

**WHIPLASH PATIENTS' RESPONSES ON THE IMPACT OF EVENTS SCALE-R –
CONGRUENT WITH PAIN OR PTSD SYMPTOMS?**

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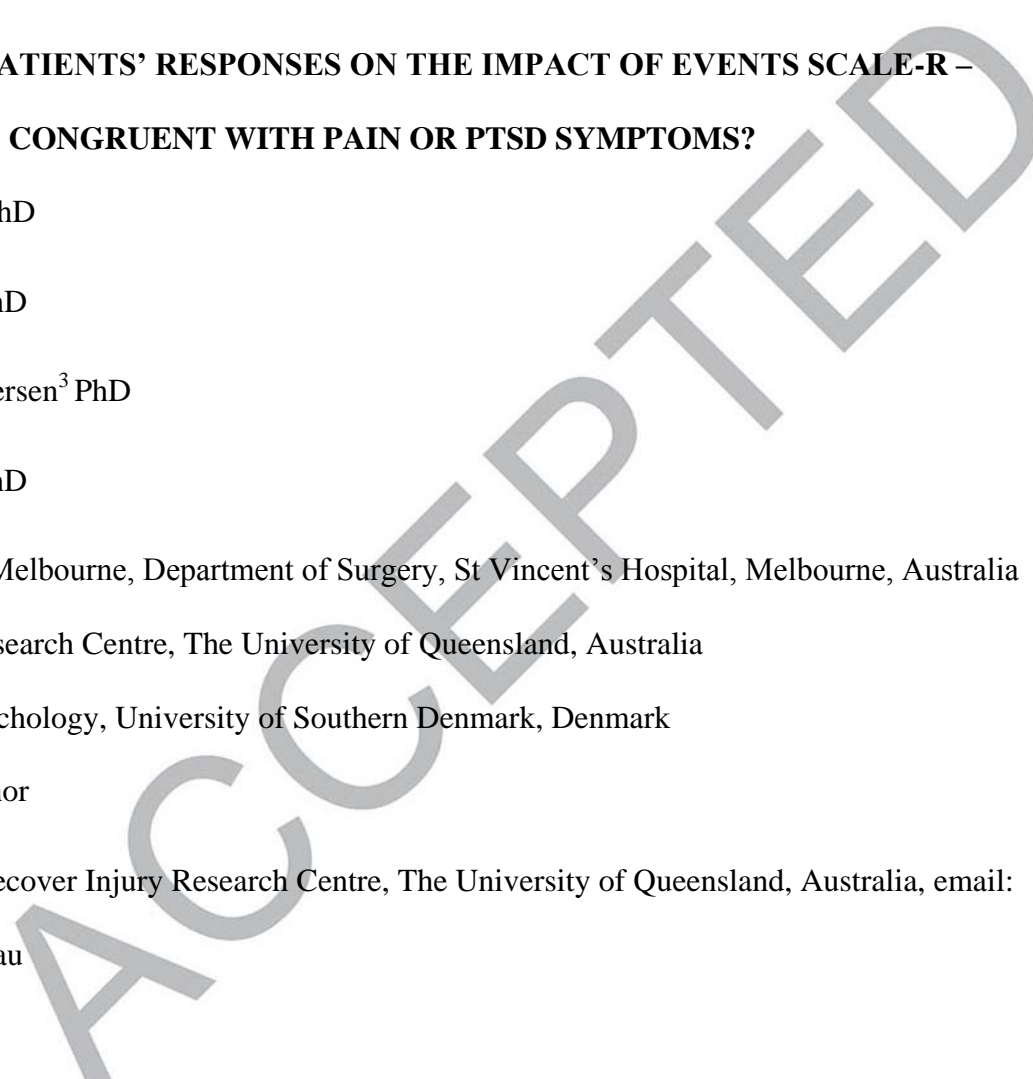
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Abstract

Objectives: Post-traumatic stress disorder (PTSD) symptoms are common among people with whiplash following a motor vehicle crash. The Impact of Events Scale - Revised (IES-R) screens for PTSD symptoms with psychologist referral recommended for above-threshold scores. Recent data indicate that PTSD symptoms post-whiplash may relate more to pain and disability than the crash itself. This study explored the interpretation of IES-R items by people with whiplash to establish whether responses relate to the crash or to whiplash pain and disability.

Methods: Adults with whiplash scoring >24 on the IES-R were eligible. The Three-Step Test-Interview technique was used and responses analysed using content analysis. A coding framework was developed, comprising five categories: '*congruent*' – responses related to the crash; '*incongruent*' – responses did not relate to the crash; '*ambiguous*' – responses were both congruent and incongruent; '*confusion*' – participants misunderstood the item content; '*not applicable*' – irrelevancy of items to participants' circumstances.

Results: The 15 participants (mean IES-R= 37/88) were inclined to respond congruently to specific PTSD items and incongruently to non-specific PTSD items. Participants were more inclined to rate non-specific PTSD items in terms of pain and disability, e.g., >60% responded incongruently to item 2: '*I had trouble staying asleep*'; item 4: '*I felt irritable and angry*'; item 15: '*I had trouble falling asleep*'; and item 18: '*I had trouble concentrating*'.

