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Perception of illness: Nonspecificity of Postconcussion Syndrome symptom expectation

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Abstract

A growing number of studies show postconcussion syndrome (PCS) symptom report is influenced by factors other than head injury, suggesting symptoms typically associated with PCS may not be specific to head injury. Given the role that symptom expectation has been hypothesized to play in PCS symptom etiology, a comparison of symptoms expected for various disorders seems overdue. The present study asked 82 undergraduates to report the symptoms they currently experience, and then to report the symptoms they would expect to experience if they had had suffered either a head injury, an orthopedic injury, posttraumatic stress, or depression. No current differences in overall symptoms or in symptom subscales emerged. Results showed individuals portraying head injury, posttraumatic stress, and depression expected an increase in total symptoms, though individuals portraying an orthopedic injury did not expect such an increase. Results also showed simulators of head injury, posttraumatic stress, and depression expected equivalent rates of overall symptoms, memory/cognitive complaints, somatic concerns, and distracter symptoms, though head-injured individuals reported fewer affective symptoms than those portraying psychological disorders. In all, these findings suggest that individuals have a relative lack of specificity in symptom expectation for various disorders, with the implication that symptom checklists for "PCS" may not be useful for diagnosis. (*JINS*, 2002, *8*, 37–47.)

Keywords: Postconcussion syndrome, Symptom expectation, Nocebo effect

INTRODUCTION

Despite increased attention in recent years, mild head injuries remain a "major public health concern" in the United States (Evans, 1992). About eight million Americans suffered a head injury in 1998 (Centers for Disease Control and Prevention, 1999), and about 75% of these are mild in severity (Kraus et al., 1986). Mild head injuries have an estimated incidence between 100 and 200 per 100,000 individuals though it is believed this estimate may be much lower than the actual number of injuries (NIH Consensus Development Panel on Rehabilitation of Persons with Traumatic Brain Injury, 1999).

Victims of minor head injury report similar symptoms, with headaches, anxiety, memory problems, dizziness, and emotional changes being among those complaints most commonly reported (Alves et al., 1993; Dunn et al., 1995; Fox et al., 1995b; Gouvier et al., 1988). This cluster composes the core symptomology of postconcussion syndrome (PCS). Rates of PCS have been estimated at 50% in victims of mild head injury (Mandel, 1989). It has been suggested that mild head injury sequelae are relatively short-lived (Barth et al., 1989; Kibby & Long, 1996; Levin et al., 1987), though reported recovery rates range from ten days (Macciocchi et al., 1996) to more than 1 year post injury (Alves et al., 1993).

Nonspecificity of PCS symptoms

A growing number of studies show PCS symptom report is influenced by factors other than just head-injury status, suggesting that symptoms typically associated with PCS may not be specific to head injury. For example, complaints of headache, fatigue, and irritability may be found in disorders as diverse as chronic fatigue syndrome (Wearden & Appleby, 1996), gastrointestinal disorders (Hochstrasser & Angst, 1996), Graves' disease (Stern et al., 1996), and the common cold. Iverson and McCracken (1997) found 39% of individuals with chronic pain conditions met DSM–IV criteria for PCS, without evidence of head injury. Further,

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81% of individuals with chronic pain met three or more criteria for the condition. Fox et al. (1995b) found that individuals seeking psychotherapy report PCS symptoms at a rate similar to neurology and family practice patients, and at a rate higher than controls and medical patients. The authors explain this finding through elevated symptom reports of individuals high in negative affectivity (as per Seidenberg et al., 1994). Hanks et al. (1999) found that TBI patients report equivalent rates of emotional and cognitive problems to trauma patients without history of head injury 1 year post injury.

A host of studies show cognitive complaints more closely related to psychological distress than objective deficits in various populations (Binder, 1999; Errico et al., 1990; Tiersky et al., 1997). Depressed persons have been shown to report higher rates of current PCS symptoms than normal controls, chronic tension headache sufferers, and head injured athletes (Gunstad & Suhr, 2001). Gouvier et al. (1992) found that stress, not head injury status, was most closely related to report of PCS symptoms. Sawchyn et al. (2000) found both negative affectivity and sex were better predictors of self-reported PCS symptoms than head injury status. Other studies also show females reporting more symptoms than males (Alves et al., 1993; Rutherford, 1989), though this finding is inconsistent (Gunstad & Suhr, 2001; Levin et al., 1987). In all, results suggest that numerous nonneurologic factors, including sex, chronic pain, presence of medical illness, treatment seeking, depression, and negative affectivity, may be more closely related to the self-report of PCS symptoms than is head injury status. Despite these findings, self-report of symptoms frequently comprises a majority of the evaluation for PCS diagnosis (Dunn et al., 1995).

