

A systematic review of illness representations in patients with mild traumatic brain injury

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ABSTRACT

Introduction: Little is known about the cognitive and emotional perceptions of patients with mild traumatic brain injury, although studies showed patients experiencing difficulties in cognitive functioning and psychological impacts following their injury. This systematic review aims to identify the current literature regarding illness representation dimensions in mild traumatic brain injury and their related factors.

Methods: A search of electronic databases was completed using PubMed, CINAHL, Embase, and Web of Science, which were published from 2002 to April 2020. Studies were assessed for quality and bias, and data were analyzed using narrative synthesis.

Results: The initial search yielded 155 studies, and ten were included. The results showed that patients had negative perceptions toward their mild traumatic brain injury. Some dimensions of illness representation were found to have relationships to their post-concussion symptoms, post-traumatic stress disorder, and quality of life of mild traumatic brain injury patients.

Conclusions: The illness representations can be applied to such patients because it is able to explain symptoms and related factors that indicate their recovery process. The findings help trauma nurses to build interventions based on the dimensions of illness representations to generate appropriate perceptions after injury, and may to enhance the recovery process and outcomes.

Keywords: illness representations, mild traumatic brain injury, nursing, systematic review

Introduction

Mild traumatic brain injury (mTBI) constitutes one of the most challenging public health issues, with an estimated incidence of 100-350/100,000 people worldwide (Cassidy et al., 2004; Nguyen et al., 2016; Skandsen et al., 2019). Patients with mTBI frequently experience headaches, dizziness, fatigue (van der Naalt et al., 2017), poor quality of life (Fikriyanti et al., 2014; Voormolen et al., 2019), cognitive function impairments (Theadom et al., 2016), and psychological distress after receiving mTBI (Cassidy et al., 2014; Vikane et al., 2019).

Although an mTBI is not a life-threatening event, studies have emerged indicating that mTBI patients experience difficulties in cognitive functioning and psychological distress. The cognitive problems of such patients vary in terms of the associated recovery rates, with one study reporting that the majority of mTBI patients fully recovered within 90 days after the injury (Karr et al., 2014). In contrast, another study found that about 39% of patients with mTBI still reported cognitive complaints as of six months after being injured (Stulemeijer et al., 2007). In addition, various

psychological problems, such as anxiety and depression, have also been reported as of two months after receiving an mTBI (Vikane et al., 2019). Furthermore, one recent study found that not all patients with mTBI reported experiencing a full recovery after the injury (Nelson et al., 2019).

The recovery process after an mTBI might not always be observed by a medical professional (Theadom et al., 2016), as one three-month follow-up study of patients with mTBI reported that only 52% had even visited a medical practitioner regarding their injury (Seabury et al., 2018). Furthermore, it has been reported that most non-hospitalized mTBI patients do not experience a full recovery, with visits to outpatient clinics being common among such patients (de Koning et al., 2017). Evidence has showed that the recovery process after an mTBI influenced by patients' perceptions and behavioral responses to their condition (Var & Rajeswaran, 2012). Therefore, an innovation for posthospital follow-up with respect to patient perception is definitely important, because a study showed patients with negative perceptions of injury-related symptoms, self-control, and treatment controls on discharge from the hospital were at increased risk of impaired quality of life 3

months after discharged from the hospital (Tonapa et al., 2021).

One of the increasingly popular models that describe patients' views and responses toward illness is Leventhal's Common-Sense Model of Illness Representations (CSMIR) (Petrie et al., 2007). The CSMIR model has received increasing attention because it can explain how individuals view and adapt to changing consequences and health threats (Rice, 2012). Illness representations (IRs) are a central part of the CSMIR, and can be assessed along different dimensions of IR. IRs were originally conceived of as being comprised of five dimensions of cognitive representations, including identity, timeline, consequences, control, and causes. Each dimension reflects different perceptions or internal beliefs regarding an illness (Leventhal et al., 2001). Moss-Morris et al. (2002) used different patient populations to rebuild the dimensions of IR. Two dimensions, illness coherence and emotional representations, were added as a result. The timeline dimension was divided into two subscales, timeline-acute/chronic and timeline cyclical, and the control dimension was divided into personal control and treatment control (Moss-Morris et al., 2002). The