Discussion: Incongruent responses on non-specific PTSD items may inadvertently inflate levels of PTSD symptoms measured with the IES-R for some whiplash patients, raising implications for the assessment and treatment of the psychological sequelae of whiplash.

Key words: Whiplash; Post-traumatic stress disorder; Impact of Events Scale-Revised; Qualitative study

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Introduction

Post-traumatic stress disorder (PTSD) symptoms have been reported to be common in patients with whiplash injury following a motor vehicle crash (MVC). In Australia, up to 43 per cent of individuals with whiplash injury display moderate symptoms of PTSD in the early recovery period, and 17 per cent display moderate/severe symptoms up to 12 months post injury¹. The development of chronic neck pain disability and PTSD after whiplash injury appear linked; early symptoms of PTSD predict the persistence of heightened neck pain and disability and vice versa^{1,2}. Thus, best practice recommendations suggest the early targeting of modifiable predictors such as pain levels and stress responses to influence both disability and psychological outcomes following whiplash injury^{3,4}.

Australian primary care guidelines recommend screening for PTSD symptoms in this population with psychologist referral for above threshold scores⁴. However recent data indicate that PTSD symptoms reported by patients with whiplash may not only be related to the event (MVC), but can also be related to neck-related pain and disability⁵. Specifically, PTSD hyperarousal symptoms such as difficulties sleeping, troubles concentrating and irritability are not necessarily specific to trauma and can also be present in people with neck pain not associated with any specific trauma (e.g. postural neck pain)^{6,7}. These hyperarousal symptoms have been found to be most predictive of whiplash injury outcomes at a population level and are included in a recently published clinical prediction rule^{5,8}.

Overlap between symptoms of PTSD and symptoms of neck pain and disability may lead clinicians to over diagnose PTSD in patients with whiplash injury. For patients, this may have negative psychological consequences from receiving inappropriate and unnecessary treatment. Cost implications also arise from the referral of patients to psychological services when they may be effectively managed in a primary care, physiotherapy setting. Further, evidence suggests that a PTSD diagnosis following a MVC is associated with both higher health care and economic costs⁹.

To help prevent these negative sequelae, a better understanding of how individuals with whiplash injury interpret items on measures of PTSD symptoms is pertinent.

Therefore, the aim of this qualitative study was to explore how patients with whiplash injury following an MVC interpret items on the Impact of Events Scale - Revised (IES-R)¹⁰, a measure recommended by the Australian guidelines for whiplash management to identify symptoms of PTSD¹¹, to establish whether responses relate to the traumatic event (MVC) or more to whiplash pain and disability in order to assist primary care clinicians making treatment decisions.

Materials and Methods:

Participants:

Fifteen individuals took part in this study. The inclusion criteria comprised of: self-reported whiplash injury following an MVC; Any duration post injury; Adults aged >18 years and fluent in English; A score of >24 on the IES-R. Individuals were excluded if they had a whiplash injury grade IV (determined by asking patients if they had experienced a fracture or dislocation of the cervical spine), or experienced concussion or head injury as a result of the accident.

Participants were recruited from advertisements placed in primary care practices in an urban region of Queensland, Australia. Individuals who contacted the project team in response to advertisements were provided with the details of the study and underwent a brief telephone interview to screen inclusion and exclusion criteria. The IES-R was administered over the phone to individuals who met all other inclusion criteria. Those who scored >24 on the IES-R were deemed eligible and were invited to participate in the study. Consecutive individuals who contacted the research team were enrolled in the study until at least 15 participants had been recruited and data saturation was reached. Data saturation was pre-defined as the point at we observed patterns in the data that could answer our research question and it was expected that further interviews would not add to the final conclusions. Participants received a \$20 voucher for participation.

Ethics approval and consent to participate:

This study was approved by the human ethics committee at Griffith University (2017/450)

Design:

The Three-Step Test-Interview (TSTI)¹² was selected as a method for exploring the validity of a questionnaire by observing a response behaviour while completing questionnaire items (i.e. their responses), before exploring the reasons for these responses. The TSTI is a particularly useful way of identifying problems arising from a mismatch between the theory underlying questionnaire items on the one hand, and features of the respondents' actual behaviour on the other hand¹². The TSTI involves a combination of think-aloud techniques to enable insight into the cognitive processes involved in choosing a response, and a debriefing interview to provide deeper contextual insight into the respondent's choice of response. This TSTI study was conducted by a research team with methodological expertise in qualitative research (SB), and content expertise in psychology (AM, TA) and whiplash injuries (MS).

Measures

The Impact of Events Scale – Revised (IES-R)¹⁰ (Appendix 1, Supplemental Digital Content 1, <http://links.lww.com/CJP/A534>) was selected for this study as it is the measure recommended by the Australian whiplash guidelines to identify symptoms of PTSD⁴. The 22-item scale comprises three subscales: Intrusion, Avoidance and Hyperarousal subscales, corresponding to the three PTSD symptom clusters described in the DSM-IV¹³. The IES-R asks respondents to indicate the degree with which they experienced each PTSD symptom in the past week on a five-point scale: 0 = 'Not at all'; 1 = 'A little bit'; 2 = 'Moderately'; 3 = 'Quite a bit'; 4 = 'Extremely'. Scores of > 24 are considered to be of clinical concern¹⁴, and it is recommended that individuals scoring >33 are referred to a psychologist⁴. The psychometric properties of the IES-R were originally reported in two samples of emergency workers¹⁰, and have since been confirmed in people who have experienced an MVC¹⁵.