Cognitive PCS Explanations

Considering these findings and the continued popularity of cognitive models, it is not surprising that a growing number of cognitive explanations for PCS appear in the literature. One model suggesting a possible cognitive mechanism is the nocebo effect, which is a more specific rendering of Kirsch's (1985) response expectation theory. Response expectancies are "anticipations of automatic reactions to particular situational cues" (Kirsch, 1999), and are outside both volition and conscious thought (Maddux, 1999). Expectations are particularly strong in influencing perception of ambiguous stimuli, as they establish "temporary perceptual sets" or even perceptual biases (Kirsch, 1999). With ambiguous stimuli, especially something as ambiguous as an internal state or condition, an individual's actual experience is based largely upon one's expectation of that experience. For example, 71% of individuals told that impending electrical shocks would cause headaches reported experiencing headaches—despite no actual application of current (Schweiger & Parducci, 1981). Even after being informed of the absence of current, participants experienced headache pain. Hahn (1999) suggests that some studies of asthma (e.g., Luparello et al., 1968) and psychogenic seizure patients (e.g., Lancman et al., 1994) may also be viewed as evidence for the role of expectation in symptoms, as subjective expectations were found to alter individuals' physiological reactions to experimental stimuli.

A handful of studies offer at least partial support for the nocebo effect in the self-report of PCS symptomatology. Mittenberg et al. (1992) asked naive controls to complete a 30-item symptom checklist. Then, after reading a vignette describing an automobile accident, they were asked to report symptoms they would expect to experience after such an accident. Results showed controls expected 22 of the 30 symptoms at a rate similar to those reported by PCS patients. Controls overestimated the rates of headaches and visual difficulties and underestimated the occurrence of irritability, fatigue, and memory problems when compared to the current symptoms of PCS patients. Similar results were found by Wong et al. (1994).

Using a methodology similar to Mittenberg et al. (1992), Gunstad and Suhr (2001) found depressed individuals, athletes, and normal controls expected to experience more symptoms following a head injury than they currently experience. However, athletes expected fewer symptoms than either controls or depressed persons, suggesting that their general expectation for healthy and quick recovery may alter the symptoms they expect to experience after head injury (as per Barth et al., 1989; Macciocchi et al., 1996; Powell & Barber-Foss, 1999).

A second model employing expectations as a central explanation for PCS incidence and persistence is Mittenberg et al. (1992) expectation as etiology model. Expectation as etiology suggests that PCS may be explained by the degree to which individuals reattribute everyday maladies specifically to their head injury. For example, an individual experiencing a headache weeks after the injury may attribute a headache to the head injury, and not to a stressful day at work. Evidence for this model comes from results showing PCS patients report more current symptoms than normal controls, and that PCS patients report premorbid symptoms at a rate lower than the baseline of normal controls, suggesting that daily "symptoms" were being reattributed to the head injury (Mittenberg et al., 1992). Similar results have recently been found in head injured athletes (Ferguson et al., 1999).

A recent study examined the expectation as etiology model in depressed individuals, chronic tension headache sufferers, head-injured athletes, healthy athletes, and normal controls (Gunstad & Suhr, 2001). In that study, participants received differential instructions dependent upon group membership. Head injured athletes and headache sufferers were asked to report PCS symptoms experienced prior to the headache or onset of headaches, respectively. Depressed individuals and normal controls were asked to report symptoms they would expect to experience following a head injury. Results showed depressed individuals reported more current symptoms than did normal controls. Repeated measures ANOVA showed head-injured athletes

and headache sufferers report experiencing more current than premorbid symptoms. Repeated measures ANOVA also found that depressed individuals and normal controls both expect to experience more symptoms following head injury than they currently experience.

The study failed to fully support Mittenberg's (1992) model, as head injured athletes did not report current symptoms at a rate higher than baseline controls, nor did they report premorbid symptoms at a rate lower than control baseline levels. However, both head injured athletes and chronic tension headache sufferers reported experiencing more current than past symptoms, just not at a rate outside normal ranges. To explain these findings, Gunstad and Suhr (2001) suggest that all individuals, not just those with mild head injury, may fall prey to a "good old days" bias. With this bias, individuals report fewer symptoms in the past because of a less specific expectation (i.e., "things were better before"), but also report more current symptoms because of the nocebo effect (expecting nonspecific negative consequences due to increased subjective distress). In effect, individuals, through negative expectations and subjective distress, reconstruct the past in a favorable manner. This notion is the retrospective counterpart to the generalized nocebo effect described by Hahn (1997), in which individuals expect nonspecific, negative consequences following a given event.