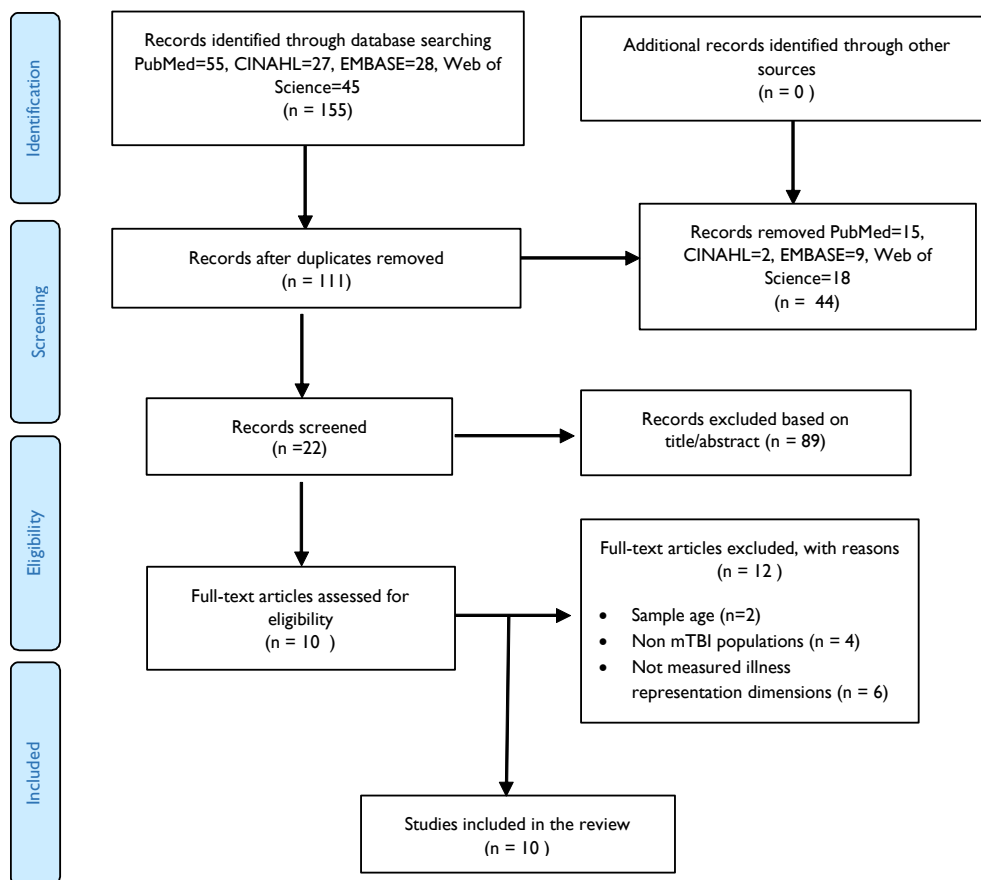


Figure 1 PRISMA Flowchart

Table 1 Search terms used computerized databases

Group	PubMed (indexed terms)	CINAHL (CINAHL headings)	Embase (Embase Emtree)	Web of Science
Search keywords group 1	((((mild traumatic brain injury) OR (mild brain injury)) OR (mTBI)) OR (Concussion)) OR (mild traumatic brain)	mild traumatic brain injury OR mild brain injury OR concussion OR mTBI	'traumatic brain injury' OR 'head injury' OR concussion	((((mild traumatic brain injury OR mild brain injury OR concussion OR mtbi))))
Search keywords group 2	((((illness perceptions) OR (illness representations)) OR (common sense model illness representations)) OR (leventhal))	illness representation OR illness perception OR leventhal & johnson self-regulation theory OR self-regulation	'illness perception' OR 'illness perception questionnaire' OR 'self regulation model' OR 'common sense/exp OR 'common sense model'	((((illness perceptions OR illness representations OR common sense model illness representations OR leventhal))))
Search keywords group 3	Group 1 AND group 2	Group 1 AND group 2	Group 1 AND group 2	Group 1 AND group 2