Participants' age, gender, work status and accident date were collected. To further characterise the sample, participants were asked to complete the following measures:

Pain intensity

Self-reported pain intensity over the last 24 hours was measured on an 11 point scale ranging from 0 (no pain) to 10 (worst pain imaginable)¹⁶.

Neck Disability Index (NDI)

The NDI¹⁷ is a self-report measure of neck pain-related disability. It comprises of ten items pertaining to functional activities, pain intensity, concentration and headache. Respondents rate each item on a Likert scale from 0 (no disability) to 5 (total disability). The overall score (out of 100) is calculated by totalling the responses of each individual item and multiplying it by 2, with higher scores indicating greater levels of neck pain related disability. The NDI has good internal consistency, validity and test-retest reliability¹⁷

Depression Anxiety Stress Scale – 21 (DASS-21)

The DASS-21¹⁸ is a self-report measure which assesses symptoms of three independent constructs, namely depression, anxiety and stress. Respondents rate each item on each of the subscales according to how much the item applied to them in the past week on a four point Likert scale from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The total score on each subscale ranges from 0 to 21. The DASS-21 has excellent reliability and validity^{19,20}.

Data collection:

Data was collected by SB, a female physiotherapist and experienced qualitative researcher not previously known to the participants. The TSTI task was conducted face-to-face in a private university room (12 participants), and over the phone (three participants) with only SB and the participant were present. The TSTI task lasted approximately 45 minutes. No differences were noted between the length and content of TSTI tasks conducted face-to-face or over the phone. Field notes taken immediately following each interview captured SB's impressions of the TSTI task and the participant's responses, but were not included as raw data for analysis. All interviews were audio recorded. Data collection and data analysis were conducted in parallel. No follow-up interviews were conducted and participants did not play a role in the interpretation of study findings.

The three stages of the TSTI task were conducted as follows:

1. TSTI: Think Aloud

Consistent with ‘best-practice’ instructions for think-aloud studies²¹, and adapted from McCorry²², participants were instructed to say everything they were thinking from the moment they read the instructions on the IES-R until they got to the end of the questionnaire. If they were silent for longer than ten seconds, they were prompted to keep talking.

2. TSTI: Clarification

The researcher asked participants to clarify their behaviour and thought processes observed in step 1, for example “Did I hear you say...?”, “What were you thinking when you stopped at ...?”

3. TSTI: Debriefing

The researcher asked the participants a series of probing questions to provide deeper contextual insight into their responses (See Table 1. Probing questions)

Analysis

The TSTI task was transcribed verbatim. Transcripts were uploaded into NVivo 9 (QSR International) to facilitate analysis. Data from the three stages of the TSTI were analysed using Framework Analysis²³, a matrix-based method for ordering and synthesising qualitative data.

Analysis consists of the following stages: familiarisation (reading and re-reading of transcripts), identification of coding framework, indexing, charting, mapping and interpretation.

After familiarisation with the interview content, the first five transcripts were used to generate a coding framework. Two researchers (SB and AM) familiar with the IES-R generated codes from responses to each item. The coding framework was compared, discussed and revised amongst the research team and comprised of: ‘congruent response’ (indicating that the participant responded to that item by relating it to the traumatic event (MVC)); ‘not applicable’ (when the participant perceives the item is not appropriate to their circumstances); ‘incongruent response’ (indicating that the participant responded to that item by relating it to something else other than the traumatic event (MVC)); ‘ambiguous’ (participants answered in a way that was at the same time congruent and

incongruent) ‘confusion’ (participants did not fully understand the content of the item). The coding framework was then applied to all transcripts by two researchers (SB and AM) independently. We determined saturation had been reached once we had applied the coding framework to 15 interviews, and observed items on which the majority of participants had responded incongruently. At this point, recruitment stopped. The level of agreement between the two raters who applied the coding framework was excellent (Cohen’s Kappa = 0.79)²⁴. Disagreements were settled through discussion, and in all instances, an agreement was reached.

A matrix was then compiled, with IES-R items entered as a row heading and the codes (congruent, incongruent, not applicable, ambiguous and confused) entered as columns headings. Key points identified within each transcript for each IES-R item were then summarised (charted) into the framework with mapping to the original extract in the transcript (indexing). Comparisons were then made within and between codes for each IES-R item (mapping and interpretation).

Results

The characteristics of the sample are presented in Table 2. The sample comprised of 12 females and three males. The mean age of the sample was 40.47 years, SD = 12.18 years, range 20-62 years, with an average time since accident of 2.87 years, SD = 2.39 years, range 1 - 10 years. The average pain intensity score in the last week was 6.53, SD = 1.85, range 3 - 9. The sample was moderate to severely disabled with a mean of 51.20%, SD = 13.22%, range 30 - 76 on the NDI, while most continued working in some capacity. The mean scores on the DASS were within the normal range for Depression: 7.60, SD = 5.33, range 1- 20, cut-off >9, and Stress: 10.93, SD = 3.81, range = 3 - 17, cut-off >14. Whereas the mean score for the DASS Anxiety subscale was just above the cut-off score, with a mean score of 7.67, SD = 3.73, range 0 - 13, cut-off >7. The mean score on the IES-R was 36.73, SD = 11.71, range 20 - 54). The Intrusion subscale mean was 13.27, SD = 5.31, range 4 - 24; the Avoidance subscale mean was 11.0, SD = 5.8, range 5 - 20; and the Hyperarousal subscale mean was 12.8, SD = 4.09, range 6 - 19. Two participants (013 and 014) scored 20 on the IES-R at

the time of participation despite scoring 33 and 30 during the phone screening interview.