Present Study

Given the absence of specific findings for PCS symptomatology and the growing use of expectations in explanatory devices for PCS, a comparison of expectations for disorders unrelated to head injuries seems overdue. Although several studies have looked at naive persons' expectations of symptoms following head injury (Gunstad & Suhr, 2001; Mittenberg et al., 1992; Wong et al., 1994), none have looked at the expectations of symptoms for other disorders.

The present study looked to expand past studies and to more clearly identify expected consequences of head injury and other disorders. Do individuals expect different symptoms following a head injury than for other disorders, or do they expect a generalized increase in all types of symptoms, regardless of etiology? The present study asked individuals to report the symptoms they currently experience, and then to report the symptoms they would expect to experience if they had had suffered either a head injury, an orthopedic injury, posttraumatic stress, or depression. In addition to overall numbers of symptoms, checklist items were categorized into subscales to better disentangle possible explanations for symptom report. To this end, the symptom checklist was broken into cognitive/memory, somatic, affective, distracter, and metamemory subscales. To date, no study has examined the relative specificity of symptom expectation for disorders unrelated to head injury.

On the basis of past studies and the good old days model, it was predicted that naive individuals would not expect specific symptom clusters for the various disorders. Instead, we hypothesized that individuals portraying head injury, orthopedic injury, posttraumatic stress, and depression would expect to experience similar overall numbers of and types of symptoms following the onset of the condition.

METHODS

Research Participants

Subjects were 82 undergraduates randomly assigned to portray head injury ($n = 20$), back injury ($n = 21$), posttraumatic stress ($n = 20$), or depression ($n = 21$). All subjects received course credit for their voluntary participation.

Measures

Subjects completed a brief survey of demographic information, relevant medical history, and relevant psychological history. Subjects were then asked to complete a 97-item symptom checklist comprised of common neuropsychological symptoms and distracter items. As suggested by Dunn et al. (1995), distracter items allow a comparison of expected symptoms not typically associated with head injury. Use of the same instrument as Gunstad and Suhr (2001) allowed the possibility of a direct comparison to groups employed in that study. The symptom checklist is comprised of items from studies in this area (Alves et al., 1993; Bohnen et al., 1992; Fox et al., 1995a; Gouvier et al., 1988; Iverson & McCracken, 1997; Mittenberg et al., 1992; Rattan et al., 1987; Wong et al., 1994), and has demonstrated adequate internal reliability ($\alpha = .97$) and test–retest reliability ($\alpha = .88$). Items on the symptom checklist have been categorized as cognitive/memory, somatic, affective, distracter, and metamemory items (please see Appendix 1). Symptom severity was rated on a 5-point Likert-type scale, with responses of 3 or more being categorized as an endorsement of the item. However, all analyses were conducted using both presence/absence and symptom severity, with no significant differences being found between the analyses. Therefore, to better match previous studies in this area, all analyses reported below were conducted in a presence/absence fashion.

Procedure

After obtaining informed consent, subjects from all conditions were asked to complete a packet comprised of the information page and symptom checklist. After reporting current rates of symptomatology, subjects read a vignette and completed the checklist a second time. Individuals were randomly assigned to one of four groups, portraying head injury, orthopedic injury, posttraumatic stress, or depression. The vignettes used in this study were modified from those used by Mittenberg et al. (1992), and Gunstad and Suhr (2001). The nature of the vignettes was suggested by factors believed to be related to PCS self-report, as head

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injury, pain, subjective distress, and depression have all been shown to affect self report of PCS symptoms.

Head injury vignette

Automobile accidents are a fact of life and can happen to anyone. We are interested in your opinion of how such an accident might affect your ability to do everyday things. We would like you to imagine for a moment that you were driving to the store at night about six months ago when another car turned into you. You hit your head on the windshield, were knocked out for a while, and when you woke up you were in the hospital. Imagine that you had to stay in the hospital for a week or two for treatment. Try to answer the questions below as you think you might answer the questions after an accident like this. If you aren't sure how to answer, guess.

Orthopedic injury vignette

Automobile accidents are a fact of life and can happen to anyone. We are interested in your opinion of how such an accident might affect your ability to do everyday things. We would like you to imagine for a moment that you were driving to the store at night about six months ago when another car turned into you. During the crash you injured your back, and had to have surgery for a ruptured disk. Imagine that you had to stay in the hospital for a week or two for treatment. Try to answer the questions below as you think you might answer the questions after an accident like this. If you aren't sure how to answer, guess.

