

---

---

# Risk Factors for Posttraumatic Stress Disorder in Persons With Spinal Cord Injury

Catherine Otis, PhD,<sup>1</sup> André Marchand, PhD,<sup>1</sup> and Frédérique Courtois, PhD<sup>2</sup>

<sup>1</sup>Department of Psychology, <sup>2</sup>Department of Sexology, Université du Québec à Montréal, Montréal, Québec, Canada

**Purpose:** Many of the events that cause spinal cord injury (SCI) are traumatic events that can result in posttraumatic stress disorder (PTSD). It therefore appears that most persons with SCI are at risk for developing PTSD. This study retrospectively examined risk factors for PTSD symptoms in a sample of 71 persons with SCI. **Method:** The Structured Clinical Interview for DSM-IV was used to assess full and partial PTSD diagnoses. Self-administered questionnaires were used to measure potential risk factors. **Results:** Results indicated that 11% of the participants met the criteria for full PTSD, and an additional 20% met the criteria for partial PTSD at some point after their SCI. Hierarchical linear regression analyses revealed that trauma history, peritraumatic reactions, and intolerance of uncertainty predicted the number of PTSD symptoms. **Conclusion:** This study highlights the importance of trauma history, peritraumatic reactions, and intolerance of uncertainty in the development of PTSD symptoms. Patients at risk for PTSD should be identified early in the rehabilitation process and could benefit from psychological interventions with the aim of preventing PTSD development. **Key words:** anxiety, post-traumatic stress disorder, PTSD, risk factors, spinal cord injury

In the past decade, posttraumatic stress disorder (PTSD) has become a subject of interest in persons with spinal cord injury (SCI). An SCI results in an impairment or loss of motor or sensory function. Tetraplegia occurs if the individual is injured in the cervical region, and paraplegia is observed when the injury is in the thoracic, lumbar, or sacral region. The function of the arms is preserved in the case of paraplegia. A complete injury means that the individual is completely paralyzed below the lesion, whereas an incomplete injury means that only part of the spinal cord is damaged and some motor or sensory functions can remain. Many of the experiences associated with sustaining an SCI can be considered traumatic according to the definition in the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, such as the event causing the injury, realizing one's inability to move, witnessing another person's death or injury during the accident, or even experiencing the neurological consequences of the injury. It therefore appears that most persons with SCI are at risk for PTSD. PTSD involves 3 categories of symptoms: (1) persistent re-experiencing of the event, (2) persistent avoidance of stimuli associated with the event and numbing of general responsiveness, and (3) persistent symptoms of increased arousal.<sup>1</sup> These symptoms must be present for at least 1 month and must cause significant distress or impairment in functioning to warrant a diagnosis of PTSD.

## Prevalence of PTSD in Persons With SCI

Recent studies have established the prevalence of PTSD in persons with SCI as varying between 7% and 44%.<sup>2-8</sup> Different factors could account for the variability observed in these studies, but the fact that the samples were defined by type of injury sustained rather than by type of traumatic event experienced is likely to have had an impact. Although the results are variable, it appears that patients with SCI generally experience PTSD at higher rates than the general population (7%<sup>9</sup>) and at comparable rates to those found in other traumatized populations (10% to 25%<sup>10</sup>). These statistics point to the importance of studying PTSD and the associated risk factors in persons with SCI. The identification of the risk factors for PTSD would allow the detection of individuals at risk soon after a traumatic event and would contribute to the development of prevention strategies.<sup>11</sup>

For the purpose of this study, risk factors are grouped into pretraumatic, peritraumatic, and posttraumatic factors. This grouping has been used by other authors and is useful for comparing risk factors between studies.<sup>12</sup>

### Pretraumatic factors

Pretraumatic factors consist of characteristics of the individual that were present before the traumatic event. Regarding sociodemographic characteristics, some studies revealed that being younger at the time of the event,<sup>6,13</sup> being female,<sup>13</sup> being single,<sup>7,13</sup> and being less educated<sup>14</sup> were associated with more PTSD symptoms in persons with SCI. However, in other studies, investigators found no significant effect of age,<sup>15</sup> gender,<sup>16</sup> or marital status.<sup>14</sup> Previous trauma exposure was consistently found to be correlated with PTSD symptoms in persons with SCI.<sup>5,17,18</sup>

The contribution of a personal or family history of psychiatric disorders, which was found to be a significant predictor in other populations,<sup>19,20</sup> has not been investigated in persons with SCI to date.

### Peritraumatic factors

Peritraumatic factors refer to characteristics of the event and the person's reactions during or immediately after the event. In persons with SCI, injuries resulting from violence appear to be related to PTSD symptoms in some studies<sup>3</sup> but not in others.<sup>21</sup> Nielsen<sup>7</sup> found that individuals injured during diving accidents, motor vehicle accidents, or falls were at greater risk for PTSD than those injured in other sports-related or industrial accidents<sup>7</sup> but found no effect for the type of trauma in another study.<sup>6</sup> Being intoxicated during the event and trauma severity were not found to be related to PTSD, but sustaining a head injury during the traumatic event has been associated with PTSD severity.<sup>21</sup>

Although the role of peritraumatic risk factors seems inconclusive in persons with SCI, it has been clearly established in other traumatized populations. More specifically, a recent meta-analysis showed that dissociation and emotional reactions during the event, perceived severity of the trauma, and perceived life threat<sup>20</sup> are important predictors of PTSD in various traumatized populations. It would be worthwhile to study the impact of these variables in persons with SCI to see whether they have similar importance.