concept of IRs has been helpful in understanding conditions such as cardiovascular disease (French et al., 2006; Nur, 2018), kidney disease (Lin et al., 2013; Velez-Velez & Bosch, 2016), and traumatic injury (Lee et al., 2010). Early screening and prevention innovations using interventions based on reframing illness representations in trauma patients before they transition back into society would be beneficial (Lee et al., 2015; Tonapa et al., 2022). Relatedly, a study regarding IRs in mTBI reported that a patient's increasing understanding of his or her condition was reflected in various IR dimensions (such as the timeline acute/chronic, timeline cyclic, consequences, and illness coherence dimensions) (Snell et al., 2013).

There have been few studies reviewing the role of IRs and the various IR dimensions in mTBI patients. It is essential, however, to better understand the present evidence regarding IRs in mTBI, as such evidence could potentially be useful in terms of informing future clinical interventions based on the IR dimensions.

Therefore, this review aims to review the current literature regarding illness representation dimensions in mild traumatic brain injury and their related factors. The research questions were: (a) What have been the IR dimensions of mTBI patient groups studied? (b) What are the IRs related factors in patients with mTBI?

Materials and Methods

Research design

This study was a systematic review using the the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement process of identification, screening, and assessment of eligibility (Moher et al., 2009).

Search methods

A systematic review (SR) was completed using electronic searches across four databases: PubMed, CINAHL, Embase, and Web of Science databases. The

keywords or key terms used in these searches matched the Population, Intervention, Comparison intervention, and Outcome measures (PICO) inclusion criteria, and were then combined with the Boolean operator (Aromataris & Riitano, 2014). The search terms used in searching each database were slightly different based on the preferences of each database. Relatedly, the search terms were organized into three groups of keywords that were determined based on the respective databases that the terms were used to search (Table 1). The inclusion and exclusion criteria were the study: (1) concerned patients with mTBI, (2) included IR dimensions measurements, (3) included adult participants, and (4) was presented in a full-texts paper in English.

Search outcomes

A total of 155 potentially relevant articles were initially identified in the four databases. A total of 111 of those remained after duplications were removed using Endnote software. Next, the titles and abstracts of those articles were read one by one for further screening, after which 22 remaining full-text articles were further assessed for eligibility. Subsequently, 12 of those articles were excluded for various reasons (i.e., the age of the study subjects, the inclusion of non-mTBI populations, and no measurements conducted using a questionnaire that contained the dimensions IR). Finally, ten studies were deemed eligible for inclusion in this review (Figure 1).

The study selection process was carried out by two of this study's authors (MM and TSI) independently, after which they reached agreement. There was no disagreement between the two authors during the selection process.

Quality appraisal

The Joanna Briggs Institute (JBI) Critical Appraisal Checklist has been used for analytical cross-sectional

Table 2 Critical appraisal of cohort studies

Authors	Checklist criteria for cohort studies											Results (%)
	1	2	3	4	5	6	7	8	9	10	11	
Whittaker et al. 2007	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	16/22 (73%)
Snell et al. 2011	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	22/22 (100%)
Snell et al. 2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	22/22 (100%)
Jones et al. 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	21/22 (95%)
Jones et al. 2019	Y	Y	Y	Y	Y	Y	Y	Y	U	U	Y	20/22 (91%)
Anderson & Fitzgerald. 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	21/22 (95%)

Y = yes; N = no; U = unclear. 1. Were the two groups similar and recruited from the same population? 2. Were the exposures measured similarly to assign people to both exposed and unexposed groups? 3. Was the exposure measured in a valid and reliable way? 4. Were confounding factors identified? 5. Were strategies to deal with confounding factors stated? 6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)? 7. Were the outcomes measured in a valid and reliable way? 8. Was the follow up time reported and sufficient to be long enough for outcomes to occur? 9. Was follow up complete, and if not, were the reasons for loss to follow up described and explored? 10. Were strategies to address incomplete follow up utilized? 11. Was appropriate statistical analysis used?