Posttraumatic stress vignette

Automobile accidents are a fact of life and can happen to anyone. We are interested in your opinion of how such an accident might affect your ability to do everyday things. We would like you to imagine for a moment that you were driving to the store at night about six months ago when another car turned into you. During the crash you were not injured but your best friend was killed, and your doctor informed you that you were suffering from posttraumatic stress. Imagine that you had to stay in the hospital for a week or two for treatment. Try to answer the questions below as you think you might answer the questions after an accident like this. If you aren't sure how to answer, guess.

Depression vignette

Psychological disorders are a fact of life and can happen to anyone. We are interested in your opinion of how depression might affect your ability to do everyday things. We would like for you to imagine for a moment that you were very unhappy for about six months, and that your friends and family became concerned about you. You went to see a psychologist and were told that you were depressed. Try to answer the questions below as you think you might answer if you had depression. If you aren't sure how to answer, guess.

RESULTS

Demographic Information

To address possible confounding variables, groups were compared on a number of demographic variables (see Table 1). No differences emerged between groups on age [$F(3,76) = 1.10$, $p > .35$] or educational attainment [$F(3,76) < 1$, $p > .56$]. Using a two-tailed chi-square analysis, no differences in group membership appeared in number of minorities [$\chi^2(3) = 9.17$, $p > .026$], history of psychological treatment [$\chi^2(3) = 1.96$, $p > .58$], history of concussion [$\chi^2(3) = 2.62$, $p > .46$], history of substance abuse (reported by no subjects in any group), or current use of medication [$\chi^2(3) = 2.16$, $p > .54$] appeared. No differences in current rates of symptoms between individuals reporting history of a concussion and those without such a history emerged [$t(73) = 1.34$, $p > .184$]. Similarly, no differences in current symptoms appeared between individuals reporting psychologi-

Table 1. Descriptive information for head injury, orthopedic injury, posttraumatic stress, and depression simulators

Group	N	Age*	School*	Male	Min	Psych	HI	Sub	Meds
Head injury	20	19.1 (.73)	13.5 (.70)	6	0	1	5	0	1
Orthopedic injury	21	18.7 (.63)	13.3 (.73)	5	0	2	5	0	0
PTSD	20	18.9 (1.07)	13.7 (.99)	3	1	1	2	0	0
Depression	21	18.7 (.81)	13.4 (.75)	4	4	0	6	0	1

Note. "School" denotes the number of years of educational attainment.
"Male" denotes the number of males in the respective group.
"Min" denotes the number of minority individuals in the respective group.
"Psych" denotes the number of individuals reporting a history of psychological treatment.
"HI" denotes the number of individuals reporting a history of concussion.
"Sub" denotes the number of individuals reporting a history of substance abuse.
"Meds" denotes the number of individuals reporting currently taking prescribed medication.
**M*, (*SD*).

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cal treatment and those without treatment history [$t(73) < 1$, $p > .34$]. No sex differences emerged in reported rates of current symptoms [$t(75) = 1.50$, $p > .13$]. Given the absence of differences, no demographic variables were employed as covariates in subsequent analyses.

PCS Symptom Report and Expectation

A 4 × 2 repeated measures ANOVA was conducted separately for overall symptoms and for each of the five subscales (memory/cognitive complaints, somatic concerns, affective symptomatology, distractor items, and memory compensation strategies). For each significant repeated measures ANOVA, one-way ANOVAs and/or repeated measures ANOVAs were conducted to better clarify the nature of the results.

For overall number of symptoms, there was a significant between-groups effect [$F(3,67) = 9.48$, $p < .001$], a significant difference between current and expected symptoms [$F(1,67) = 135.37$, $p < .001$], and a significant Group × Current *versus* Expected Symptom interaction [$F(3,67) = 8.12$, $p < .001$; see Table 2]. Follow-up one-way ANOVAs revealed no between group differences in current symptoms [$F(3,73) = 1.43$, n.s.], but did show between group differences in expected symptoms [$F(3,70) = 12.99$, $p < .001$]. Bonferroni-corrected posttests showed that indiduals simulating head injury, posttraumatic stress, and depression expected more symptoms than individuals simulating orthopedic injury. Holms's (1979) corrected repeated measures ANOVAs found that individuals portraying head injury [$F(1,15) = 66.65$, $p < .001$], posttraumatic stress [$F(1,19) = 43.20$, $p < .001$], and depression [$F(1,17) = 41.01$, $p < .001$] expected more overall symptoms than they currently experience; no difference emerged for individuals portraying orthopedic injury [$F(1,16) = 3.65$, $p > .07$].