### Posttraumatic factors

Posttraumatic risk factors are factors that are present after the traumatic event that can contribute to the development of PTSD. The lesion severity variable, determined by the level of the lesion (paraplegia or tetraplegia) and the completeness of the lesion (complete or incomplete), shows conflicting results. Some studies suggest an association between paraplegia and PTSD symptoms,<sup>21</sup> and others suggest that tetraplegia is associated with more PTSD symptoms.<sup>3</sup> Martz<sup>22</sup> found a curvilinear association between SCI severity and posttraumatic stress levels, but individuals with the least severe SCI had higher scores on the PTSD measure that was used in her study. Some studies did not find any association.<sup>5,16</sup> With regard to the completeness of the lesion, one study suggests that having an incomplete lesion is a predictor of PTSD,<sup>6</sup> and other studies suggest that having a complete lesion is associated with more PTSD symptoms.<sup>7,13</sup>

Positive social support was found to be associated with fewer PTSD symptoms,<sup>7,14</sup> and negative social support was associated with more PTSD symptoms.<sup>7</sup> Meta-analyses have also indicated the importance of social support: Lack of social support<sup>20</sup> and perceived social support<sup>19</sup> were found to be among the best predictors of PTSD. Among other posttraumatic variables studied, neurogenic pain was found to be associated with higher posttraumatic stress levels.<sup>22</sup> Trauma recency was found to be related to PTSD symptoms in some studies<sup>21</sup> but not in others.<sup>5</sup>

Intolerance of uncertainty—the tendency to consider it unacceptable that a negative event may occur, regardless of the probability of its occurrence<sup>23</sup>—is a variable that has received very little attention with regard to its possible role in PTSD. To the best of our knowledge, only one study has examined the association between intolerance of uncertainty and PTSD, and it demonstrated a significant positive relationship between the 2 constructs.<sup>24</sup> According to the author, intolerance of uncertainty might be related to the hypervigilance symptoms of PTSD, which are characterized by efforts to avoid surprises and uncertainty. Sustaining an SCI involves a high degree of uncer-

tainty (eg, uncertainty about possible recovery of certain functions, uncertainty about the impact the SCI is going to have on one's life, uncertainty about the future).<sup>25</sup> More research is needed to determine whether intolerance of uncertainty could develop after an SCI and could foster the development and maintenance of PTSD by promoting the development of hypervigilance-related symptoms.

Results of the previously mentioned studies are sometimes conflicting, and some of the variables that have been shown to play major roles in other populations have not yet been studied in persons with SCI. Specifically, personal and family history of psychiatric disorders, history of dissociation, emotional and physical reactions during the event, and perceived life threat have not been investigated to date. Clarification of the risk factors for PTSD in persons with SCI is therefore warranted. Moreover, many studies have used self-report questionnaires rather than validated clinical interviews to gather information about PTSD symptoms. The goal of this study was to investigate the prevalence of PTSD and the role of pretraumatic, peritraumatic, and posttraumatic risk factors for PTSD symptoms in persons with SCI. We also sought to remedy one of the major limitations of most studies conducted on this population by using a structured clinical interview to establish the diagnosis of PTSD. To the best of our knowledge, this study is the first to investigate PTSD and its associated risk factors in a sample of French Canadians with SCI.

Because of the mixed findings of previous research in persons with SCI, hypotheses were developed on the basis of recent meta-analyses of the risk factors associated with PTSD in different traumatized populations.<sup>19,20</sup> We hypothesized that peritraumatic and posttraumatic risk factors would be better predictors of PTSD symptoms than pretraumatic risk factors. We also hypothesized that peritraumatic dissociation and negative social support would be robust risk factors for PTSD symptoms.

## Method

### Participants

One hundred eleven individuals with SCI were contacted and invited to participate in this

study. They were all patients at the outpatient clinic of the Montreal Institute of Rehabilitation. Of the 111 individuals contacted, 83 agreed to participate, allowing for a participation rate of 75%. Participants were injured, on average, 12.06 years before the study. The inclusion criteria were a minimum age of 18 years and having a stable SCI that was caused by a trauma and not by an evolving pathology or a congenital disease. Individuals who had experienced moderate to severe traumatic brain injury at the same time as the SCI were excluded. Complete data were available for 71 participants.