Table 3 Critical appraisal of cross-sectional studies

Authors	Checklist criteria for cross-sectional studies								Results (%)
	1	2	3	4	5	6	7	8	
Var & Rajeswaran. 2012	Y	Y	Y	Y	N	N	Y	Y	12/16 (75%)
War & Rajeswaren. 2013	Y	Y	Y	Y	N	N	Y	Y	12/16 (75%)
Sullivan et al. 2014	Y	Y	Y	Y	Y	U	Y	Y	15/16 (94%)
Bahraini et al. 2018	Y	Y	Y	Y	Y	Y	Y	Y	16/16 (100%)

Y = yes; N = no; U = unclear. 1. Were the criteria for inclusion in the sample clearly defined? 2. Were the study subjects and the setting described in detail? 3. Was the exposure measured in a valid and reliable way? 4. Were objective, standard criteria used for measurement of the condition? 5. Were confounding factors identified? 6. Were strategies to deal with confounding factors stated? 7. Were the outcomes measured in a valid and reliable way? 8. Was appropriate statistical analysis used?

and cohort studies (The Joanna Briggs Institute, 2017). More specifically, for a cohort study, a JBI checklist assessment regarding 11 qualities is used, while for cross-sectional research, a JBI checklist assessment regarding eight qualities is used. That approach was therefore taken initially in this study. Two authors independently assessed the collected studies for methodological quality, after which they came to agreement. For each study assessed with JBI checklist, each criterion was given a score (Yes = 2, No = 0, Unclear = 1), and these scores were then converted to a percentage. In order to ensure methodological quality among the studies ultimately reviewed, a minimum score of 70% was required for an included study (Fernandez et al., 2020). This study followed these criteria, and no study was excluded based on its methodological quality (Table 2 and Table 3).

Data extraction and synthesis

Two authors independently extracted data from all of the included studies into Excel spreadsheets. Any disagreements during the data extraction process were resolved through un-blinded discussion. The authors extracted data into five main categories: (a) study information including the author(s), year of publication, and study country; (b) populations; (c) research design; (d) measurements; and (e) findings. Narrative synthesis was applied to analyze and explain the findings in this study (Popay et al., 2006). The process included listing data for the included studies, identifying IR dimensions, and exploring IR-related factors in patients with mTBI.

Results

Characteristics of included studies

The number of participants in those studies ranged from 30 to 245. Four of the studies were conducted in New Zealand (Jones et al., 2016; Jones et al., 2019; Snell et al., 2013; Snell et al., 2011), two in Australia (Anderson & Fitzgerald, 2018; Sullivan et al., 2014), two in India (Var & Rajeswaran, 2012; War & Rajeswaren, 2013), one in the USA (Bahraini et al., 2018), and one in the UK (Whittaker et al., 2007). Five of the studies collected their data using prospective longitudinal observations (Anderson & Fitzgerald, 2018; Jones et al., 2016; Snell et al., 2013; Snell et al., 2011; Whittaker et al., 2007), four used a cross-sectional design (Bahraini et al., 2018; Sullivan et al., 2014; Var & Rajeswaran, 2012; War & Rajeswaren, 2013), and one used a retrospective design (Jones et al., 2019).

Two different instruments developed from the CSMIR were used. They were the Illness Perceptions Questionnaire-Revised (IPQ-R) and the Brief Illness Perceptions Questionnaire (BIPQ). The IPQ-R was used in six studies (Anderson & Fitzgerald, 2018; Bahraini et al., 2018; Snell et al., 2013; Snell et al., 2011; Sullivan et al., 2014; Whittaker et al., 2007), and the BIPQ was used in four studies (Jones et al., 2016; Jones et al., 2019; Var & Rajeswaran, 2012; War & Rajeswaren, 2013).