Interviews were conducted on average one week following phone screening interviews.

Findings for each subscale of the IES-R i.e. the intrusion, avoidance and hyperarousal subscale are presented separately. We present frequencies of responses to provide the reader with a better understanding of the range of interview responses. Below we elaborate on items for which the majority (>8 of 15) of participants' responses were classified in the same way i.e. incongruent, congruent, ambiguous, confusion or not applicable. Instances where the minority (<7 of 15) of participants responded in a certain way, but we deemed this to be of relevance to our research question were also elaborated on. Descriptor frequencies we used are defined as follows: almost all (13-15 participants), most (10-13 participants), many (8-10 participants), some (5-8 participants).

We provide example quotes indexed with the participant identifier, response category selected for that item and overall IES-R score out of the total of 88 e.g. (P011, 'moderately', 29/88).

Intrusion subscale:

Most participants responded congruently to item 1: '*Any reminder brought back feelings about it*'.

Analysis of these responses revealed many participants described driving or traffic-related incidents associated with feelings of anxiety: "If you are talking about reminders as places and close calls it will bring back feelings and make me more alert about a situation to prevent an accident

happening" (P011, 'quite a bit', 29/88). Most responded congruently to item 3: '*Other things kept making me think about it*'. For many, pain was a salient stimulus to trigger thoughts of the accident:

"The pain I have keeps making me think about it" (P012, 'quite a bit', 52/88). One participant

described how the process of pursuing an insurance claim required him to discuss the MVC in detail, triggering thoughts and emotions associated with the MVC: "Like the aggravated

conversation with the insurance company, when you prefer not to be, you get dragged back into

having to think about the accident itself" (P025, 'quite a bit', 39/88). Many responded congruently

to Item 14: '*I found myself acting or feeling like I was back at that time*' e.g. "I get that feeling

every time I pass it. My body has a feeling. I can't erase what happened that day" (P017, 'quite a bit', 48/88).

Conversely, most participants responded incongruently to item 2: '*I had trouble staying asleep*'.

Analysis of incongruent responses on this item revealed that participants identified their neck pain as the source of their disrupted sleep e.g. "As soon as I move, the pain in my neck wakes me up" (P027, 'quite a bit', 34/88). Many also responded incongruently to item 16: '*I had waves of strong feelings about it*'. In responding to this item, many participants referred to their feelings of frustration and/or anger associated with the experience of whiplash pain and disability e.g. "I can't run anymore. Running was my stress relief (...) It makes me angry at times. And frustrated" (P019, 'moderately', 34/88). Two participants described their frustration with navigating the legal system e.g. "I think the most frustrating thing was the court case which took over a year. It was dragged out. And I couldn't understand – I am the victim here" (P026, 'a little bit', 25/88).

Most participants indicated that item 20: '*I had dreams about it*', was not applicable to their situation, responding 'not at all' on the IES-R. Some clarified this response by indicating that while they no longer had dreams about it, they did in the immediate aftermath of the MVC: "I did have dreams about it in the first few months when it first occurred but not now" (P010, 'not at all', 42/88).

Avoidance subscale:

Most of the participants responded congruently to item 8: '*I stayed away from reminders of it*'.

Analysis of these responses revealed that participants preferred to stay away from driving and traffic related reminders of the accident: "I don't take that road at all costs. Like literally I will find other ways of going like where I was going to work, I will find other ways to go" (P011, 'quite a bit', 29/88). For some however, this was unavoidable: "A little bit, but I can't because if I am traveling in a car I have to. If I am driving where I had the accident, I am a little bit wary, but I just I have to keep going" (P027, 'a little bit', 34/88). Sixty per cent (9 of 15) of the participants responded congruently to item 11: '*I tried not to think about it*': "I try not to think about the

accident happening. I wish it didn't happen so I could be back on my feet" (P017, 'quite a bit', 48/88). Several participants reported that while they tried not to think about it, pain and disability made them think of the MVC: "I don't really try to think about the accident. It is only when pain is there it is an awful reminder for me" (P011, 'not at all', 29/88). Over 50 per cent (8 of 15) responded congruently to item 12: '*I was aware that I still had a lot of feelings about it*'. Many described their anger at the pain and suffering that resulted from the MVC: "I am upset about the accident and the pain from the accident, it wasn't my fault!" (P028, 'moderately', 47/88).

