Note on the Use of the Postconcussion Syndrome Checklist

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Symptoms of the Postconcussion Syndrome (PCS) were evaluated in a university sample, using the Postconcussion Syndrome Checklist (PCSC). Three hundred twenty-six participants completed a questionnaire regarding history of head injury, cognitive or psychosocial difficulties, and demographic data. Scores on the PCSC did not vary by self-report of head injury. Females, however, endorsed more frequent, intense, and prolonged symptomatology, regardless of history or severity of head injury. Only 5% of the sample endorsed more than 6 symptoms on the PCSC, suggesting a potentially useful cutoff for abnormality. The PCSC was significantly correlated with the Beck Depression Inventory, suggesting that general level of psychological distress is a key factor in evaluating symptoms of PCS. © 1999 National Academy of Neuropsychology. Published by Elsevier Science Ltd

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The postconcussion syndrome (PCS) is a collection of symptoms that can include cognitive complaints (attention, concentration, and memory difficulties), physical complaints (headache, fatigue, dizziness, blurred vision, sensitivity to light and noise), and psychosocial complaints (irritability, depression, anxiety, personality changes; American Psychiatric Association, 1994). It has been estimated that postconcussion symptoms are experienced by 50 to 80% of individuals during the acute period following mild head trauma (Binder, 1997; Mittenberg & Burton, 1994). Although symptoms usually resolve (Binder, 1997; Levin et al., 1987), it has been estimated that approximately 50% of affected individuals experience symptoms for at least 3 months (Szymanski & Linn, 1992), and approximately 10 to 15% complain of persistent postconcussive symptoms (Alves, 1992; Kay, Newman, Cavallo, Ezrachi, & Resnick, 1992). These incidence estimates suggest that the potential for functional disability following mild traumatic brain injury is a major clinical problem.

PCS has recently been included in the DSM-IV as a diagnosis requiring further investigation, although the existence of a true syndrome, one that relates to the experience of a mild traumatic brain injury, remains controversial (Binder, 1997; Binder, Rohling, & Larrabee, 1997). For example, a recent meta-analysis of the cognitive dysfunction associated with mild head trauma found that only 7 to 8% of affected individuals demonstrate measureable...
neuropsychological deficits (Binder et al., 1997). In particular, the subjective nature of the symptoms of PCS, and the overlap with other physical and psychological conditions, has made accurate assessment and interpretation of symptoms difficult. There is evidence that the subjective experience of PCS can persist beyond the acute period, perhaps years after the initial injury (Dikmen, Machamer, Winn, & Temkin, 1995; Dikmen, Temkin & Armesden, 1989). The literature also suggests that endorsement of PCS symptoms occurs with considerable frequency in the normal population, and particularly in individuals with medical or psychological problems, and individuals involved in litigation (Fox, Lees-Haley, Earnest & Dolezal-Wood, 1995; Gouvier, Uddo-Crane, & Brown, 1988; Lees-Haley & Brown, 1993). Procedures are needed for distinguishing symptoms of a specific injury from base rates. To address such assessment difficulties, self-report measures of PCS have been devised to evaluate the nature and severity of symptoms (e.g., Gouvier, Cubic, Jones, Brantley, & Cutlip, 1992; Oddy, Humphrey, & Uttley, 1978). Such measures could prove useful for diagnostic and treatment purposes, and ultimately could potentially address the more fundamental issue of whether a unique, discriminable syndrome exists.

The Postconcussion Syndrome Checklist (PCSC; Gouvier et al., 1992) allows individuals to rate the frequency, intensity, and duration of 10 symptoms most commonly associated with PCS. An initial study of this inventory compared the ratings of 50 normal college students with the ratings of 47 students who had experienced a head injury (defined as loss of consciousness between 5 sec and 4 days; Gouvier et al., 1992). The PCSC Total Score (i.e., sum of the frequency, intensity, and duration ratings across the 10 symptoms) correlated .73 with an earlier self-report measure, the Postconcussion Checklist (Oddy et al., 1978), and identified a small but statistically significant group difference in the frequency with which normal and head-injured students experienced symptoms. The PCSC was able to correctly classify 70% of the normal students and 56% of the head-injured students. Further analysis found that scores on the PCSC had a tendency to be higher when individuals were asked to rate their experiences over the past 2 months, compared to the past 24 hours. Interestingly, high scores on a self-report measure, the Daily Stress Inventory (Brantley & Jones, 1989), were associated with frequency, severity, and duration of PCS symptoms. These initial findings suggest that the PCSC may prove useful as a screening measure for identifying persistent symptoms of PCS in cases of mild traumatic brain injury.