### Measures

#### *Diagnoses of PTSD and other psychiatric disorders*

The Structured Clinical Interview for DSM-IV (SCID)<sup>26</sup> was used to establish the PTSD diagnosis after the lesion. Interviews were done by qualified and well-trained research assistants. Lifetime and current symptoms were assessed with reference to the event causing the SCI. A diagnosis of partial PTSD was made when a participant had at least 1 re-experiencing symptom, 1 avoidance and blunting symptom, and 1 increased arousal symptom or 1 re-experiencing symptom and 2 increased arousal symptoms.<sup>27</sup> History of PTSD was assessed when a participant reported the presence of another traumatic event in addition to the one that caused the SCI. The interview was also used to determine the presence of a lifetime diagnosis of other psychiatric disorders, such as acute stress disorder, major depressive disorder, alcohol or drug abuse and dependence disorders, and anxiety disorders. The PTSD module of the SCID has good test-retest reliability (0.78) and good inter-rater reliability (0.88).<sup>28</sup> Studies conducted with the earlier version of the SCID suggest good concomitant validity ( $\kappa = 0.69$ )<sup>29</sup> and good convergent validity with other measures of PTSD, such as the Clinician-Administered PTSD Scale.<sup>30,31</sup> Reliability studies indicate adequate reliability for the establishment of other current and lifetime diagnoses.<sup>32</sup> An independent interviewer rated 25% of the audiotaped evaluations, and a perfect level of agreement was obtained for diagnosis of PTSD ( $\kappa = 1$ ).

### ***Measures of sociodemographic, medical, and pretraumatic variables***

A questionnaire was developed to gather information about participants' age, gender, level of education, relationship status, cohabitation status (living alone or with someone), date and cause of SCI, and family psychiatric history. Relationship status was measured by asking respondents to identify whether they were currently single, in a common law relationship, married, divorced, or widowed. The variable was dichotomized as single, divorced, or widowed and in a common law relationship or married. Familial psychiatric history was assessed with the following question: "Have any of your family members ever had psychological problems?" If applicable, respondents had to indicate their relationship to this person and the kind of problems the person had experienced. Information about level of injury and completeness of lesion were obtained from participants' medical records.

The Trauma Assessment for Adults (TAA)<sup>33</sup> was used to measure the number of traumatic events experienced before the SCI. This interview contains 13 items referring to potentially traumatic events such as sexual abuse, natural disasters, and serious accidents. The French version of this questionnaire demonstrates good internal consistency (0.89) and excellent reliability (0.97).<sup>34</sup>

### ***Measures of peritraumatic variables***

The Peritraumatic Dissociative Experiences Questionnaire (PDEQ)<sup>35</sup> contains 10 items that measure dissociation symptoms that may have occurred during the traumatic event. The French version has demonstrated good internal consistency (Cronbach's  $\alpha = 0.85$ ) and good test-retest reliability (0.88).<sup>36</sup>

The Initial Subjective Reaction (ISR) Emotional Scale of the Potential Stressful Events Interview<sup>37</sup> consists of 15 items relating to peritraumatic emotions that can be experienced during a traumatic event. A principal component factor analysis of the French version yielded the same 4 factors as those of the original version,<sup>38</sup> demonstrating appropriate internal consistency. Because of item overlap between the peritraumatic dissociation/numbing

subscale of the ISR emotional scale and the PDEQ, the 5 items of the ISR emotional scale pertaining to dissociation were excluded from the final score.

The ISR Physical Scale of the Potential Stressful Events Interview<sup>37</sup> is a 10-item scale that assesses peritraumatic physical reactions that can be experienced during a traumatic event, such as shortness of breath, trembling, and chest pain or discomfort. The French version of the questionnaire used in this study shows the same internal consistency (Cronbach's  $\alpha = 0.86$ ) as that of the original version.<sup>38</sup>

Because there is no consensus in the scientific literature on how to measure trauma severity,<sup>19</sup> 2 questions were developed for the purpose of this study. Perception of trauma severity was measured by 2 questions that assessed participants' fear of being seriously injured and fear of dying during the event. Participants had to use a Likert scale to indicate the degree to which they were afraid of being seriously injured or dying during the traumatic event.

### ***Measures of posttraumatic variables***

The Perceived Negative Spouse Behaviors Scale<sup>39</sup> was used to measure the presence of negative social support in the month following the traumatic event. It is composed of 13 items that measure the perception of negative support (overtly negative and withdrawal/avoidant responses) received from the most significant person involved in the victim's life at the time of the traumatic event. The French version of this questionnaire has an internal consistency of 0.84 and a convergent validity of  $r = -0.43$ .<sup>40</sup>

The Short-Form McGill Pain Questionnaire<sup>41</sup> contains 15 descriptors of pain that allow the assessment of sensory and affective aspects of pain. Actual daily pain level was assessed. The English version of the questionnaire demonstrated good internal consistency with patients suffering from rheumatoid arthritis and fibromyalgia (0.73 and 0.89) and good convergent validity with results obtained when other pain measurement instruments were used.<sup>42</sup> The French version of the questionnaire used in this study shows appropriate internal consistency (Cronbach's  $\alpha = 0.90$ ).

The Intolerance of Uncertainty Scale (IUS)<sup>43</sup> consists of 27 items relating to the idea that uncertainty is negative and should be avoided, it leads to the inability to take action, and it reflects poorly on a person. The French version of the IUS has excellent internal consistency ( $\alpha = 0.91$ ) and has demonstrated criterion, convergent, and discriminant validity.<sup>43</sup>

### Procedure

After receiving approval from the appropriate ethics committee, a nurse selected patients who met the inclusion criteria of the study and contacted them by phone to tell them about the study. Patients were told that the study was seeking to assess potential stress reactions after an SCI. Patients who agreed to participate were interviewed by a research assistant at the rehabilitation center. The interview consisted of administering the SCID and the Trauma Assessment for Adults. Demographics and medical information were also collected during the interview. Participants were then asked to complete the aforementioned questionnaires at home and to return completed questionnaires by mail. Each participant was given a stamped, pre-addressed envelope for this purpose.

