REVIEW ARTICLE

Fatigue after spinal cord injury: a systematic review of self-assessment instruments

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Abstract:

Fatigue is one of the consequences of population with spinal cord injury (SCI). A number of instruments measuring fatigue have been developed, but it lacks consistency among SCI participants. The intention of this review is therefore to determine which fatigue scales should be recommended for future research among the SCI population. Data sources included PubMed, Web of Science, and Scopus. The included studies were obligated to use the self-assessment fatigue scale to measure fatigue among participants of SCI, be in the English (Malaysia) language, among human, and full-text articles. Nineteen studies with a total of 8 fatigue instruments were identified and included in this review; Fatigue Severity Scale (FSS), Modified Fatigue Impact Scale for SCI (MFIS-SCI), Modified Fatigue Impact Scale Abbreviation Version (MFIS-5), Fatigue Questionnaire (FQ), Chalder Fatigue Scale (CFQ), Checklist Individual Strength (CIS), Numerical rating scale (NRS) and Visual Analog Scale (VAS). Participants varied from acute, sub-acute and chronic SCI, with traumatic SCI higher than non-traumatic SCI and also varies from Grade A to D classification of AIS. Among all the self-assessment fatigue instruments identified, FSS seems to have the most substantial evidence to be used among the SCI population in measuring fatigue. MFIS-SCI also seems to be able to be more precise in measuring fatigue with multidimensional criteria but still need to have more research on the scale.

Keywords: Fatigue, instruments, outcomes, spinal cord injury

1. INTRODUCTION

Spinal cord injury (SCI), according to the World Health Organization, refers to all lesions to the spinal cord, conus medullaris, and cauda equine [1]. The harm to the spinal cord may be traumatic or non-traumatic. Traumatic SCIs come from many sources, including falls, road traffic injuries, occupational and sports injuries, and violence. Meanwhile, for non-traumatic SCI, it usually comprises an underlying pathology like an infectious disease, tumor, musculoskeletal disease such as osteoarthritis, and congenital problems such as spina bifida, a neural tube defect that arises during development of the embryo [1].

Worldwide, the incidence of spinal cord injury (SCI) ranges from 40 to 80 cases per million and the prevalence is higher for traumatic as compared to the non-traumatic injuries [2]. People suffering from SCI have to face many consequences due to the impairment they had from the injury. One of the consequences is fatigue.

Fatigue is a state of excessive chronic physical and mental tiredness that involves a pervasive feeling of exhaustion and negative emotions like anxiety and depressed mood [3]–[5], as cited in Lovas et al. [6].The exact prevalence of fatigue among people with SCI is unclear, but some researchers proposed that 25% of individuals with SCI report fatigue that is severe enough to interfere with daily activity function and well-being [7], [8].

To date, the measurement of fatigue among the SCI population has been shown to be inconsistent. There were varieties of fatigue scale used. Also, many studies on adults with SCI use outcome measures developed for the general population and may not reflect the needs of those with SCI [9]. Therefore, this study aimed to identify the fatigue instruments used in people with SCI, the characteristics or fundamental properties of those self-assessment instruments, and which among the scales should be recommended for future studies for the SCI population.

2. METHODOLOGY

The search strategy was designed to get literature relating to measures of subjective fatigue in the population of SCI. Preferred Reporting System for Systematic Reviews and Meta-Analyses (PRISMA) [10] were referred to as in the making of the systematic review. PubMed, Scopus, and Web of Science platforms were used in searching the studies related from 2010 to 2020.

Subject headings and keywords used were the following; "spinal cord injury" OR "spinal cord contusion" OR "spinal cord lesion" OR "SCI" OR "paraplegic" OR "quadriplegic" OR "tetraplegic" AND fatigue OR “mental fatigue” OR “muscle fatigue” OR “fatigue syndrome” OR “chronic fatigue” OR “lack of energy” OR “lassitude” OR “weariness” AND "assess" OR "measure" OR "tool" OR "outcome" OR "index" OR test OR scale.

The inclusion criteria were full-text articles in English (Malaysia) language. In addition, the population of SCI included traumatic or non-traumatic injuries (all levels of injury according to the ASIA Impairment Scale). Besides, the studies must use any self-assessment fatigue instruments. The exclusion criteria were the non-SCI population. It also excluded the research articles using electromyography in measuring fatigue. Any books or single case studies were excluded from this systematic review.

Data extraction was conducted according to the previous study [11]. From the fatigue instruments identified, its dimensions or domains, the construct assessed, response option, range of scores, and also whether it has been evaluated among the SCI population were reported.

The methodological quality of included studies was evaluated by using the Physiotherapy Evidence Database (PEDRO) scale for Randomized Controlled Trial (RCT) paper. While cohort studies, cross-sectional studies, pilot studies, and case series studies were evaluated using a quality assessment tool from the National Heart Lung and Blood Institute (NIH) [12].

3. RESULTS AND DISCUSSION

Figure 1 shows the sequence of the research selection process. A total of nineteen studies measuring fatigue by usingeight instruments were included in data extraction [6], [13]–[30].