For memory/cognitive complaints, there was a significant between-groups effect [$F(3,72) = 10.60$, $p < .001$], a significant difference between current and expected symptoms [$F(1,72) = 53.08$, $p < .001$], and a significant Group × Current *versus* Expected Interaction [$F(3,72) = 13.29$, $p < .001$]. Follow-up one-way ANOVAs found no differences in current memory/cognitive complaints [$F(3,79) = 1.10$, n.s.], but did reveal differences in expected complaints [$F(3,77) = 19.22$, $p < .001$]. Bonferroni-corrected posttests showed that individuals simulating head injury, posttraumatic stress, and depression expected more cognitive symptoms than did individuals portraying orthopedic injury. Holm's corrected repeated measures ANOVAs found that individuals portraying head injury [$F(1,17) = 49.50$,

Table 2. Current symptoms, expected symptoms, and corresponding repeated measures *F* values

Group/subscale	Current symptoms *M* (*SD*)	Expected symptoms *M* (*SD*)	*F*	*p*
Head injury	24.31 (9.03)	59.75 (21.96)	66.65	.000*
Memory	9.95 (4.44)	22.58 (8.17)	49.5	.000*
Somatic	3.00 (2.26)	10.35 (4.49)	55.45	.000*
Distractor	2.35 (2.68)	7.74 (4.89)	25.35	.000*
Affect	5.55 (3.76)	11.53 (6.18)	16.70	.001*
Metamemory	5.60 (2.23)	8.00 (3.24)	9.82	.005*
Orthopedic injury	25.89 (17.46)	30.39 (17.95)	3.65	.074
Memory	10.80 (7.16)	5.84 (7.24)	4.60	.047
Somatic	2.95 (2.77)	8.60 (4.11)	72.31	.000*
Distractor	1.70 (2.30)	3.60 (3.91)	12.64	.002*
Affect	5.52 (5.35)	10.85 (5.07)	26.87	.000*
Metamemory	5.43 (2.13)	3.71 (3.22)	4.97	.037
Posttraumatic stress	27.75 (13.17)	59.65 (21.19)	43.20	.000*
Memory	9.65 (5.49)	19.15 (8.54)	21.72	.000*
Somatic	3.25 (2.51)	8.25 (4.18)	30.26	.000*
Distractor	2.85 (2.30)	7.85 (4.72)	29.50	.000*
Affect	6.50 (2.01)	16.95 (3.91)	126.15	.000*
Metamemory	6.50 (2.01)	7.45 (2.89)	1.85	.189
Depression	33.75 (18.65)	69.72 (17.45)	41.07	.000*
Memory	13.00 (8.25)	23.00 (8.11)	21.03	.000*
Somatic	4.24 (3.18)	9.38 (4.18)	23.21	.000*
Distractor	2.95 (2.06)	9.85 (4.36)	43.10	.000*
Affect	7.23 (4.95)	18.45 (3.27)	71.94	.000*
Metamemory	6.38 (2.91)	7.52 (3.03)	1.59	.222

Note. * denotes significance with Holm's corrected posttests.

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$p < .001$], posttraumatic stress [$F(1,19) = 21.72$, $p < .001$], and depression [$F(1,19) = 21.03$, $p < .001$] reported more expected than current symptoms; individuals portraying orthopedic injury did not expect more memory/cognitive complaints after hypothetical injury [$F(1,17) = 4.60$, $p > .04$].

For affective symptomatology, there was a significant between groups effect [$F(3,76) = 7.62$, $p < .001$], a significant difference between current and expected symptoms [$F(1,76) = 188.18$, $p < .001$], and a significant Group × Current *versus* Expected Symptom interaction [$F(3,76) = 5.95$, $p < .002$]. Follow-up one-way ANOVAs revealed no between-group differences in current affective symptomatology [$F(3,78) < 1$, n.s.], but did find differences in expected rates of affective symptomatology [$F(3,76) = 13.12$, $p < .001$]. Corrected posttests found that individuals portraying posttraumatic stress and those portraying depression expected greater affective symptomatology than individuals portraying either head injury or orthopedic injury. No differences emerged between individuals portraying posttraumatic stress or depression. Holm's corrected repeated measures ANOVA found that individuals in all groups expected more affective symptomatology than they currently experience [head injury: $F(1,18) = 16.70$, $p < .002$; orthopedic injury: $F(1,20) = 26.87$, $p < .001$; posttraumatic stress: $F(1,19) = 126.15$, $p < .001$; and depression: $F(1,19) = 71.94$, $p < .001$].

For somatic concerns, there was a nonsignificant effect for group [$F(3,76) < 1$, n.s.), a significant difference between current and expected symptoms [$F(1,76) = 156.73$, $p < .001$], and a nonsignificant interaction [$F(3,76) = 1.30$, $p > .25$]. Holm's corrected repeated measures ANOVA found individuals in all four groups expected more somatic concerns than they currently experience [head injury: $F(1,18) = 55.45$, $p < .001$; orthopedic injury: $F(1,19) = 72.31$, $p < .001$; posttraumatic stress: $F(1,19) = 30.26$, $p < .001$; depression: $F(1,20) = 23.21$, $p < .001$].

