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"Expectation as etiology" *versus* "the good old days": Postconcussion syndrome symptom reporting in athletes, headache sufferers, and depressed individuals

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Abstract

The present study explored the explanatory power of Mittenberg's "expectation as etiology" theory for the persistence of postconcussion syndrome (PCS) complaints. One hundred forty-one participants completed a PCS symptom checklist under 2 conditions. Normal controls, healthy athletes and depressed individuals reported current symptoms and symptoms expected following a hypothetical mild head injury. Head-injured athletes, chronic headache sufferers, and a 2nd sample of normal controls reported current symptoms and retrospective symptoms (prior to their injury/illness or from some point in the past). Depressed individuals reported more current symptoms than normal controls and healthy athletes, demonstrating that "PCS" symptoms are not specific to PCS. All groups expected more symptoms following mild head injury than currently experienced, supporting the idea that individuals expect negative consequences following head injury. However, healthy athletes expected fewer symptoms than normals or depressed individuals, possibly due to preexisting expectations for speedy recovery. Both head-injured athletes and headache sufferers reported more current symptoms than the past, but not at a rate lower than baseline of normal controls. Results suggest that the "expectation as etiology" hypothesis may be too specific, and that, following any negative event, people may attribute all symptoms to that negative event (the "good old days" hypothesis). (*JINS*, 2001, *7*, 323–333.)

Keywords: Postconcussion syndrome, Expectation as etiology, Symptom report, Good old days, Symptom expectation

INTRODUCTION

Despite its inclusion in DSM–IV (American Psychiatric Association, 1994) and a growing number of studies, the notion of postconcussion syndrome (PCS) remains controversial (Fox et al., 1995a, 1995b), with disagreement upon the etiology and maintenance of this disorder. Many psychologists suggest that sequelae of mild head injury are short-lived, with resolution of most symptoms in less than 3 months (Barth et al., 1989; Kibby & Long, 1996; Levin et al., 1987). However, rates of reported recovery vary, from as brief as 10 days (Macciocchi et al., 1996) to more than 1 year post injury (Alves et al., 1993) found in the literature.

Some theorists posit an interplay between organic injury and psychological factors (Kibby & Long, 1996; Levin et al., 1987, Lishman, 1988; McClelland, 1996) as a central cause of PCS. Mittenberg et al. (1992) suggested the incidence and persistence of PCS may be explained by the degree to which an individual reattributes common complaints to the head injury. At the risk of oversimplification, an individual may begin attributing all headaches to the head injury, and forgets their premorbid prevalence. Instead of a "long day at work" giving him/her a headache, it is the lingering effects of the head injury. In this fashion, everyday complaints become linked to the injury, and thus become more difficult to treat. A test of this "expectation as etiology" theory found approximately 67% shared variance between the symptoms expected on an everyday basis by controls and symptoms experienced by individuals with PCS (Mittenberg et al., 1992). Additionally, individuals with head injury endorsed pre-morbid symptoms at a rate lower than that currently experienced by controls, thus suggesting a reattribution of everyday "symptoms" to the head injury. However, the literature in this area has failed to address the possibility that all individuals, not only those with docu-

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mentable head injuries, report experiencing more current symptoms than they experienced in the past. Ross and Conway's (1986) constructive model of memory suggests that individuals anchor memories on their current belief, attitude or mood state, and then infer information about the past in a manner consistent with their expectations. This model readily lends itself to PCS. After suffering an injury, individuals are frequently asked to report the current and premorbid frequency of symptoms. Through their expectation of an increase in symptoms following a head injury, individuals report the past as being better than the present. In this way, it may be common for all individuals to selectively remember being healthier in the past and to fail to remember having common maladies. To date, no studies have adequately tested for a general response bias in retrospective symptom reporting.

In many situations, an individual's self-reported symptoms comprise a majority of the evaluation for PCS diagnosis (Dunn et al., 1995). This practice has been questioned in recent years (e.g. Dunn et al., 1995; Lees-Haley & Brown, 1993; Wong et al., 1994). Base rates of reported PCS symptoms have been found to be similar in matched comparisons of injured and noninjured individuals using symptom checklists (Fox et al., 1995a, 1995b; Gouvier et al., 1988), suggesting that self-report of symptoms of "PCS" are at best not specific to this disorder. A host of factors have been shown to influence report of neuropsychological symptoms, including malingering (Youngjohn et al., 1995), emotional state and affectivity (Seidenberg et al., 1994), expectations (Barth et al., 1989), and chronic pain conditions (Iverson & McCracken, 1997).

Malingering and Knowledge of Head-Injury Symptoms

Individuals with head injury who are involved in litigation have been shown to endorse symptoms on purported PCS checklists at a rate higher than that of head-injured clients not in litigation (Dunn et al., 1995; Lees-Haley & Brown, 1993; Rutherford, 1989). Wong et al. (1994) found that persons simulating head injury had endorsement rates on checklists that were similar to rates found in head-injured clients of Gouvier et al. (1992), suggesting noninjured individuals can accurately endorse PCS symptomology when instructed to do so. However, Youngjohn et al. (1995) found a substantial minority of head-injured clients in litigation reported "exceedingly improbable" symptoms, including double vision only when walking through doorways, and triple vision. In all, studies in this area suggest that individuals anticipate negative consequences after head injury, though may be uncertain as to the nature of those consequences. Indeed, a growing number of studies show individuals without head injury reporting symptom rates equivalent to head injury victims. Examples of such groups include individuals seeking psychotherapy (Fox et al., 1995b), litigants without history of head injury (Lees-Haley & Brown, 1993), a comparison of college students (Gouvier et al., 1992), and individuals with chronic pain (Iverson & McCracken, 1997).