Most reviewed studies were cross-sectional (8; 47%) with sample size ranged from 30 to 2296 subjects. The participants in the studies mainly were males and suffered from traumatic injuries; see Figure 4.

3.1. Methodological Quality Assessment

The methodological quality assessment of articles in this review showed different quality ratings. However, overall the papers were rated either good or fair. The fair rated articles mostly lose their point due to not reporting the effect sizes of their research study. Besides, the cohort and cross-sectional studies included in this review may show detection bias because there was no blinding of the outcome assessor.

3.2. Identified Instruments

Eight fatigue instruments were identified (Figure 2). The Fatigue Severity Scale (FSS) was the most commonly used, cited in 10 (53%) studies [13], [20]–[27], [30], [31]. The MFIS-5 and MFIS-SCI were the second most common instruments to be cited in 3 (16%) studies [14], [15], [29] and 2 (11%) studies [21], [28] respectively. While other fatigue instruments were only cited once in the remaining articles; Chalder Fatigue Scale (CFQ) [6], Checklist Individual Strength (CIS) [16], Fatigue Questionnaire (FQ) [17], Numerical Rating Scale (NRS) [19] and Visual Analog Scale (VAS) [18].

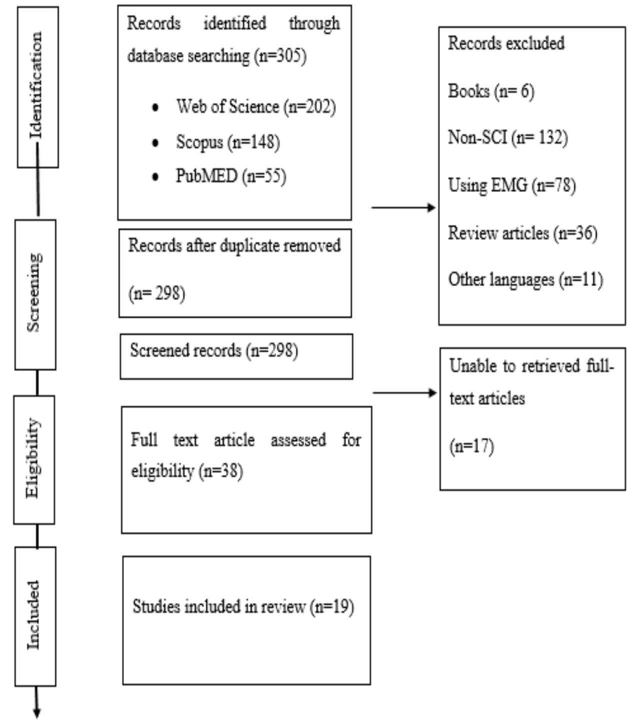

Figure 1. PRISMA flow diagram of study identification and selection

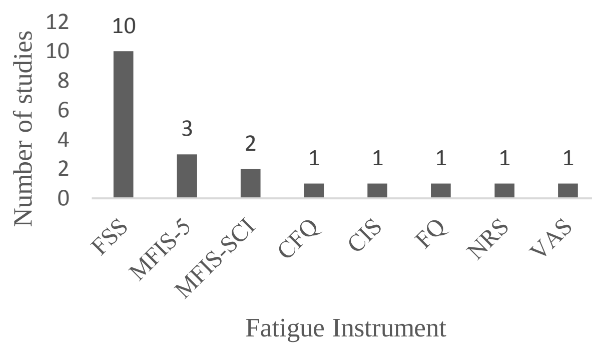

Figure 2. Fatigue instruments identified in included studies

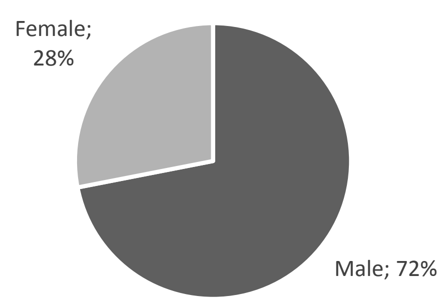

Figure 3. Participants' gender in the included studies

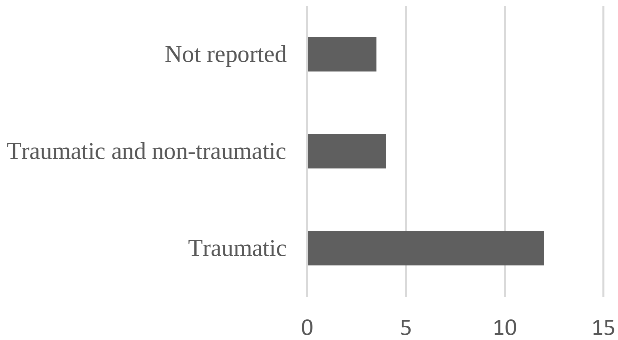

Figure 4. Categories of injuries

3.3. Characteristics of Fatigue Instrument Identified

Most instruments assessed the severity of fatigue (63.2%) [16] – [19], two instruments assessed impacts of fatigue [7], [14], [15], [21], [28], [29], and two instruments assessed both [5], [7], [13], [21] – [25], [27], [30]. Among 8 instruments, 6 of the instruments using 4-point or 7-point likert scale, and two instruments using numerical scores. Also, only two of the fatigue instruments have been validated among SCI population; FSS by [32] and MFIS-SCI by [21]. The MFIS has been modified into MFIS-SCI by deleting 3 items of the original scale as those items reported as not reflecting the SCI population [21]. The description of these fatigue instruments is found in Table 1.