A minority of participants responded incongruently on item 5: '*I avoided letting myself get upset about it*'. These five participants referred to the distress they experienced when they thought about their neck pain and disability not the MVC per se, e.g. "I am trying to not get upset about the pain but I can't control it" (P012, 'a little bit', 52/88). Interestingly, one third of the participants' responses on item 13: '*My feelings about it were kind of numb*' were classified as 'confusion'. Five participants had difficulties interpreting the phrase 'feeling numb'. One participant chose to respond to this lack of understanding by choosing the response category 'A little bit': "I will put a little bit. I don't understand that question, I don't feel numb" (P026, 'a little bit', 51/88); while another participant opted to go 'down the middle' by choosing the response category 'Moderately': "I don't know what to put for that one because I don't really feel much of it because it just is what it is. So can I just put in the middle for that one, then I am just in the middle!" (P016, 'moderately', 33/88) Many of participant responses on item 7: '*I felt as if it hadn't happened or wasn't real*' were classified as 'not applicable' with participants indicating a score of 'not at all' on the IES-R: "Not at all. I mean I have accepted it. It has happened, I can't take it back. It is just a matter of coping" (P013, 'not at all' 20/88). Many of participant responses on item 17: '*I tried to remove it from my memory*' were classified as 'not applicable', corresponding to a score of 'not at all' on the IES-R: "No I don't try to remove it from memory but just try and have a balanced perspective about it – in terms of that is it you can't change it, I don't think there is any benefit in removing it from memory

otherwise you don't learn from it, you make the same mistake, you create the same situation"

(P025, 'not at all', 39/88)

Hyperarousal subscale:

Most participants responded congruently to item 10: '*I was jumpy and easily startled*'. Analysis of these responses revealed that most described their jumpiness when driving or being a passenger in the car: "I would say that I would be jumpy as far as driving but I am not so much easily startled only because I kind of anticipate what is about to happen or I give myself plenty of room so things don't happen" (024 'moderately', 54/88), however a few described being easily startled by loud noises: "Yes I am overly scared when I hear sounds like if an unexpected person walking or opening the doors, those sort of sounds that I didn't expect" (P028, 'a little bit' 47/88). Most responded congruently to item 19: '*Reminders about it caused me to have physical reactions such as sweating, trouble breathing, nausea or a pounding heart*'. Again, most participants described these reactions occurring when driving in traffic: "I think that normally if I am driving and someone cuts me off and I get startled, I do feel my heart pounding. I think it is always just a little bit" (P021, 'a little bit', 24/88). Sixty per cent (9 of 15) responded congruently to item 21: '*I felt watchful and on guard*' and described being watchful and on guard when driving to prevent another MVC: "I would say quite a bit. After the accident I am overly cautious of like I have always been aware but I even more really cautious about how people drive or the environment surrounding me when I am driving" (P011, 'quite a bit', 29/88)

Most participants responded incongruently on item 4: '*I felt irritable and angry*'. Similar to responses on item 16: '*I had waves of strong feelings about it*', analysis of incongruent responses on item 4 revealed that participants primarily referred to their irritability and anger associated with their neck pain and disability when responding to this item e.g. "I get really short with people because I am in the pain ... I can be quite intolerant sometimes or a bit sharp" (P024, 'quite a bit', 54/88). Almost all participants responded incongruently on item 15: '*I had trouble falling asleep*'. Similar to responses on item 2: '*I had trouble staying asleep*', analysis of incongruent responses on

item 15 also revealed that participants primarily referred to their neck pain as preventing them from falling asleep e.g. “Well that was quite a bit because I was in pain. Not really because I was thinking about that accident at all but because I was in pain” (P016, ‘quite a bit’, 33/88). Most participants responded incongruently on item 18: ‘*I had trouble concentrating*’. Participants referred to the disruptive nature of pain which kept them from focussing on tasks when responding to this item e.g. “If something isn’t taking my full attention I get very distracted very easily, especially by the pain and having to move all the time” (P014, ‘moderately’, 20/88).

Discussion:

In this TSTI study, we identified nine of 22 items on the IES-R to which most participants answered ‘congruently’ i.e. they attributed symptoms described in the item to the MVC they had experienced (items: 1, 3, 8, 10, 11, 12, 14, 19, 21). We also identified five items to which most participants answered ‘incongruently’ (items: 2, 5, 15, 16, 18), attributing the symptoms described in the item to the experience of pain and disability, rather than the MVC. The nine ‘congruent’ items were evenly spread across the three subscales (Intrusion: Items 1, 3, 14; Avoidance: Items 8, 11, 12; Hyperarousal: Items 10, 19, 21). These congruent items represent symptoms which are specific to PTSD and therefore rarely present in other psychological conditions. In contrast, the ‘incongruent’ items were not evenly spread across the three subscales; three were from the hyperarousal subscale (Items 5, 15, 18) and two were from the Intrusion subscale (Items 2, 16). These incongruent items represent symptoms known to be non-specific to PTSD as they often occur in other conditions such as other anxiety disorders, mood disorders, and chronic pain²⁵⁻²⁷. Hyperarousal symptoms have repeatedly been associated with poor recovery after whiplash injury^{5,8}. This finding may simply be due to symptom overlap with pain distress and disability. However, elevated levels of hyperarousal may also be an indicator of shared vulnerability mechanisms such as trait-anxiety and sympathetic dysregulation²⁸.

Many participants (11 of 15) indicated that they did not have recurrent dreams about the MVC.