For memory compensation strategies, there was a significant between-groups effect [$F(3,78) = 6.54$, $p < .002$], a nonsignificant difference between current and expected use [$F(1,78) = 3.08$, n.s.], and a significant Group × Current *versus* Expected Interaction [$F(3,78) = 4.82$, $p < .005$]. One-way ANOVAs revealed no between-group differences in current rates of strategy use [$F(3,78) = 1.09$, n.s.], but did find group differences in expected use [$F(3,78) = 8.532$, $p < .001$]. Bonferroni-corrected posttests showed individuals portraying head injury, posttraumatic stress, and depression expected to use a greater number of memory compensation strategies than individuals portraying orthopedic injury. Holm's corrected repeated measures ANOVA found that individuals portraying head injury [$F(1,19) = 9.82$, $p < .006$] expected more strategy use following hypothetical injury, but that individuals portraying orthopedic injury [$F(1,20) = 4.97$, n.s.], posttraumatic stress [$F(1,19) = 1.85$, n.s.], and depression [$F(1,20) = 1.59$, n.s.] did not expect increased use.

Finally, for distractor items, there was a significant between-group effect [$F(3,74) = 6.439$, $p < .002$], a significant difference between current and expected symptoms [$F(1,74) = 106.40$, $p < .001$], and a significant Group × Current *versus* Expected Interaction [$F(3,74) = 6.51$, $p < .002$]. One-way ANOVAs revealed no between group differences in distractor items [$F(3,76) = 1.19$, n.s], but did find differences in expected rates [$F(3,75) = 6.87$, $p < .001$]. Corrected posttests showed individuals portraying orthopedic injury expected fewer distractor items than all other groups. Holm's corrected repeated measures ANOVA found all groups expected to experience more distractor items than they currently experience [head injury: $F(1,18) = 23.25$, $p < .001$; orthopedic injury: $F(1,18) = 12.64$, $p < .003$; posttraumatic stress: $F(1,19) = 29.50$, $p < .001$; depression: $F(1,19) = 43.10$, $p < .001$].

To better clarify endorsement pattern differences among groups, each of the 97 items on the symptom checklist were examined. Chi-square analyses revealed between group differences on 61 of the possible 97 items. For 46 of the items, significantly fewer of the orthopedic injury group endorsed them relative to the three other groups. Only 15 items showed significant differences in endorsement rates among head injury, posttraumatic stress, and depression groups (see Table 3). Of these 15 items, seven came from the affective subscale, two from the cognitive subscale, and six from the distractor subscale. Interestingly, for the vast majority of these items, significantly fewer persons simulating head injury endorsed them relative to posttraumatic stress and depression simulators. Only three of these items were consistent with DSM–IV PCS criteria; "sleeping problems" and "losing temper" were endorsed by fewer persons simulating head injury, and "forgets things" was endorsed by fewer individuals portraying posttraumatic stress, but equivalent numbers of head injury and depression simulators.

Table 3. Symptom checklist items showing endorsement rate differences among simulators of head injury, posttraumatic stress, and depression

Item	HI	PTSD	DEP
10. Impatient	40%	85%	86%
26. Sexual problems	35%	60%	81%
30. Trembling or tremors	45%	85%	76%
36. Constipation	10%	35%	52%
47. Feeling totally disabled	30%	45%	76%
49. Loss of common sense	35%	30%	71%
63. Getting in frequent arguments with your friends or family	40%	70%	86%
73. Sweating	35%	60%	81%
77. Sleeping problems	65%	100%	91%
80. Substantial weight loss or gain	65%	90%	95%
83. Feelings of hopelessness	55%	90%	95%
88. Forgetting things people tell you	80%	60%	95%
91. Having shoulder pain	70%	65%	19%
94. Losing temper	50%	75%	95%
98. Marital problems	65%	70%	81%

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DISCUSSION

These results speak to the role of expectations in PCS symptom development and maintenance in several ways. Finding individuals did not expect a generalized symptom increase with orthopedic injury is interesting, as it suggests that individuals may view orthopedic injuries differently from head injury, posttraumatic stress, or depression. Basic knowledge about the typical nature of symptoms following an orthopedic injury may account for this result, as naive persons may be more or less knowledgeable about back injuries than about head injury or psychological disorders. Future studies should examine the role that pre-existing knowledge about, exposure to, or experience with a given disorder plays in symptom expectation.