Dimensions of illness representation in mTBI

Seven of the ten studies used all of eight IR dimensions (Anderson & Fitzgerald, 2018; Jones et al., 2016; Jones et al., 2019; Snell et al., 2013; Snell et al.,

2011; Var & Rajeswaran, 2012; War & Rajeswaren, 2013). Two studies reported using only three dimensions, namely, consequences, illness coherence and emotional representations (Bahraini et al., 2018), identity, timeline (acute/chronic) and consequences (Whittaker et al., 2007). One study used only two of them, namely, timeline (acute/chronic) and consequences (Sullivan et al., 2014). Two studies divided the measured IRs scores into three groups, namely, low, medium, and high groups (Var & Rajeswaran, 2012; War & Rajeswaren, 2013). Regarding the IR dimensions, both the IPQ-R and BIPQ measure eight dimensions. It should be noted, however that the IPQ-R specifically divides the timeline dimension into two parts (acute/chronic (A/C), and cyclical), while the BIPQ includes two items used to assess the emotional representation dimension (namely, the concern and emotions items).

Identity: symptoms that the individual patient labels as being related to their injury

Most of the studies, consistently reported that patients with mTBI identified few symptoms that appeared to be a result of their mTBI (Jones et al., 2016; Snell et al., 2013; Snell et al., 2011; Var & Rajeswaran, 2012; War & Rajeswaren, 2013).

Timeline: the progress and duration of the injury (i.e., acute, chronic, or cyclic)

Three studies reported that patients with mTBI were more confident that their injury would only affect them for a short time (Jones et al., 2016; Var & Rajeswaran, 2012; War & Rajeswaren, 2013). These findings, however, were in contrast to those of other studies, which found the mTBI patients perceived that the impacts of their injury would last longer/that they would

Table 4 Study characteristics, Dimensions of illness representation, and Factors related to illness representations

Authors, year, country	Population	Research Design	Measure	Findings
Whittaker et al. (2007), UK	73 patients with mild head injury	Longitudinal study	IPQ-R RPQ	Symptomatic mTBI was correlated with identity and consequences.
Snell et al. (2011), New Zealand	147 patients with mTBI	Prospective observational study	IPQ-R RPQ	Identity, timeline, illness coherence, and emotional representations were correlated with PCS.
Var & Rajeswaran. (2012), India	31 patients with mild to moderate TBI	Cross-sectional	BIPQ RPQ	Consequences, timeline, personal control, treatment control, concern, and emotional representations were correlated with PCS.
Snell et al. (2013), New Zealand	147 patients with mTBI	Prospective observational study	IPQ-R RPQ	Emotional representations, identity, and consequences were correlated with PCS.
War & Rajeswaren. (2013), India	30 patients with a mild to moderate TBI	Cross-sectional	BIPQ RPQ WHOQOL-BREF	Consequences, concern, personal control, and emotional representations were correlated with physical QOL, and the timeline dimension was correlated with psychological QOL.
Sullivan et al. (2014), Australia	108 volunteers with diagnosis of mTBI (n = 27), minor head injury (n = 24), concussion (n = 31), no diagnosis (n = 26).	Cross-sectional	IPQ-R NSI mBIAS	Patients who were diagnosed with mTBI perceived worse undesirability, timeline, and consequence.
Jones et al. (2016), New Zealand	245 adults with predominantly mTBI	Prospective longitudinal study	BIPQ RPQ	Greater drawing of brain damage at one month was correlated with the consequences and, timeline dimensions for recovery at six months.
Jones et al. (2019), New Zealand	92 adults following mTBI	Retrospective observational study	BIPQ RPQ	Greater drawing of brain damage at one month was correlated with perceived greater impacts on life, including in the timeline, identity, and emotional representation dimensions at four years.
Bahraini et al. (2018), USA	80 patients (mTBI and PTSD, mTBI and no PTSD, non-TBI and PTSD, non TBI and no PTSD)	Cross-sectional	IPQ-R PCL-C	Consequences and emotional representations were correlated with PTSD symptom severity, irrespective of mTBI vs non-TBI.
Anderson & Fitzgerald. (2018), Australia	61 individuals who were admitted to hospital after mTBI	Prospective observational	IPQ-R RPQ	Identity was correlated with whole PCS symptoms, and timeline-cyclical was correlated with late enduring PCS.