### Data analysis

Data analyses were performed using the Statistical Package for the Social Sciences version 13.0 (SPSS, Chicago, Illinois, USA). Descriptive analyses were used to obtain PTSD prevalence and participants' characteristics. Posttraumatic delay (decimal logarithm), annual income (square root), emotional reactions (square root), reactions of dissociation (square root), and intolerance of uncertainty (square root) were transformed to achieve normality. The number of children the participants had, the trauma severity (as measured by the fear of dying and the fear of being seriously injured), trauma history, new traumas after the event, and negative social support were dichotomized because their distribution could not be normalized. A composite score was obtained for dissociation reactions, emotional reactions, and physical reactions at the time of the event because these variables were highly intercorrelated. The

new variable obtained from this computation was named *peritraumatic reactions*.

Univariate analyses were carried out to identify potential PTSD predictors. Predictors included sociodemographic variables, as well as pretraumatic, peritraumatic, and posttraumatic risk factors. The outcome variable was the maximum number of clinical PTSD symptoms since the injury occurred. The maximum number of clinical PTSD symptoms was used as an outcome measure because it is more sensitive than categorical assessment. A hierarchical linear regression was performed to determine how much of the variance in the number of PTSD symptoms, as measured by the SCID, was explained by pretraumatic, peritraumatic, and posttraumatic risk factors. Only risk factors that were found to be correlated with the number of PTSD symptoms in the univariate analyses were included in the regression. Pretraumatic risk factors were entered in the first step, followed by peritraumatic risk factors and posttraumatic risk factors. The "enter" method was used for all steps.

## Results

### Characteristics of the sample

Of the 83 individuals who were interviewed for this study, 12 were excluded because they did not return the completed questionnaire following the interview. No significant differences were found between participants who returned the questionnaires ( $n = 71$ ) and those who did not ( $n = 12$ ) in terms of sociodemographic characteristics and pretraumatic, peritraumatic, and posttraumatic risk factors. Participants' characteristics are presented in **Table 1**.

### Prevalence of full PTSD, partial PTSD, and PTSD symptomatology

In this sample, the prevalence of participants diagnosed with full PTSD at some point since the injury occurred was 11%; an additional 20% of the participants had met the criterion for partial PTSD. Participants reported an average of 3.69 ( $SD = 2.92$ ) clinical symptoms of PTSD. Forty-one percent of the participants had met the re-experi-

**Table 1.** Characteristics of the sample

Variable	% (n)
Gender	
Male	78.9 (56)
Female	21.1 (15)
Education	
High school	33.8 (24)
Professional	8.5 (6)
Collegial	18.3 (13)
University	36.6 (26)
Other	2.8 (2)
Involved in a relationship	53.5 (38)
Yes	46.5 (33)
No	
Cohabitation	
Yes	70.4 (50)
No	29.6 (21)
Mean age at time of study, years ( <i>SD</i> )	41.06 (12.27)
Mean age at injury, years ( <i>SD</i> )	29.31 (11.72)
Mean trauma recency, years ( <i>SD</i> )	12.06 (11.52)
Type of trauma	
Motor vehicle accident	42.3 (30)
Work accident	4.2 (3)
Diving	15.5 (11)
Sports	11.3 (8)
Medical	14.1 (10)
Fall	12.7 (9)
Paraplegia	46.5 (33)
Quadriplegia	53.5 (38)
Complete lesion	66.2 (47)
Incomplete lesion	33.8 (24)
Mean level of pain <sup>a</sup>	13.68 (10.47)

Note: Values given as n (%) unless otherwise indicated.

<sup>a</sup>Measured by the McGill Pain Questionnaire.

encing criterion, 30% had met the avoidance and blunting criterion, and 35% had met the increased arousal criterion at some point since the injury occurred.

**Simple regression analysis**

Correlations between predictors and outcome variables are presented in **Table 2**. Trauma history, peritraumatic reactions, negative social support, pain, and intolerance of uncertainty were found to be significantly correlated with number of PTSD symptoms. A one-way analysis of variance (ANOVA) on the categorical variable of type

**Table 2.** Correlations among predictors and outcome variables (n = 71)

Variable	Correlation with PTSD symptoms
<b>Sociodemographics</b>	
Gender	0.15
Age at injury, years	0.08
Education	0.01
Involved in a relationship	0.02
Cohabitation	0.04
<b>Pretraumatic factors</b>	
History of depression	0.05
History of drug or alcohol abuse or dependence	0.01
History of anxiety disorders	0.08
Trauma history	0.29*
Family psychiatric history	0.12
<b>Peritraumatic factors</b>	
Peritraumatic reactions	0.60***
Trauma severity (fear of dying)	0.15
Trauma severity (fear of being injured)	-0.07
Loss of consciousness	-0.18
<b>Posttraumatic factors</b>	
New trauma since lesion	0.02
Negative social support	0.24*
Intolerance of uncertainty	0.54***
Paraplegia vs quadriplegia	0.14
Completeness of lesion	0.29
Trauma recency	-0.08
Pain	0.38***

Note: PTSD = post-traumatic stress disorder.