Insomnia (difficulty falling and staying asleep) and recurrent distressing dreams have been found to

be the most common and distressing symptoms reported by trauma survivors²⁹. Furthermore, recurrent distressing dreams/nightmares have the strongest correlation with a PTSD diagnosis³⁰. That only four participants reported dreaming about the MVC could indicate that for most participants the MVC may not have been perceived as sufficiently traumatic so as to trigger recurrent distressing dreams.

The findings illustrate how individuals referring only to their symptoms of neck-related pain and disability when responding to the IES-R may be interpreted as having symptoms of PTSD related to the MVC, when this may not necessarily be the case. For example, responding 'extremely' on the six items related to sleep difficulties (items 2, 15), mood disturbance (items 4, 5, 16) and problems concentrating (item 18) could result in a score of 24 on the IES-R corresponding to PTSD symptoms of 'clinical concern'. We also identified instances where many participants were confused by the meaning of an item, particularly item 13: '*My feelings about it were kind of numb*'. The five participants who had difficulty with this item dealt with their confusion in different ways. Three selected the response category 'not at all', one selected 'a little bit', and one selected 'moderately' to be "down the middle", further illustrating how scores on the IES-R may be elevated without the individual necessarily experiencing symptoms of PTSD related to the MVC.

A previous study found that individuals may report PTSD symptoms without having experienced an event they perceived as traumatic. Bodkin et al. (2007)³¹ screened for PTSD symptoms in a population seeking treatment for major depression using the DSM-IV criteria and found that among individuals who did not meet DSM-IV criteria for trauma (criterion A of PTSD), 78 percent displayed all other DSM-IV criteria for symptoms of PTSD. The authors advised exercising caution when attributing PTSD symptoms to trauma. Based on the present study's findings, we suggest that clinicians interpreting scores on the IES-R may need to probe patients to better qualify the underlying drivers of their symptoms, particularly related to sleep, concentration and emotional responses. We encourage the use of the probes such as those detailed in Table 1. For example, responses to item 2: '*I had trouble staying asleep*', may be investigated further through questions

such as “What is stopping you from staying asleep?” A better understanding of these symptoms may assist in providing more effective and targeted treatment. For example, if pain is disturbing sleep, the patient could be provided with strategies to manage their pain at night. In contrast, sleeping difficulties related to intrusive memories and thoughts may benefit from more specific psychological treatment

This study highlights the value of qualitative research in providing insight into the interpretations and considerations of individuals choosing responses on questionnaire items, thereby making an important contribution to questionnaire psychometrics. A previous evaluation of the psychometric properties of the IES-R among people who experienced an MVC, reported adequate internal consistency, concurrent validity and discriminative validity¹⁵. Findings from the present study inform the construct validity of the IES-R in people with whiplash injury following an MVC. The findings may also have implications for the use of other measures assessing PTSD in the whiplash population. Future qualitative studies are needed to explore how individuals with whiplash injury respond to measures which are based on the new DSM-5 PTSD criteria, e.g., the PTSD Checklist for DSM-5 (PCL-5)³² or ICD-11³³.

Design limitations

The TSTI was conducted by one author (SB), a female physiotherapist and qualitative researcher, not previously known to the participants. Having a physiotherapist rather than a psychologist administer the TSTI was deemed to be ‘ecologically valid’, as the IES-R is recommended by Australian Clinical Guidelines for Acute WAD for the assessment of PTSD symptoms by primary healthcare providers.

As with any qualitative study, alternative interpretations to those presented in this paper can be made. We have attempted to render our interpretive process ‘visible’ by illustrating the findings with quotes and describing the lens through which the data were analysed. Having both a physiotherapist and a psychologist conduct the analysis independently enabled us to introduce different viewpoints regarding the coding and interpretation of data and refine the analysis. The

inter-coder reliability calculation provides an indication of the extent to which interpretations between the two data analysts varied.

The coding framework was deliberately simplistic to identify patterns among responses. However, by classifying responses as ‘congruent’ or ‘incongruent’ some richness in the data was lost. For example, in response to Item 14: *‘I found myself acting or feeling like I was back at that time’*, Participant 017 said “I get that feeling every time I pass it. My body has a feeling. I can’t erase what happened that day”, and we classified this response as ‘congruent’ as the participant related the item to the traumatic event (MVC)). However, Participant 017 elaborates: “I can’t erase what happened that day. You know what he said, he told his insurer I drove off first and he followed me. I said how did I drive off first? He came out from my left and he gave me ahead sign like follow me. He is a liar”. Here, Participant 017 describes how the ‘feelings’ she experienced every time she passed the site of the MVC are associated with her anger towards the driver of the car which rear-ended her, and the subsequent difficulties she experienced establishing liability with the insurance company. The IES-R instructions ask respondents to indicate how distressing each difficulty (item) has been with respect to ‘the event’ (see Appendix 1) and therefore participants should have completed the questionnaire items with the MVC in mind. However, a limitation of this study is that we did not specifically ask the participants if they perceived the MVC as traumatic or not. We acknowledge that while the participants had all experienced a MVC for which they were not hospitalised, relatively minor MVC’s may still be experienced as traumatic. Future qualitative studies would be useful to investigate the wider context of people’s experiences such as how they perceived the MVC and its consequences, and whether previous traumatic events also contribute to their symptoms.