Results also showed individuals from all groups expected symptom increases on multiple subscales. Despite no difference in overall rates of symptoms, individuals portraying back injury expected to experience increased numbers of somatic complaints, affective symptomatology, and distracter symptoms. More interesting is the finding that individuals portraying head injury, posttraumatic stress, and depression expected similar symptom constellations. Individuals from each of these groups expected increases in memory/cognitive problems, somatic complaints, distracter items, and affective symptomatology, with between group differences emerging only in rates of affective symptomatology. Item by item analysis of the symptom checklist revealed a similar pattern, with the three groups portraying a symptom cluster with more similarities than differences. Where differences emerged, individuals simulating head injury were actually less likely to endorse many cognitive and affective symptoms, even those consistent with the DSM–IV criteria for PCS. This suggests that these symptoms are not specific to head injury, further highlighting the need to be cautious when interpreting results of "PCS" symptom checklists.

Results showing increased distractor symptoms in all groups further suggest a nonspecificity of symptom expectation. Some increase in the number of distractor items may, and perhaps should, be expected for certain disorders as the symptom may be typically associated with that disorder. For example, individuals may correctly expect pain following a ruptured disk. However, a vast majority of the distractor items are very unlikely for the given disorders, perhaps suggesting that individuals are expecting nonspecific, negative consequences.

An important consideration for the above findings is found in asking undergraduates to report their expectations for various disease or disorder states, as it may not be possible to fully generalize from this sample to individuals in other settings. As aforementioned, it is possible that expectations of illness are mediated by factors such as exposure to or knowledge about particular disorders. Despite this possibility, past studies by Wong et al. (1994) and Mittenberg et al. (1992) have found naive, noninjured persons to accurately portray the symptoms reported following mild head injury. But, the question remains, how accurate and specific are predictions for other disorders?

To answer this question, the symptom reports of depression simulators from the present study were compared to the report of actual depressed persons from Gunstad and Suhr (2001). Individuals for that group of depressive individuals were selected on the basis of their responses to the Inventory of Depressive Symptomatology (IDS; Rush et al., 1986), with individuals scoring above cutoff being invited to participate. These 25 depressed individuals from Gunstad and Suhr (2001) were compared to the 21 individuals asked to portray depression in the present study on the symptom checklist. When comparing current symptoms and subscales, *t* tests revealed depressed individuals from the earlier study reported more current affective symptomatology ($t(45) = 2.42$, $p < .02$) and nearly more overall symptoms ($t(45) = 1.88$, $p < .07$) than individuals asked to portray depression in the present study when reporting current symptom rates.

More interesting findings emerge when comparing the current rate of symptoms reported by depressed individuals from that earlier study and the symptoms expected by individuals asked to portray depression in the present study. Results show individuals asked to portray depression overestimate the number of overall symptoms ($t(45) = 5.05$, $p < .001$), memory and cognitive problems ($t(45) = 4.36$, $p < .001$), somatic complaints ($t(45) = 4.20$, $p < .001$), and distractor items ($t(45) = 5.11$, $p < .001$) relative to those actually experiencing depression. No differences emerged for reported rates of affective symptomatology or metamemory strategies. Again, these results are suggestive of the existence of relatively nonspecific symptom expectations, and demonstrate the importance of comparisons of symptoms reported by individuals with a given disorder and the expected symptoms for that disorder. For example, a current study in our laboratory is addressing the contribution that factors such as psychological distress, the presence of chronic pain, head injury status, and treatment seeking behavior may play in the self report of PCS symptoms. Such studies may better clarify the role that expectations may play in many forms of psychopathology.

What do the results of this study suggest about the role of expectation in the development of PCS symptoms? Overall, the results are suggestive of a relative nonspecificity of symptom expectation following head injury, posttraumatic stress, and depression. One explanation for these findings may be that individuals harbor an implicit notion that posttraumatic stress and/or depression may be part of suffering a head injury in an automobile accident. In effect, individuals may see head injury, posttraumatic stress, and depression as part of an overall response to a traumatic event, and may thus be reporting accurate symptoms for such an experience. Another possible explanation may be found in the good-old-days hypothesis and generalized nocebo effect. Individuals may have nonspecific, pessimistic expectations for the consequences of a negative event, and presume that symptoms will be worse than they presently are—though

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without specific knowledge of which symptoms will be worse. Though individuals expect negative consequences from suffering a head injury, posttraumatic stress, or depression, they do not have a distinct conceptualization for the disorders.