Abbreviations: mTBI: mild Traumatic Brain Injury, TBI: Traumatic Brain Injury, PTSD: Post Traumatic Stress Disorder, IPQ-R: Illness Perception Questionnaire-Revised, BIPQ: Brief Illness Perception Questionnaire, RPQ: Rivermead Post Concussion Questionnaire, NSI: Neurobehavioral Symptom Inventory, PCL-C: PTSD Checklist-Civilian Version, WHOQOL BREF: WHO Quality of Life BREF Version, mBIAS: mild Brain Injury Anxious Symptom Scale

take some time to recover (Snell et al., [2013](#); Sullivan et al., [2014](#)).

Consequences: patient's perception of the severity or negative influence of their injury

The majority of the studies reported that the investigated patients perceived that their mTBI might severely impact their lives (Bahraini et al., [2018](#); Snell et al., [2013](#); Snell et al., [2011](#); Sullivan et al., [2014](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#); Whittaker et al., [2007](#)). Only one study reported that the investigated patients believed that their mTBI would not severely and negatively influence their lives (Jones et al., [2016](#)).

Illness coherence: the degree to which the injury can be understood by the patient

Consistent findings regarding mTBI coherence were found in several of the reviewed studies, with several reporting patients with mTBI can comprehend their injury (Bahraini et al., [2018](#); Jones et al., [2016](#); Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)).

Personal control: patients' beliefs about themselves that can control the injury

The reviewed studies consistently reported that the investigated patients with mTBI perceived themselves as having a high level of control over their condition (Jones et al., [2016](#); Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)).

Treatment control: patients' expectations the medical treatments can control over the injury

The findings from the earlier reviewed studies repeatedly indicated that the included patients' viewed their medical treatments as effective in controlling their injury (Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)). Surprisingly, however, one study reported that the investigated patients with mTBI viewed their medical treatments as in-adequate for their condition (Jones et al., [2016](#)).

Concern: how concerned are individuals toward their injury

The investigated patients with mTBI reported being relatively worried and concerned about their injury (Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)). However, one of the studies conducted by Jones and his colleagues ([2016](#)) found that the investigated patients were less concerned about their condition as of one month after the mTBI (Jones et al., [2016](#)).

Emotional representations: the amount of negative emotion that individuals showed as results of an injury

Patients with mTBI may show emotional responses such as anger, fear, becoming upset, and even depression. This was shown by a number of the reviewed studies, which all found that most of the investigated patients exhibited a lot of emotional responses to their injury (Bahraini et al., [2018](#); Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)). However, one of the more recent reviewed studies found that the investigated patients exhibited fewer emotional responses as of one month after their mTBI (Jones et al., [2016](#)).

Factors related to illness representations

This review found that IRs are associated with several factors in mTBI including post-concussion symptoms (PCS), post-traumatic stress disorder (PTSD), and quality of life (QOL) ([Table 4](#)). Factors that have a relationship with IRs, are statistically described with p-value <0.05. Many of the reviewed studies reported that IRs have a relationship with PCS (Anderson & Fitzgerald, [2018](#); Snell et al., [2013](#); Snell et al., [2011](#); Sullivan et al., [2014](#); Var & Rajeswaran, [2012](#); Whittaker et al., [2007](#)). One study reported a link between PTSD and IRs (Bahraini et al., [2018](#)), while another reported correlation among IRs and physical, psychological, and environmental aspects of QOL for patients with mTBI (War & Rajeswaren, [2013](#)).

Discussions

This review aims to review the current literature regarding illness representation dimensions in mild traumatic brain injury and their related factors. The results showed that patients had negative perceptions toward their mTBI. The results also showed that the IRs are correlated with PCS, PTSD, and QOL.

