191-202.
- van Marle, H. (2015). PTSD as a memory disorder. *European Journal of Psychotraumatology*, *6*(1), 27633. doi: 10.3402/ejpt.v6.27633
- Weiss, D. S. (2007). The impact of event scale: revised. In *Cross-cultural assessment of psychological trauma and PTSD* (pp. 219-238). Springer, Boston, MA.
- Weiss, D. S., & Marmar, C. R. (1997). The Impact of Event Scale-revised. Assessing psychological trauma and PTSD. *New York, Guilford*, 399-411. Wilson, J. P., & Keane, T. M. (2004). *Assessing Psychological Trauma and PTSD*. New York: Guilford Press.

Zoellner, T., Rabe, S., Karl, A., & Maercker, A. (2011). Post-traumatic growth as outcome of a cognitive-behavioural therapy trial for motor vehicle accident survivors with PTSD.

Psychology and Psychotherapy, 84(2), 201-213. doi:10.1348/147608310X520157

Table 1
Reliable change scores for psychological distress

Participant	OQ45 Initial	OQ45 Final	OQ45 Follow-up	RCI Initial to Final	RCI Initial to Follow-up
Joan	80	51	36	4.06***	6.16***
William	80	41	37	5.46***	6.02***
Adam	82	68	63	1.96*	2.66**

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; OQ45 = Outcome Questionnaire 45.2; RCI = Reliable Change Index

Table 2
Reliable change scores for trauma symptoms

Participant	IES-R Initial	IES- R Final	IES-R Follow-up	RCI Initial to Final	RCI Initial to Follow-up
Joan	36	18	23	2.49*	1.80
William	28	12	4	2.22*	3.32***
Adam	32	19	20	1.80	1.66

* $p < .05$; ** $p < .01$; $p < .001$; IES-R = Impact of Event Scale – Revised; RCI = Reliable Change Index

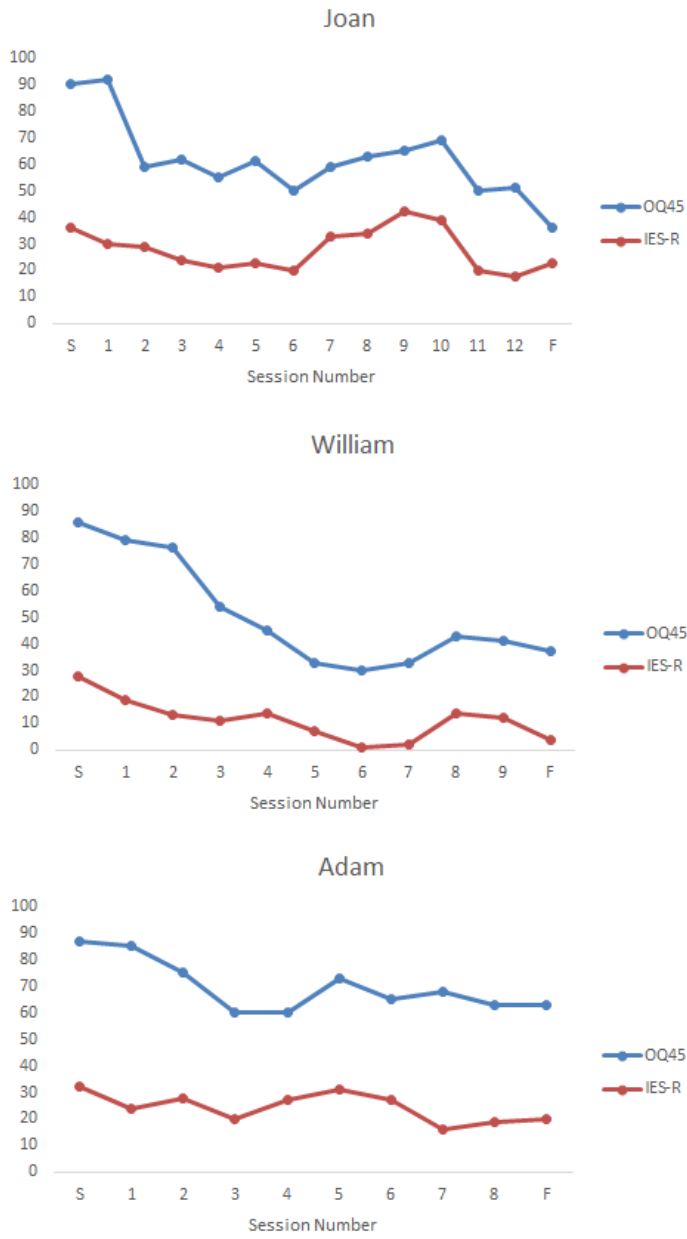


Figure 1. Participants' therapeutic trajectory on study measures.