Although encouraging, the previously published studies involving the PCSC are limited in number, having relied on relatively small samples of college students with a history of head trauma (Gouvier et al., 1992), and on students who were instructed to simulate head injury symptoms (Wong, Regennitter, & Barrios, 1994). Gouvier and colleagues found that the subscales of the PCSC (i.e., frequency, intensity, and duration of symptoms) did not differ markedly between head-injured and non-head-injured university students. The authors did note that there was a trend for a group of eight community-solicited individuals with persisting postconcussion complaints to endorse more symptoms than either of the university groups. Unfortunately, this was a very small group, and it appears that the community-solicited sample varied considerably from the university head-injury sample, based on the initial severity of injury (i.e., duration of hospital stay), making this an unsuitable comparison group.

In another study involving the PCSC, Wong et al. (1994) compared the symptom ratings of 297 students assigned to base-rate and simulated head trauma groups. They found that head trauma simulation groups scored higher on the PCSC, with scores comparable to the head-injured group of Gouvier et al. (1992). Wong and colleagues concluded that the PCSC may be susceptible to the influence of malingering. A second finding of the Wong et al. study was that there were no significant gender differences observed in the base-rate of PCS complaints. The authors suggested that separate male-
female norms may not be needed, although this runs counter to the findings Segalowitz and Lawson (1995), who found significant relationships between the incidence of mild head injury, gender, and a variety of neuropsychological factors including sleep difficulties, attention difficulties, depression, and speech, language and reading disorders. The issue of gender differences on the PCSC has not been resolved.

A number of questions regarding the utility of the PCSC remain to be addressed. In earlier studies of the PCSC, subject responses have been treated in a global manner, with no information reported on the endorsement of specific symptoms. Although preliminary conference reports are appearing (e.g., Hanna-Pladdy, Gouvier & Bennet, 1997; Hanna-Pladdy, Gouvier, Berry, & Phillips, 1998; Ryan, Gouvier, & Schrager, 1998), the relationship between symptoms captured by the PCSC, head injury, and psychological stress remains to be further explored. Finally, the differences in PCSC scores between control and mild traumatic brain injury groups has been modest, suggesting the need for large and stable normative groups. In short, the purpose of the present study was to provide further elaboration on the clinical utility of the PCSC by providing psychometric and normative information on this self-report measure. Experience of specific symptoms was examined to gain a better understanding of base-rate response tendencies on the PCSC. In addition, responses on the PCSC were examined with respect to experience of previous head trauma, and were compared with responses on the Beck Depression Inventory (BDI; Beck, 1987).

METHOD

Participants

Subjects were 326 undergraduate students (114 males, 212 females) from the University of Victoria. Participants were solicited from introductory-level psychology courses, in order to attain as unselected a sample as possible, within the university population. The mean age of the sample was 20.6 years ($SD = 3.70$), and the mean education was 14.5 years ($SD = 1.51$). Participants were naive to the purpose of the study, which was described as a “School and Health Questionnaire.”

Procedure

Participants completed an eight-page survey which included questions about head trauma, psychiatric and neurologic history, achievement, cognitive difficulties, sleep disturbance, social activity, and demographic information. As part of the survey, students also completed the BDI and the PCSC. The survey took approximately 25 minutes to complete.

The PCSC requires individuals to rate their experience of 10 symptoms on the dimensions of frequency, intensity, and duration, using a 5-point Likert-type scale (i.e., $1 = not at all$, $5 = constant or crippling$). Four symptom scores were derived for each individual: Frequency Total, Intensity Total, Duration Total, and a Total Score across dimensions. Information regarding the duration of loss of consciousness, age at injury, cause of head trauma, and length of hospitalization was also gathered.

STATISTICAL ANALYSIS AND RESULTS

Subjects were divided into two groups, in response to the question “Have you ever lost consciousness due to an accident in which you hit your head?” Of those who re-
reported an experienced loss of consciousness \((n = 79, 24\%)\), most \((87\%)\) had sustained a mild traumatic brain injury \((\text{LOC} < 5 \text{ min})\), while only two students reported having been unconscious for “more than 20 minutes, but less than 60 minutes.” Average time since injury was \(5.7\) years \((SD = 3.9)\), suggesting that any difficulties relating to the injury could truly be considered to be persistent.

A MANOVA was completed to determine the pattern of responding on the PCSC and BDI, based on sex and report of head trauma. There was no main effect of head trauma on the BDI scores, or on any of the PCSC scores \((i.e., \text{Total}, \text{Frequency}, \text{Duration}, \text{or Intensity})\). However, there was a main effect of sex \((\text{Hotelling’s } F = 6.25, p < .001)\). Results of univariate ANOVAs indicated a pattern of significant results, with the PCSC Total Score, \(F(1, 316) = 27.77, p < .001\); Frequency Score, \(F(1, 316) = 22.60, p < .001\); Intensity Score, \(F(1, 316) = 22.03, p < .001\); and Duration Score, \(F(1, 316) = 29.13, p < .001\), higher for females than for males in this sample. Females also scored higher on the BDI, \(F(1, 316) = 8.54, p < .01\). There was no interaction between report of head trauma and sex on any of the measures \((\text{Hotelling’s } F = 1.12, p = .347)\). Finally, modest but significant correlations were obtained between the PCSC Total Score and the BDI \((r = .55)\). Correlations between the individual PCSC items and the BDI score were significant, ranging from .16 to .45, with concentration, fatigue and irritability being most highly correlated with the BDI.