\**P* < .05. \*\*\**P* < .001.

of trauma revealed that the mean numbers of clinical PTSD symptoms were not significantly different among the 6 types of trauma category variables (motor vehicle-, work-, diving-, or sports-related accidents; a medical condition; or a fall).

**Linear regression analysis for number of PTSD symptoms**

**Table 3** shows the results of the linear regression analysis for the number of clinical PTSD symptoms. The results showed that trauma history predicted 8% of the variance in PTSD symptoms, peritraumatic reactions predicted 32%, and

**Table 3.** Hierarchical linear regression analysis for the prediction of number of clinical post-traumatic stress disorder symptoms (n = 71)

	Variable	B	SE B	$\beta$	R <sup>2</sup>	$\Delta R^2$	Sr <sup>2</sup>
Step 1					0.083*		
	Trauma history	1.74	0.70	0.29*			0.08
Step 2					0.398	0.315***	
	Trauma history	1.20	0.58	0.20*			0.04
	Peritraumatic reactions	2.02	0.34	0.57***			0.32
Step 3					0.520	0.122**	
	Trauma history	0.40	0.57	0.07			0.00
	Peritraumatic reactions	1.44	0.35	0.41***			0.12
	Negative social support	1.67	0.96	0.16			0.02
	Pain	0.02	0.03	0.06			0.00
	Intolerance of uncertainty	7.20	1.91	0.37***			0.10

\* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

intolerance of uncertainty predicted 10%. Negative social support and pain level did not significantly contribute to the variance in the number of PTSD symptoms.

## Discussion

The purpose of this study was to examine the prevalence and risk factors for PTSD symptoms in a sample of persons with SCI using a pre-, peri-, and posttraumatic risk factor model. Eleven percent of our sample had met the criteria for full PTSD at some point since their injury occurred, and 20% had met the criteria for partial PTSD. A hierarchical linear regression indicated that trauma history, peritraumatic reactions, and intolerance of uncertainty significantly predicted the number of clinical PTSD symptoms.

### Representativeness of the sample

Our sample appears to be representative of persons with SCI in Canada in terms of gender, cause of lesion, age at injury, and severity of lesion, according to the Canadian Paraplegic Association.<sup>44</sup> With regard to the prevalence of PTSD found in our study, the rates were similar to those obtained by Radnitz et al,<sup>8</sup> who reported rates of 12% of current PTSD and 29% of lifetime PTSD,

but are lower than those obtained in other studies (24%,<sup>2</sup> 44%<sup>5</sup>). Many factors could explain the lower prevalence observed in our study. The use of a clinical interview (in contrast to self-report questionnaires), allowing for a more in-depth investigation of symptoms, may have contributed to the lower prevalence obtained in our study. Also, none of the participants from our sample sustained their injuries in events involving violence, which are known to have a higher association with PTSD than accidents.<sup>45</sup>

### Risk factors

In partial support of our hypothesis, the results indicate that peritraumatic factors are the strongest predictors of PTSD symptoms among persons with SCI. Peritraumatic reactions, the variable that was created from dissociation reactions and emotional and physical reactions at the time of the trauma, were found to predict 32% of the variance in the number of PTSD symptoms. Because it has been proposed that dissociation may be the result of strong physiologic arousal or intense emotions,<sup>46</sup> it is not surprising that these 3 variables were highly intercorrelated in our study. These results indicate that the individual's immediate emotional and physical responses to the traumatic event may be significant in the development

of PTSD in the population of persons with SCI as they are in other populations.<sup>19,20,47</sup> Regarding the dissociation variable specifically, it has been suggested that because dissociation reactions restrict awareness of the event, adequate emotional processing and integration of memories are impaired.<sup>48</sup> This mechanism would explain how dissociation leads to PTSD symptoms. However, it is important to note that the results obtained in our study depend on retrospective reports of dissociation and emotional and physical reactions at the time of the traumatic event. Candel and Merckelbach<sup>49</sup> argue that many factors such as forgetting, attributions (severe consequences must have intense causes), malingering, intentional over-reporting, and inclination to fantasy are likely to influence retrospective reports of dissociation. For many reasons, participants may have (consciously or not) underestimated or overestimated their reports of how they reacted and how they felt during the traumatic event. The independent role of dissociation has also been questioned, because it appears that when it is assessed prospectively, taking into account the impact of other variables such as prior psychiatric history, it loses its predictive power.<sup>50</sup> In the same way, Bryant<sup>51</sup> postulates that the relationship between dissociation and PTSD could be explained by the fact that dissociation is associated with other known risk factors for PTSD. He suggests that dissociation reactions are associated with later PTSD symptoms because of their association with extreme anxiety and hyperarousal at the time of the traumatic event. Although our results concur with those reported in most of the previous literature on PTSD and peritraumatic reactions, further research is needed to clarify the role of these variables.