Two of the participants in the current study scored 33 on the IES-R during phone screening and 20 at the time of the interview, one week later. This is a common phenomenon when asking patients about their symptoms in the last 14 days. One possible explanation for the variability in scores between the two time points in this study could be attributed to significant events that may have

occurred for these two participants between completing the measure during the phone screening and one week later during the interview. This is illustrated by Participant 013's response to item 10: 'I was jumpy and easily startled', "I find I get jumpy a little bit when I am a passenger in someone else's car when I am travelling" As Participant 013 had not been the passenger in the front seat of someone's car in the last week she responded: "In the last week, not at all" (P013, 'not at all', 20/88).

We cannot generalise these findings given the small sample size. However, the data provided much needed insight into the way whiplash patients interpret/respond to items on a widely-used PTSD measure. While the sample was predominantly female, this is consistent with epidemiological data on whiplash injury². All participants in our sample had experienced their MVC at least one year prior. This is a key limitation given that our motivation for conducting this research was to assist clinicians making treatment decisions in patients presenting post-MVC with whiplash symptoms, which includes acute and chronic whiplash. Scores on the IES-R may differ in the acute versus later stages of injury, therefore future research is needed to replicate this study in an acute population. We chose to use the IES-R as this measure is recommended in the Australian whiplash guidelines. Future research could replicate this study using a similar sample who has formally been diagnosed with PTSD to establish whether whiplash injured individuals who meet criteria for a PTSD diagnosis would respond congruently to all PTSD items (i.e., attributing the PTSD symptoms described in these items to the traumatic event (MVC) rather than to whiplash-related pain and disability). Future studies may consider conducting a TSTI with the new DSM-5 PTSD criteria. In conclusion, the findings of this study indicate that incongruent responses on the IES-R may inadvertently inflate levels of PTSD symptoms for some whiplash patients. This suggests that a simple cut off score on the IES-R is not sufficient to base treatment decisions. Clinicians need to look closely at how individuals respond to IES-R items and look for positive symptoms within all three symptom clusters prior to onward referral for the assessment and treatment of the psychological sequelae of whiplash injury.

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Table 1. Probing questions for interview

Column heads:

Column 1. Goal

Column 2. Probing questions

Key:

xxx = insert participants score as they indicated on the questionnaire

ACCEPTED

Table 2. Sample characteristics

Column Heads:

Column 1: Code

Column 2: Sex

Column 3: Age (years)

Column 4: Profession

Column 5: Time since accident (years)

Column 6: IES-R Total score and subscale scores

Column 7: NRS (Total 10)

Column 8: DASS

Column 9: NDI (Total 100)

Key:

M = Male

F = Female

IES-R = Impact of Events Scale Revised

NRS = Numerical Rating Scale

DASS = Depression Anxiety Stress Scale. D = Depression subscale; A =Anxiety subscale; S = Stress subscale

NDI = Neck Disability Index

T = IES-R Total score

I = IES-R Intrusion subscale score

A = IES-R Avoidance subscale score

H = IES-R Hyperarousal subscale score

Table 3. Coding summary: Intrusion subscale

Column heads:

Column 1: IES-R items

Column 2: Congruent response

Column 3: Incongruent response

Column 4: Confusion

Column 5: Ambiguous

Column 6: Not applicable

ACCEPTED

Table 4. Coding summary: Avoidance subscale

Column heads:

Column 1: IES-R items

Column 2: Congruent response

Column 3: Incongruent response

Column 4: Confusion

Column 5: Ambiguous

Column 6: Not applicable

ACCEPTED

Table 5. Coding summary: Hyperarousal subscale

Column heads:

Column 1: IES-R items

Column 2: Congruent response

Column 3: Incongruent response

Column 4: Confusion

Column 5: Ambiguous

Column 6: Not applicable

ACCEPTED

Table 1. Probing questions for interview

Goal	Probing questions
To understand the participant's interpretation of the task	<p>The instructions refer to a stressful life event that you have experienced.</p> <p>What event do you have in mind when you are filling in these questions?</p> <p>Are you referring to the same event when you respond to all the items?</p>
To understand the participant's responses on each item	<p>For item 1: 'Any reminder brought back feelings about it', can you explain to me why you ticked xxx? What does the 'it' refer to you in your mind?</p> <p>What sort of things remind you of 'it'?</p> <p>For item 2: 'I had trouble staying asleep', can you explain to me why you ticked xxx? What is stopping you from staying asleep?</p> <p>For item 3: 'Other things kept making me think about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?</p> <p>What sort of things make you think about it?</p> <p>For item 4: 'I felt irritable and angry', can you explain to me why you ticked xxx? What sort of things make you feel irritable and angry?</p> <p>For item 5: 'I avoided letting myself get upset when I thought about it or was reminded of it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?</p>

For item 6: 'I thought about it when I didn't mean to', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 7: 'I felt as if it hadn't happened or it wasn't real', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 8: 'I stayed away from reminders about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 9: 'Pictures about it popped into my mind', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 10: 'I was jumpy and easily startled', can you explain to me why you ticked xxx? What sort of things make you feel jumpy and startled?

For item 11: 'I tried not to think about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 12: 'I was aware that I still had a lot of feelings about it but I didn't deal with them', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind? Why do you think you didn't deal with them?

For item 13: 'My feelings about it were kind of numb', can you explain to

me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 14: 'I found myself acting or feeling like I was back at the time', can you explain to me why you ticked xxx? Back at the time of what?