Table 1 provides the proportion of individuals who reported PCS symptoms as occurring “often” to “all of the time.” Fatigue, concentration difficulties, and irritability were endorsed by a large segment of the student sample \((53\%, 40\%, \text{and } 30\%, \text{respectively})\). Only \(8\%\) of the sample reported experiencing difficulty with more than 5 of the 10 PCS symptoms, and only \(2\%\) of the sample endorsed 7 or more items as occurring often. These figures did not vary by injury status, sex, or other demographic characteristics. Thus, although endorsement of 6 or more items on the PCSC may provide a statistical cutoff for abnormality \((i.e., \text{occurring in less than } 5\% \text{ of the normative sample})\), this cut-off did not appear to be related to self-report of head trauma.

Finally, a correlation matrix was created examining the relationship between scores on the PCSC and BDI with self-report of difficulties in a variety of areas including: ac-

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<tr>
<th>TABLE 1</th>
<th>PCSC Scores and Proportion of Endorsed Items (Total Sample)</th>
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<tbody>
<tr>
<td>PCSC</td>
<td>Males ((n = 114))</td>
</tr>
<tr>
<td>Symptom</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>21 ((18%))</td>
</tr>
<tr>
<td>Dizziness</td>
<td>9 ((08%))</td>
</tr>
<tr>
<td>Headache</td>
<td>12 ((11%))</td>
</tr>
<tr>
<td>Memory</td>
<td>24 ((21%))</td>
</tr>
<tr>
<td>Visual Problems</td>
<td>6 ((05%))</td>
</tr>
<tr>
<td>Concentration</td>
<td>43 ((38%))</td>
</tr>
<tr>
<td>Fatigue</td>
<td>50 ((44%))</td>
</tr>
<tr>
<td>Irritability</td>
<td>24 ((21%))</td>
</tr>
<tr>
<td>Judgement Problems</td>
<td>7 ((06%))</td>
</tr>
<tr>
<td>Noise Sensitivity</td>
<td>24 ((21%))</td>
</tr>
<tr>
<td>Total scores ((SD))</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>18.99 ((4.24))</td>
</tr>
<tr>
<td>Insensity</td>
<td>20.11 ((4.38))</td>
</tr>
<tr>
<td>Duration</td>
<td>23.47 ((5.28))</td>
</tr>
<tr>
<td>Total</td>
<td>62.67 ((12.82))</td>
</tr>
<tr>
<td>Beck Depression Inventory</td>
<td>6.93 ((2.90))</td>
</tr>
</tbody>
</table>
demic failure, reading difficulties, speech difficulties, learning problems, diagnosis of ADHD, concentration difficulties, neurological problems, sleep difficulties, depression, or recent stressful event (e.g., divorce, death, or move). Correlations of these experiences with the PCSC Total Score were generally weak, with the strongest association appearing between presence of sleep difficulties and the PCSC Total Score ($r = .26, p < .001$). In this sample, PCSC Scores were unrelated to a variety of injury-related variables, including report of or duration of loss of consciousness, length of hospitalization, time since injury, or age at injury.

**DISCUSSION**

The results of the current study reflect prevalence levels of mild traumatic brain injury that are consistent with previous reports using similar samples (e.g., Segalowitz & Lawson, 1995). The current findings suggest that a considerable portion of university students (approximately 24%) have experienced an injury which has resulted in a brief loss of consciousness. The results are also consistent with levels of symptom endorsement found in other studies investigating PCS in university samples (e.g., Gouvier et al., 1992; Wong et al., 1994).

Table 2 provides a summary of PCSC data from previously published studies and the current data. Although these study populations are not fully representative of the TBI patients in general (i.e., elevated academic attainment, very mild injury), it is known that young persons between the ages of 15 and 19, and males are disproportionately represented among persons who have reported a mild traumatic brain injury (e.g., Kraus & Nourjah, 1988). Taken together, it is felt that these data provide a relatively large normative baseline, as well as scores for mild head trauma, and malingering groups, against which actual clinical cases may be compared.