The outcome measures for measuring fatigue included here vary in their domains or dimensions. For example, FSS has a total of 9-items in the domains, while MFIS-SCI contains 21-items with a subscale of 11-item on cognitive, 7 on physical, and 3 on psychosocial factors. The lesser item will surely make it easy for the user to use it.

The user influences the characteristics of an ideal fatigue assessment instrument. It should be easy to complete if the user were a respondent or patient; it should have the capacity to discriminate cases from non-cases as well as to describe symptom severity, impact and profile if the user were rehabilitation professionals; and it should have robust psychometric properties for researchers [33] as cited in Fredriksson-Larsson et al. [34]. Nonetheless, these characteristics are not present in any of the 8 identified instruments.

Besides, almost all fatigue scales present with a Likert scale except NRS and VAS. Likert-scale questionnaires have shown some advantages; the data can be gathered relatively from a large number of respondents, highly reliable person ability estimates are provided, and the data they provide can be established through a variety of means. Also, they can be profitably compared, contrasted, and combines with qualitative data-gathering techniques, such as participant observation, open-ended questions, and interviews [35].

Measure	Construct assessed	Dimensions / domains	Response option	Range of scores	Evaluated among SCI
FSS	Severity and impact of fatigue	9 question on overall fatigue	7-point likert	9-63	Yes
MFIS-SCI	Impact of fatigue	21 items; cognitive, physical and psychosocial effect	4-point likert	0-84	Yes
MFIS-5	Impact of fatigue	5 items	4-point likert	0-20	Not reported
CFS	Severity and impact of fatigue	14 items on physical and mental fatigue	4-point likert	0-56	Not reported
CIS	Severity of fatigue	20 items on subjective, cognitive and emotional fatigue	7-point likert	20-240	Not reported
FQ	Severity of fatigue	11 items on physical and metal fatigue	3-point likert	0-33	Not reported
VAS	Severity of fatigue	Total fatigue	0-10 scores	0-10	Not reported
NRS	Severity of fatigue	Total fatigue	0-10 scores	0-10	Not reported

Table 1. Characteristic of fatigue instruments identified

The only fatigue instruments which have been validated among the SCI population were FSS [32] and MFIS-SCI [21]. Fawkes-Kirby et al. [31] reported that they were able to identify the prevalence of fatigue among their subjects. While Imam et al. [21] suggested that the MFIS-SCI was a worth tool consideration in measuring the impact of fatigue in persons with a traumatic SCI due to its excellent internal consistency, good diagnostic accuracy, and support validity. However, there were no reports on validation of other instruments in SCI population.

Physical therapy is one of the central roles in rehabilitation for SCI individuals [36]. According to Harvey [37], as cited in Serpanou et al. [39], physical therapy helps to improve health-related quality of life by improving patients' ability to participate in the activities of daily living. However, people with SCI often have poor adherence to physical therapy. Basset [38], as cited in Serpanou et al. [39] reported that up to 65% of patients being either non-adherent or partially adherent to their home exercise programs, and estimated about 10% of patients failing to finish their prescribed course of physical therapy.

One of the reasons for them being non-adherence to the prescribed exercise was fatigue and also a lack of mental strength [39]. Therefore, the usage of fatigue instruments plays a role in the decision-making for the intervention for SCI patients as the causes of fatigue may come from physical activity or their mental states. This can act as an indicator of the progress of fatigue severity getting worse or better.

3.4 Limitations

Limitations of this review are it cannot be generalized for all SCI populations because the participants involved in the studies included were varied from traumatic and non-traumatic injury, and also varied in terms of time since injury; acute, sub-acute and chronic SCI. Besides, the number of male participants surpass the number of female participants by a wide margin. In addition, out of eight instruments identified, only two had been validated in SCI populations, while others were not reported.

4. CONCLUSION

Among the eight fatigue instruments identified in this review, FSS seems to be the most reliable evidence for fatigue measures and also due to it has been evaluated among SCI. Besides, from 19 studies included, 10 of these cited FSS for measuring fatigue among their subjects. However, MFIS-SCI has multidimensional fatigue measures in its item. Therefore, it may be compatible with clinicians and researchers who may need to take note more about how much fatigue affecting the participants' quality of life.

Even so, these fatigue instruments should be evaluated more among SCI with more sample size and group them according to their level of injury or age as that may cause fatigue to affect them differently so that the fatigue instruments would be valid for their population.

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