Contrary to our expectations, posttraumatic factors did not make a more significant contribution to the variance of PTSD symptoms than pretraumatic factors. In our study, these 2 groups of factors appear to have similar importance. As a pretraumatic factor, trauma history was found to be correlated with the number of PTSD symptoms; the number of PTSD symptoms tends to increase with the number of traumatic events experienced before the SCI. Trauma history was found to significantly predict 8% of unique variance in

the number of PTSD symptoms. This association between trauma history and PTSD supports the findings of previous studies of persons with SCI<sup>5,22</sup> and other populations,<sup>19,20</sup> suggesting that a vulnerability to PTSD develops after a first exposure to a traumatic event.<sup>52</sup>

Negative social support was not a significant predictor of PTSD, although it was found to be significantly correlated with the number of PTSD symptoms. This result is inconsistent with the results obtained in most of the studies of persons with SCI<sup>7,14</sup> and other populations.<sup>19,20</sup> One possible explanation is that the measure chosen for this study was not suitable for the population with SCI. The participants were asked to evaluate perceived negative and positive social support from their most significant other in the month following their SCI. It is possible that other aspects of social support, such as support from the rehabilitation center staff or support from other patients, should also have been assessed because all the participants were either in a hospital or a rehabilitation center during the month following their SCI. Because most patients were not living at home during that month, many items on the questionnaire may have been hard to answer. It is also possible that the lack of variance observed in the results of our social support measure could have resulted in statistically nonsignificant results for this measure. In fact, most participants scored very high on positive social support and very low on negative social support.

With regard to the role of other posttraumatic risk factors, intolerance of uncertainty correlated positively with the number of clinical PTSD symptoms and predicted 8% of the variance in the number of PTSD symptoms over and above pretraumatic and peritraumatic risk factors. This result is of particular interest because it suggests that intolerance of uncertainty, a construct that has an established relationship with worry,<sup>43</sup> may be an important factor to consider in PTSD development. This result replicates Smith's results,<sup>24</sup> but, as mentioned previously, the nature of the relationship is not clear. It is possible that the participants became intolerant of uncertainty after experiencing their SCI and that this caused PTSD symptoms. It is also possible that the hypervigilance



associated with PTSD generated intolerance of uncertainty. A third possibility is that the participants were intolerant of uncertainty before their SCI and that this variable acted as a pretraumatic risk factor. Further research is needed to clarify the role of this variable.

Finally, pain correlated with the number of clinical PTSD symptoms but did not emerge as a significant predictor. The significant association between pain and PTSD corroborates Martz's results. As suggested by Martz,<sup>22</sup> this association may be explained by the fact that pain might act as a constant reminder of the traumatic event.

In summary, this study suggests that the predictors of PTSD in persons with SCI are similar to those identified in different traumatized populations (that is, previous trauma exposure and peritraumatic variables). The results we obtained prevent us from identifying variables that are distinctive to persons with SCI and suggest that physical trauma and psychologic trauma may operate independently. The numerous potentially traumatic events associated with this condition make it a complex phenomenon to study.

#### **Methodological limitations**

The first limitation of this study is its correlational nature, which makes it impossible to determine a causal relationship between the study variables and therefore to determine true predictors of PTSD in persons with SCI. One other limitation is the study's retrospective design. Participants were evaluated, on average, 12 years after their SCI. It is possible that they overestimated or underestimated the presence of some PTSD symptoms or associated risk factors because of their difficulty remembering accurately how they had felt and which symptoms they had experienced at the time of their SCI. Another limitation concerns the representativeness of the sample. Although our sample appears to be representative of persons with SCI in Canada in terms of gender, cause of lesion, age at injury, and severity of lesion, it might not be representative of other groups

of individuals with SCI from other geographic regions. For instance, none of the participants from our sample sustained their injuries in events involving violence, which is the third cause of SCI in the United States according to the National Spinal Cord Injury Statistical Center.<sup>53</sup>

#### **Clinical implications**

These findings have important clinical implications because they suggest that patients at risk for PTSD can be identified early in the rehabilitation process. Peritraumatic reactions should be assessed early in the rehabilitation process because it appears that dissociation reactions, as well as strong physical and emotional reactions during the event, seem to be important risk factors for PTSD in persons with SCI. A careful examination of previous traumatic events may also help identify individuals at risk. Individuals whose pretraumatic or peritraumatic factors put them at risk for PTSD could benefit from post-immediate psychotherapeutic interventions that have been empirically validated, such as cognitive-behavioral therapy,<sup>54,55</sup> early after the traumatic event. These interventions could prevent the development of PTSD or the development of chronic symptoms. Finally, strategies aimed at increasing tolerance for uncertainty could possibly help diminish the hypervigilance symptoms associated with PTSD.

Further research is needed to replicate these results and confirm the importance of peritraumatic reactions in development of PTSD in persons with SCI and to clarify the association between intolerance of uncertainty and PTSD symptoms.

#### **Acknowledgments**

Catherine Otis collected the data presented in this study as a PhD student at the University of Quebec in Montreal. This work was completed as part of a PhD program in psychology under the leadership of Dr. André Marchand and Dr. Frédérique Courtois.

## REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR*. 4th ed. Washington, DC: American Psychiatric Association; 2000.
2. Agar E, Kennedy P, King NS. The role of negative cognitive appraisals in PTSD symptoms following spinal cord injuries. *Behav Cogn Psychother*. 2006;34(4):437-452.
3. Boyer BA, Tollen LG, Kafkalas CM. A pilot study of posttraumatic stress disorder in children and adolescents with spinal cord injury. *SCI Psychosocial Process*. 1998;11:75-81.
4. Boyer BA, Knolls ML, Kafkalas CM, Tollen LG, Swartz M. Prevalence and relationships of posttraumatic stress in families experiencing pediatric spinal cord injury. *Rehabil Psychol*. 2000;45(4):339-355.
5. Chung MC, Preveza E, Papandreou K, Prevezas N. The relationship between posttraumatic stress disorder following spinal cord injury and locus of control. *J Affect Disord*. 2006;93(1-3):229-232.
6. Nielsen MS. Post-traumatic stress disorder and emotional distress in persons with spinal cord lesion. *Spinal Cord*. 2003;41(5):296-302.
7. Nielsen MS. Prevalence of posttraumatic stress disorder in persons with spinal cord injuries: the mediating effect of social support. *Rehabil Psychol*. 2003;48(4):289-295.
8. Radnitz CL, Schlein IS, Walcsak S, et al. The prevalence of posttraumatic stress disorder in veterans with spinal cord injury. *SCI Psychosocial Process*. 1995;8:145-149.
9. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):593-602.
10. Breslau N, Kessler RC, Chilcoat HD, Schultz LR, Davis GC, Andreski P. Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. *Arch Gen Psychiatry*. 1998;55(7):626-632.
11. Martin M, Germain V, Marchand A. Facteurs de risque et de protection dans la modulation de l'état de stress post-traumatique. In: Guay S, Marchand A, eds. *Les troubles liés aux événements traumatiques: dépistage, évaluation et traitements*. Montreal, Québec, Canada: Les Presses de l'Université de Montréal; 2006:51-68.
12. Martin MI, Marchand A, Boyer R, Martin N. Predictors of the development of posttraumatic stress disorder among police officers. *J Trauma Dissociation*. 2009;10(4):451-468.
13. Kennedy P, Evans MJ. Evaluation of post traumatic distress in the first 6 months following SCI. *Spinal Cord*. 2001;39(7):381-386.
14. Danner G, Radnitz CL. Protective factors and posttraumatic stress disorder in veterans with spinal cord injury. *Int J Rehabil Health*. 2000;5(3):195-203.
15. Chung MC, Preveza E, Papandreou K, Prevezas N. Spinal cord injury, posttraumatic stress, and locus of control among the elderly: a comparison with young and middle-aged patients. *Psychiatry: Interpersonal Biol Processes*. 2006;69(1):69-80.
16. Mona LR, Cameron RP, Lesondak LM, Norris FH. Posttraumatic stress disorder symptomatology in men and women with spinal cord injury. *Top Spinal Cord Inj Rehabil*. 2000;6(1):76-86.
17. Adkins RH, Hume B, Nabor M, Waters RL. Spinal cord injury identified with violence: community reintegration in urban areas. *Top Spinal Cord Inj Rehabil*. 1998;4(3):18-27.
18. Martz E, Livneh H, Priebe M, Wuermser LA, Ottomanelli L. Predictors of psychosocial adaptation among people with spinal cord injury or disorder. *Arch Phys Med Rehabil*. 2005;86(6):1182-1192.
19. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol*. 2000;68(5):748-766.
20. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychol Bull*. 2003;129(1):52-73.
21. Radnitz CL, Hsu L, Willard J, et al. Posttraumatic stress disorder in veterans with spinal cord injury: trauma-related risk factors. *J Trauma Stress*. 1998;11(3):505-520.
22. Martz E. Associations and predictors of posttraumatic stress levels according to person-related, disability-related, and trauma-related variables among individuals with spinal cord injuries. *Rehabil Psychol*. 2005;50(2):149-157.
23. Dugas MJ, Gosselin P, Ladouceur R. Intolerance of uncertainty and worry: investigating narrow specificity in nonclinical sample. *Cognit Ther Res*. 2001;25(5):551-558.
24. Smith JK. *Issues in PTSD Assessment: Exploring Intolerance of Uncertainty and Field Dependence Among PTSD Veterans*. Brookville, NY: ProQuest Information & Learning; 2007:55-56.
25. Yoshida K. Uncertainty in the lives of people with spinal cord injury and rheumatoid arthritis. *Can J Rehabil*. 1996;10(1):5-14.
26. First MB, Gibbon M. The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II). In: *Comprehensive Handbook of Psychological Assessment, vol. 2: Personality Assessment*. Hoboken, NJ: John Wiley; 2004:134-143.
27. Schnurr PP, Lunney CA, Sengupta A. Risk factors for the development versus maintenance of posttraumatic stress disorder. *J Trauma Stress*. 2004;17(2):85-95.
28. Zanarini MCS, Skodol AE, Bender D, et al. The Collaborative Longitudinal Personality Disorders Study: reliability of axis I and II diagnoses. *J Pers Disord*. 2000;14(4):291-299.