An unexpected finding of the current study was that scores on the PCSC did not vary with self-report of head trauma, and did not appear to be related to measures of injury severity such as duration of loss of consciousness or length of hospitalization. It was clear that individuals in the mild head injury sample utilized in the current study were experiencing very few symptoms of PCS, and as a group, a considerable amount of time had past since injury. In their sample, Gouvier et al. (1992) found that university students who reported a mild head trauma within the past 5 years, displayed a trend towards higher Total, and Frequency Scores on the PCSC, than did normal controls. However, this trend was slight, and may have been bolstered by the makeup of the sample, which included a higher proportion of students who had experienced “moderately serious head injury,” requiring up to 4 days of hospitalization. The majority of students in the current

<table>
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<td><strong>Comparison of PCSC Scores With Previous Studies Using the PCSC</strong></td>
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<table>
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<tr>
<th>PCSC</th>
<th>Normal Controls</th>
<th>Head Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>64.85 (13.91)</td>
<td>58.75 (16.36)</td>
</tr>
<tr>
<td>Frequency</td>
<td>19.76 (4.66)</td>
<td>18.57 (5.26)</td>
</tr>
<tr>
<td>Duration</td>
<td>24.10 (5.27)</td>
<td>21.20 (6.14)</td>
</tr>
<tr>
<td>Intensity</td>
<td>21.32 (4.59)</td>
<td>18.98 (5.30)</td>
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study had experienced minimal loss of consciousness, and brief (i.e., 1 day) or no hospitalization. Thus, with respect to injury severity, the results of the current study suggest that experience of a mild traumatic head injury alone is not strongly related to the experience of postconcussion symptoms as assessed by the PCSC. The results also reveal the need for additional evaluation of the PCSC with individuals who have experienced a more severe injury, as compared to the mild traumatic brain injury samples used previously.

In the initial evaluation of the PCSC, Gouvier asked students to rate symptoms over the previous 24 hours, and over the past 2 months. Although the symptom prevalence was not significantly different between time frames, there was a trend for greater symptom endorsement by both groups when subjects were rating over the previous 2 months. Our study required students to rate their “current” symptom experience, based on the assumption that 24 hours was too narrow a window to identify a persistent mild symptom complex. Although the issue of “time-frame” was not considered in the present study, the slight differences in results between the current study and those of Gouvier et al., suggest that it may be prudent to standardize the time frame for symptom reporting.

In addition to the four composite scores provided by the PCSC, the current study examined students’ experience of specific symptoms. It was not unusual for an individual to experience one or two symptoms related to PCS. However, fewer than 5% of the current sample experienced more than five postconcussion symptoms. Although this cutoff did not appear to be related to self-report of head trauma, individuals who endorse more than five items on the PCSC should be recommended for further consideration. Under such circumstances, interpretation of the intensity and duration of symptoms may prove useful in assessing the relationship to injury, stress, or possible malingering (Wong et al., 1994).

It has been suggested that psychological factors may account for the prolonged experience of postconcussion symptoms (e.g., Binder, 1997; Mittenberg, Ferguson, & Miller, 1997). The results of the current study are not incompatible with a psychogenic hypothesis of PCS, as there was a significant correlation between scores on the PCSC with scores on the BDI. This association between the BDI and the PCSC is consistent with the observations of Gouvier et al. (1992), who found that scores on the PCSC were related to daily reports of subjective distress. One must recognize that there is overlap between symptoms of depression and symptoms of PCS, and that symptoms of depression are known to occur in more serious head injuries with clear neurologic damage. It has also been hypothesized that experience of head trauma may leave an individual susceptible to stressful situations (Ewing, McCarthy, Gronwall, & Wrightson, 1980; Satz, 1993), even if the individual is normally asymptomatic. Given the relationship between stress and postconcussion symptoms, clinicians need to be especially wary of the role of psychosocial stressors in the assessment of PCS (see also Binder, 1997).

Unlike the college sample studied by Wong et al. (1994), females in the current study reported more frequent, intense, and prolonged symptom distress. The discrepancy in results suggests that there are likely to be gender differences in the experience of both postconcussion symptoms and reactions to stress. The role of gender-based differences in PCS appears to be gaining support (e.g., Ryan et al., 1998), and it seems appropriate to account for these differences through the use of appropriate normative comparisons.

A more fundamental issue is whether persons who have suffered a mild brain injury, and symptoms of PCS, can be distinguished from persons without mild TBI, but who nonetheless endorse PCS symptoms. Unfortunately, the mild nature of injuries suffered by participants in our sample precluded our ability to address this question.

Bearing in mind the limitations of self-report, and the high-functioning nature of the current sample, the results of this study suggest that endorsement of postconcussion
symptoms may be reflective of general distress, rather than the occurrence or severity of a concussion, per se. The subjective nature of postconcussion symptoms continues to be problematic for clinicians. However, constrained self-report measures, such as the PCSC, may prove to be useful in documenting the complaints of individuals who attribute their symptoms to mild head trauma.

REFERENCES