For item 15: 'I had trouble falling asleep', can you explain to me why you ticked xxx? What stops you from falling asleep?

For item 16: 'I had waves of strong feelings about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 17: 'I tried to remove it from memory', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 18: 'I had trouble concentrating', can you explain to me why you ticked xxx? What stops you from concentrating?

For item 19: 'Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 20: 'I had dreams about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?

For item 21: 'I felt watchful and on guard', can you explain to me why you ticked xxx? What are you watchful of/on guard for?

	<p>For item 22: 'I tried not to talk about it', can you explain to me why you ticked xxx? Again, what does the 'it' refer to you in your mind?</p>
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xxx = insert participants score as they indicated on the questionnaire

ACCEPTED

Table 2. Sample characteristics

Code	Sex	Age (years)	Profession	Time since accident (years)	IES-R Total score and subscale scores	NRS (Total = 10)	DASS D 14 A 10 S 10	NDI (Total = 100)
010	M	20	Student	2	T = 42/88 I = 15/32 A = 15/32 H = 14/24	4	D 14 A 10 S 10	30
011	F	29	Student	4 and 2	T = 29/88 I = 10/32 A = 6/32 H = 13/24	8	D 10 A 12 S 11	48
012	F	29	Stay at home parent	6 and 1	T = 52/88 I = 18/32 A = 19/32 H = 17/24	7	D 8 A 10 S 12	70
013	F	42	Nurse	2	T = 20/88 I = 7/32 A = 7/32 H = 6/24	3	D 1 A 1 S 3	36

014	F	42	Accountant / student	12, 3 and 2	T = 20/88 I = 6/32 A = 8/32 H = 6/24	6	D 11 A 5 S 10	34
016	F	33	Book keeping	3	T = 33/88 I = 11/32 A = 11/32 H = 11/24	8	D 1 A 6 S 7	46
017	F	62	Uber driver Real estate	1	T = 48/88 I = 18/32 A = 18/32 H = 12/24	7	D 8 A 10 S 12	70
018	F	33	Unemployed disability worker	6	T = 50/88 I = 13/32 A = 18/32 H = 19/24	9	D 20 A 13 S 16	76
019	F	31	Retail worker	4	T = 34/88 I = 15/32 A = 7/32 H = 12/24	9	D 0 A 7 S 11	50
021	F	52	Nurse	2	T = 24/88 I = 14/32 A = 3/32 H = 7/24	4	D 6 A 6 S 9	46
024	F	46	Sales rep	3	T = 54/88 I = 24/32	7	D 9 A 12	50

					A = 14/32 H = 16/24		S 17	
025	M	54	Unemployed	3	T = 39/88 I = 19/32 A = 9/32 H = 11/24	5	D 1 A 0 S 6	48
026	F	51	Unemployed	10	T = 25/88 I = 4/32 A = 5/32 H = 16/24	6	D 5 A 7 S 13	56
027	F	53	Admin	1	T = 34/88 I = 12/32 A = 5/32 H = 17/24	8	D 11 A 8 S 16	58
028	M	30	Office worker	1	T = 47/88 I = 13/32 A = 20/32 H = 15/24	7	D 7 A 9 S 11	50

M = Male

F = Female

IES-R = Impact of Events Scale Revised

NRS = Numerical Rating Scale

DASS = Depression Anxiety Stress Scale. D = Depression subscale; A = Anxiety subscale; S = Stress subscale

NDI = Neck Disability Index

T = IES-R Total score

I = IES-R Intrusion subscale score

A = IES-R Avoidance subscale score

H = IES-R Hyperarousal subscale score

Table 3. Coding summary: Intrusion subscale

IES –R items	Congruent response	Incongruent responses	Confusion	Ambiguous	Not applicable
Intrusion subscale					
1.Any reminder brought back feelings about it	10	2		3	
2. I had trouble staying asleep		11		2	2
3. Other things kept making me think about it	10	4		1	
6. I thought about it when I didn't mean to	6	2	2	3	2
9. Pictures about it popped into my mind	7		3	2	3
14. I found myself acting or feeling like I was back at that time	9	2	1		3
16. I had waves of strong feelings about it	5	9		1	
20. I had dreams about it	4				11

Table 4. Coding summary: Avoidance subscale

IES –R items	Congruent response	Incongruent responses	Confusion	Ambiguous	Not applicable
5. I avoided letting myself get upset when I thought about it or was reminded of it	3	5		2	5
7. I felt as if it hadn't happened or it wasn't real	2	2	1	1	9
8. I stayed away from reminders of it	10	2		1	2
11. I tried not to think about it	9	2		2	2
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	8	1	2	1	3
13. My feelings about it were kind of numb	2	1	5		7
17. I tried to remove it from my memory	1	3	2	1	8
22. I tried not to talk about it	6	4		1	4

ACCEPTED

Table 5. Coding summary: Hyperarousal subscale

IES –R items	Congruent response	Incongruent responses	Confusion	Ambiguous	Not applicable
4. I felt irritable and angry	2	10		2	1
10. I was jumpy and easily startled	11		1		3
15. I had trouble falling asleep	0	13		1	1
18. I had trouble concentrating	3	10			2
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	12	1			2
21. I felt watchful and on-guard	9	2	1	2	1