Such findings suggest that information about symptoms typically associated with a given disorder may alter symptom perception. This possibility was successfully realized by Mittenberg et al. (1996) in a study of consecutively admitted head injury patients. Individuals in the experimental condition received a manual (Mittenberg et al., 1993) with basic head injury information and the expectation as etiology model in everyday language. Treated individuals also met with a therapist who offered suggestions on returning to premorbid activity level, how to reduce symptoms in the face of social stressors, and how to gain the most subjective benefit from the manual. Treated individuals showed shorter average symptom duration, lower frequency of symptoms, fewer symptomatic days, and lower reported severity of symptoms at 6-month follow-up than those receiving standard care. Such findings suggest that modification of expectations, even when addressed in a single session, may have lasting consequences of reported symptoms. Future studies should continue to address the role that cognitive factors may play in postconcussion syndrome, as such studies may suggest increasingly effective treatments for individuals with PCS and persistent PCS. Future studies should also address the possibility that a similar intervention may alleviate some cognitive and somatic complaints in individuals with disorders other than PCS.

In all, results of this study suggests that individuals do not expect a specific constellation of symptoms following head injury, as individuals portraying head injury, posttraumatic stress, and depression expected similar number and types of symptoms. This finding is consistent with the predictions of the good-old-days model and a generalized nocebo effect, as both models predict individuals would expect nonspecific negative consequences from an undesirable event. Future studies should examine the relationship, if any, between an individual's rating of the undesirability of a given disorder/event, and the number of subsequent symptoms they expect to experience. It is possible that a greater level of subjective undesirability may be associated with increased symptom report in individuals.

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APPENDIX

POSTCONCUSSIVE SYNDROME CHECKLIST

Subscales

Cognitive/memory items

1. Trouble remembering things
3. Forgetting telephone numbers you use frequently
4. Problem concentrating when reading
9. Forgetting where you went today
18. Forgetting who you saw yesterday
21. Feeling disorganized
22. Feeling confused
27. Word finding problems
37. Slowed thinking
39. Poor judgement
45. Loss of common sense
49. Forgetting where you put things (e.g., keys)
52. Knowing whether you have already told someone something
54. Forgetting directions to places
55. Finding yourself beginning to do something and forgetting what you are doing
56. Losing the thread of thought in conversation

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57. Difficulty remembering things you have done (i.e., lock door, turn off stove)
58. Forgetting appointments or meetings
63. Forgetting grocery items while shopping
66. Losing wallet or pocketbook
67. Losing items around the house
68. Forgetting yesterday's newspaper stories
71. Forgetting names of new acquaintances
74. Forgetting television news stories
81. Forgetting recent telephone conversations
82. Forgetting who telephoned recently
84. Forgetting things people tell you
86. Forgetting telephone numbers you have just checked
89. Being easily distracted
91. Forgetting why you entered a room

Mood/affect items

2. Difficulty becoming interested
7. Irritable
8. Restless
10. Impatient
17. Anxiety/nervousness
19. Feeling depressed
23. Loss of efficiency in carrying out everyday tasks
28. Trembling or tremors
33. Feeling tense
38. Rapid heartbeat
40. Chest pressure
41. Fearing having an illness
43. Feeling totally disabled
59. Getting in frequent arguments with your friends or family
73. Sleeping problems
76. Substantial weight loss or gain
77. More talkative than usual/pressure to keep talking
79. Feelings of hopelessness
80. Shortness of breath/smothering
83. Nightmares/flashbacks
85. Worrying about health
90. Losing temper

Somatic items

5. Having back pain
12. Feeling dizzy
13. Ear ringing
14. Noise sensitivity
26. Numbness in parts of your body
31. Slurring of speech
32. Having seizures
42. Trouble walking
47. Difficulty with fine motor coordination
50. Neck pain
75. Tiring easily
81. Bumping into things
87. Having shoulder pain
92. Hearing problems
93. Weakness in parts of your body
96. Having headaches

Distractor items

6. Difficulty with eyes
11. Incontinence
15. Not recognizing members of your family or other familiar people
16. Amnesia for events occurring well in the past
20. Not remembering how to do well-known, everyday tasks
24. Sexual problems
26. Diarrhea
29. Forgetting names of people you know well
30. Having elbow pain
34. Constipation
35. Not remembering details about your personal life
48. Not knowing where I am
61. Having foot pain
69. Sweating
72. Hallucinations
88. Feeling nauseous
95. Marital problems

Metamemory items

36. Leaving reminder notes in prominent places (e.g., fridge, door, table, etc.)
44. Having others call you to remind you of important events

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46. Using map/written directions to find a new place
51. Having to make a grocery list
53. Having to mentally rehearse important information
60. Having to write reminder notes
62. Keeping objects in a prominent place where you'll see them (e.g., keys by the door)
64. Keeping objects in an identical place so you always know where to find them
65. Planning a daily schedule in advance
70. Having to use watch/clock alarms to remind you of important times
97. Using a tape recorder to record important conversations

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