29. Hovens JE, Op-den-Veld W, Falger PR, et al. Occurrence of current posttraumatic stress disorder among Dutch World War II resistance veterans according to the SCID. *J Anxiety Disord.* 1992;6(2):147-157.
30. Blake DD, Weathers FW, Nagy LM, et al. The development of a clinician-administered PTSD scale. *J Trauma Stress.* 1995;8(1):75-90.
31. Hyer L, Summers MN, Boyd S, Litaker M, Boudewyns P. Assessment of older combat veterans with the clinician-administered PTSD scale. *J Trauma Stress.* 1996;9(3):587-593.
32. Rogers R. *Handbook of Diagnostic and Structured Interviewing*: New York: Guilford Press; 2001:106-111
33. Resnick HS, Kilpatrick DG, Dansky BS, Saunders BE, Best CL. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. *J Consult Clin Psychol.* 1993;61(6):984-991.
34. Stephensen R, Brillion P. *Translation of Trauma Assessment for Adults*. Montreal: University of Quebec in Montreal; 1995.
35. Marmar CR, Weiss DS, Metzler TJ. The Peritraumatic Dissociative Experiences Questionnaire. In: *Assessing Psychological Trauma and PTSD*. 1997:412-428.
36. Martin A, Marchand A. Validity and reliability of Peritraumatic Dissociative Experiences Francophone Questionnaire. Paper presented at: 34th Annual Convention of the Association for the Advancement of Behaviour Therapy; 2000; New Orleans, LA.
37. Falsetti SA, Resnick HS, Kilpatrick DG, Freedy JR. A review of the "Potential Stressful Events Interview": a comprehensive assessment instrument of high and low magnitude stressors. *Behav Ther.* 1994;17:66-67.
38. Bernat JA, Ronfeldt HM, Calhoun KS, Arias I. Prevalence of traumatic events and peritraumatic predictors of posttraumatic stress symptoms in a nonclinical sample of college students. *J Trauma Stress.* 1998;11(4):645-664.
39. Manne SL, Taylor KL, Dougherty J, Kemeny N. Supportive and negative responses in the partner relationship: their association with psychological adjustment among individuals with cancer. *J Behav Med.* 1997;20(2):101-125.
40. Guay S, Bonaventure M. Le soutien social et les troubles anxieux. Paper presented at: Clinique en intervention cognitivo-comportementale de l'Hôpital Louis-H Lafontaine; 2002; Montréal.
41. Melzack R. The short-form McGill Pain Questionnaire. *Pain.* 1987;30:191-197.
42. Burckhardt CS, Bjelle A. A Swedish version of the short-form McGill Pain Questionnaire. *Scand J Rheumatol.* 1994;23(2):77-81.
43. Freeston MH, Rhéaume J, Letarte H, Dugas MJ, Ladouceur R. Why do people worry? *Pers Individ Dif.* 1994;17(6):791-802.
44. Canadian Paraplegic Association. Workforce participation survey of Canadians with spinal cord injuries. 2001. <http://canparaplegic.org>. Accessed March 19, 2009.
45. Kessler RC, Sonnega A, Bromet E, Hugues M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry.* 1995;52(12):1048-1060.
46. Marmar CR, Weiss DS, Metzler TJ, Delucchi KL, Best SR, Wentworth KA. Longitudinal course and predictors of continuing distress following critical incident exposure in emergency services personnel. *J Nerv Ment Dis.* 1999;187(1):15-22.
47. Lensvelt-Mulders G, van Der Hart O, van Ochten JM, van Son MJM, Steele K, Breeman L. Relations among peritraumatic dissociation and posttraumatic stress: a meta-analysis. *Clin Psychol Rev.* 2008;28(7):1138-1151.
48. Marmar CR, Weiss DS, Schlenger WE, et al. Peritraumatic dissociation and posttraumatic stress in male Vietnam theatre veterans. *Am J Psychiatry.* 1994;151(6):902-907.
49. Candel I, Merckelbach H. Peritraumatic dissociation as a predictor of post-traumatic stress disorder: a critical review. *Compr Psychiatry.* 2004;45(1):44-50.
50. van der Velden PG, Wittmann L. The independent predictive value of peritraumatic dissociation for PTSD symptomatology after type I trauma: a systematic review of prospective studies. *Clin Psychol Rev.* 2008;28(6):1009-1020.
51. Bryant RA. Does dissociation further our understanding of PTSD? *J Anxiety Disord.* 2007;21(2):183-191.
52. Breslau N, Chilcoat HD, Kessler RC, Davis GC. Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma. *Am J Psychiatry.* 1999;156(6):902-907.
53. National Spinal Cord Injury Statistical Center. Spinal cord injury facts and figures at a glance. 2011. <https://www.nscisc.uab.edu/>. Accessed August 22, 2011.
54. Bryant RA, Moulds ML, Nixon, RV. Cognitive behaviour therapy of acute stress disorder: a four-year follow-up. *Behav Res Ther.* 2003;41(4):489-494.
55. Foa EB, Hearst-Ikeda D, Perry KJ. Evaluation of a brief cognitive-behavioural program for the prevention of chronic PTSD in recent assault victims. *J Consult Clin Psychol.* 1995; 63(6):948-955.