The findings for the identity dimension were clear in those cases in which patients with mTBI experienced symptoms. The symptoms following an mTBI include early and late-onset symptoms, which the common in physical symptoms (eg, headaches), the most frequent in affective/social symptoms (eg, anxiety), and cognitive impairments (eg, difficulty in concentration) (McAllister, [2008](#)). Studies found that patients perceived fewer symptoms (identity) as a result of mTBI (Jones et al., [2016](#); Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)). In addition, these previous studies consistently showed that patients' perceptions of symptoms were positively related to the occurrence of PCS (Anderson & Fitzgerald,

2018; Snell et al., 2013; Snell et al., 2011; Whittaker et al., 2007). It was indicated among patients with mTBI, those with more beliefs or concerns regarding the illness label and their symptoms experienced more PCS and vice versa. Relatedly, the identity domain itself was considered an important factor. The misattribution or labeling of symptoms could influence individuals' health-related behaviors, such as adherence (Clarke et al., 2016). Moreover, it was found as a significant predictor of quality of life three months after injury (Tonapa et al., 2021). Thus, understanding how patients perceive their symptoms after injuries is essential for developing a nursing care plan.

Patients may have various expectations and beliefs regarding the duration and timeline of an mTBI. Some found that recently injured TBI patients relative to beliefs that their injury would end for briefly (Var & Rajeswaran, 2012; War & Rajeswaren, 2013), with other studies finding that, as time passes, mTBI patients tend to perceive that their injury will take more time to recover (Snell et al., 2013; Sullivan et al., 2014). Also, previous studies have noted that the expected timeline has an impact on the mTBI recovery process, psychological health, and the occurrence of PCS (Snell et al., 2011; Var & Rajeswaran, 2012; War & Rajeswaren, 2013). In other words, how patients perceive their injury duration and progress is very important, such that nurses should devote some attention to clarifying these perceptions.

Patients' perceptions of the extent to which an injury will impact their life are notably important, because those perceptions may affect their health-related outcomes. A number of the previous studies have found that strong perceptions regarding injury consequences are correlated with the perceived negative effect of brain damage, more symptomatic events, and the occurrence of PTSD (Bahraini et al., 2018; Jones et al., 2016; Jones et al., 2019; Snell et al., 2013; Var & Rajeswaran, 2012; Whittaker et al., 2007). The current review further revealed that patients generally perceive their mTBIs to have badly impacted their lives. Therefore, taking patient perceptions of mTBI consequences into account may reduce the risk of adverse outcomes.

Patient's understandings of their illness are necessarily valuable because their perceptions may influence the recovery process. This review revealed that patients with mTBI can comprehend their injury (Bahraini et al., 2018; Jones et al., 2016; Jones et al., 2019; Snell et al., 2013; Var & Rajeswaran, 2012; Whittaker et al., 2007). One of the reviewed studies reported that illness coherence is related to the

experience of PCS (Snell et al., 2011), findings that lower level of understanding of these conditions are correlated with the appearance of more PCS. Another study reported an association between coherence and PTSD severity symptoms, finding that among veterans with mTBI, PTSD symptoms were experienced in individuals with a poorer understanding of their injury (Bahraini et al., 2018). As such, providing relevant educational interventions could potentially prevent adverse outcomes.

Patient's control perceptions are considered an important factor driving post-injury behavioral adjustment. This review found that mTBI is generally considered to be a condition that can be controlled by patients (Jones et al., 2016; Snell et al., 2013; Snell et al., 2011; Var & Rajeswaran, 2012; War & Rajeswaren, 2013). Additionally, the current review found that if patients have inappropriate personal control, it may affect their QOL (War & Rajeswaren, 2013). Further, concerning treatment control, the reviewed studies indicated that the majority of patients with mTBI believe that their medical treatments are sufficient for caring for their injuries (Snell et al., 2013; Snell et al., 2011; Var & Rajeswaran, 2012; War & Rajeswaren, 2013). Personal and treatment control are notably important because past study results imply the importance of partnerships between healthcare providers with patients and further indicate the importance of patient adherence to treatment plans (Martin et al., 2005). In addition, a recent prospective study showed that patients with negative perceptions of their personal control and treatment control at hospital discharge had a higher risk of impaired quality of life three months post-discharge than those with positive perceptions (Tonapa et al., 2021). Hence, enculturating patients have an optimistic perception of themselves and treatment is warranted for nurses.

This review found that some patients with mTBI are highly concerned about their conditions (Var & Rajeswaran, 2012; War & Rajeswaren, 2013). However, it should be underlined that such perceptions may change as time passes because patients may gain more knowledge regarding the nature of their injuries and may in turn become less concerned with their conditions (Jones et al., 2016). Providing specific interventions to lead mTBI patients toward having appropriate levels of concern is among the responsibilities of nurses, especially with respect to trauma care that has physical or psychological impacts.

Showing negative emotions as a result of injury might contribute to behavioral changes. In the early phase after being injured, mTBI patients may show a lot

of emotional responses, but as of a few months after the mTBI, their emotional responses may be reduced. In addition, nurses should be careful in taking emotional representations into account, because it was related to the occurrence of PCS (Snell et al., [2013](#); Snell et al., [2011](#); Var & Rajeswaran, [2012](#); War & Rajeswaren, [2013](#)) and, the perceived negative effects of brain injury (Jones et al., [2016](#); Jones et al., [2019](#)), and may also be a determinant of QOL (War & Rajeswaren, [2013](#)). For example, having more emotional responses such as anger, fear, and depression can result in patients having poorer physical and psychological health.

IRs are the foundation of the CSMIR, commonly used to determine individuals' illness-related behaviors or coping responses to mitigate health threats. The complete CSMIR can be used to capture patients' perceptions and, coping methods, which in turn impact their health outcomes. For example, different patterns of coping and patient perception were found related to patients' behaviors in enduring PCS symptoms (Anderson & Fitzgerald, [2018](#)). Also, a recent study found that Indonesian adults with extremity injuries who harbored harmful IR were less focused on using adaptive coping strategies and more on using maladaptive coping strategies, and these mediations significantly explain the lower quality of life (Tonapa et al., [2022](#)). Regarding the benefits of the CSMIR and the limited number of studies in mTBI, further studies should apply the whole model in investigating mTBI patient groups.

In sum, IR dimensions, including the identity, timeline, consequences, coherence, and emotional representation dimensions, have been found to be related to factors affecting mTBI patient groups, including PCS, PTSD, and QOL. Patients with mTBI tend to have inappropriate perceptions of their post-injury condition that may influence their recovery process. The findings of this study demonstrate the strength of the evidence regarding the value, in clinical practice, of routinely assessing patients' cognitive and emotional perceptions and preparing appropriate interventions to improve the recovery processes and outcomes of patients with mTBI.

Implication and limitations

Capturing the illness representation dimensions of mild traumatic brain injury patients is necessary to ascertain the needs of patients who will receive trauma nursing care. Based on the findings of this review, it is important for clinical practice to regularly assess illness representations to identify what trauma interventions

are needed. Furthermore, it is essential to build interventions based on illness representation dimensions to ensure that patients have appropriate interpretations of their injuries, which can enhance the recovery process and health outcomes for patients with mild traumatic brain injury. For future researchers, these results can be used as a basis for further research, especially by considering the use of the entire Common Sense Model of Illness Representation model by adding coping assessment. This will be useful for providing a more comprehensive basis for developing intervention studies.

Three of the ten studies included in this review did not include all eight of the IR dimensions. It is possible that the exclusion of several dimensions could have fundamentally affected the findings of these studies.

Conclusions

Understanding the IR dimensions of mTBI patients and their related factors can help trauma nurses ascertain the needs of patients receiving trauma nursing care. Some dimensions of IR have been found to be related to factors affecting mTBI patient groups, including PCS, PTSD, and QOL. It is crucial in clinical practice to address this issue by focusing on the IR dimensions, such as by conducting routine IR assessments and providing interventions to make patients more adherent to their treatment and post-injury recovery. Thus, it would be beneficial to acknowledge the IR dimensions as a target for nursing interventions. The results of this study may provide critical evidence for influencing the recovery process and outcomes of patients with mTBI.

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Author contribution

MM & LBO conceiving and designing the work. MM, LBO & TSI completed data collection. MM, LBO, TSI & AH took responsibilities for analyzing and interpreting the data. MM & LBO drafted the manuscript. MM, LBO, TSI & AH revising the manuscript to make important changes in content. All authors have read and approved the final version for submission

Conflict of Interest Statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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