Emotional State and "PCS"

A number of psychological factors have been shown to elicit self-reported symptoms similar to PCS somatic symptoms and complaints, including psychological disorders (Fox et al, 1995b; Gfeller et al., 1996) and negative affective states (Burton & Volpe, 1988; Errico et al., 1990; Seidenberg et al., 1994; Youngjohn et al., 1995). Studies in this area typically assess reported symptoms of individuals presenting for treatment; however, treatment seeking behavior may be a possible confounding variable. Depressed individuals entering treatment may be quantitatively and qualitatively different from individuals with similar symptomatology, but not seeking treatment. Maier et al. (1992) found that introversion, being female, increasing age, manic or hypomanic episodes, and symptom recurrence were related to seeking treatment. Galbaud du Fort et al. (1999) suggest that individuals presenting for treatment may be more likely to have comorbid conditions, which is consistent with the findings of Bland et al.'s (1997) epidemiological study. Festinger's (1957) theory of cognitive dissonance would suggest that treatment seeking individuals would increase reported rates of symptoms to justify their actions to themselves. To date, no studies have accounted for the possibility of treatment seeking behavior being a crucial variable in symptom reporting of depressed individuals.

Expectations and Mild Head Injuries in Athletes

Concussions are the most common head injury in athletes (Gerberich et al., 1983), with greater than 90% of sports-related head injuries being mild. Though concussion rates vary, most high school sports include head injury as a possible risk (Powell & Barber-Foss, 1999). A recent study found 34% of college football players had experienced a concussion during 1 year of play, and 20% had received multiple concussions in their career (Collins et al., 1999). Their study also found football players who had never suffered a head injury reported fewer symptoms than those with one or more such injuries. However, symptom reports were made within 7 days post injury, well within the acute phase of recovery. It seems likely that further recovery would take place, which may alter symptom reporting. Other studies (Barth et al., 1989; Macciocchi et al., 1996) have demonstrated that mildly head injured athletes show cognitive improvements to baseline within 10 days post injury. Their rates of self-reported symptoms also improve to preseason baseline within days, despite having rates comparable to other head-injured groups during the first few days after the injury (Macciocchi et al., 1996). A recent study by Ferguson et al. (1999) found that head-injured athletes ($M = 6$ months post injury, $SD = 4.9$ months) did not report more PCS symptoms than athletes

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without head injury, and that head injured athletes reported more current than premorbid symptoms. Consistent with the head-injured nonathletes of Mittenberg et al. (1992), head-injured athletes underestimated the premorbid frequency of symptoms, as they reported experiencing symptoms at a rate lower than baseline of controls prior to their injury. However, it should be noted that many of the head-injured athletes in Ferguson et al. (1999) were in the acute stage of recovery, and it is likely their symptom reports will change with time. Head-injured athletes may have different expectations of recovery and symptomatology than typical mild head-injury patients. It seems plausible that these differing expectations would result in differential symptom presentation and duration when compared to normal controls.

Chronic Pain, Chronic Tension Headache and PCS

Grigsby et al. (1994) suggest that headaches or chronic pain may hamper memory and information processing skills, especially in individuals suffering a mild head injury. Consistent with this notion, individuals with chronic pain and chronic headaches have been shown to report symptoms similar to that found in PCS (Iverson & McCracken, 1997). Iverson and McCracken found that 94% of individuals with chronic pain met three or more of the four criteria necessary for DSM–IV diagnosis of PCS, and 39% would have met full diagnostic criteria for the disorder. Similar results have been found by others (Gfeller et al., 1996; Packard et al., 1993). As in affective disorders, treatment seeking behavior may prove to be an important variable in the self report of symptoms in individuals with chronic pain, but this variable has not been explored in studies to date.

Present Study

We sought to examine the relative contribution of malingering, emotional state/affectivity, expectations, and chronic pain in the reporting of PCS symptoms. First, we will explore the differences in rates of reports of current PCS symptoms in healthy controls, healthy athlete controls, head-injured athletes, depressed persons, and persons with chronic headaches. Given the results of other studies, we predicted that persons with depression and chronic headaches will endorse more PCS symptoms than other groups. However, since our samples will be non-treatment-seeking, the findings may not be as strong as those seen in prior studies. We did not expect head injured athletes to report higher levels of PCS symptoms, because they likely have expectations of full recovery from their injuries.

To explore whether different groups have different expectations about the consequences of head injury, we asked the healthy controls, healthy athlete controls, and depressed persons to simulate head injury when answering questions about PCS symptoms. We expected that all groups will endorse more symptoms when simulating head injury than they reported at baseline. We also explored the possibility that depressed persons will expect more symptoms, given their negative affectivity, and that healthy athletes will expect less symptoms, given their expectations for good health and speedy recovery.

To explore the "expectation as etiology" hypothesis, the head-injured athletes, the chronic headache group, and a second group of healthy controls were asked to give ratings of premorbid symptoms. If the "expectation as etiology" hypothesis is correct, the head-injured athlete group should report experiencing fewer symptoms prior to the onset of their headaches than they currently experience, and their ratings of prior symptoms will be lower than the current ratings of healthy controls (as per Mittenberg et al., 1992). However, head-injured athletes may have different expectations about head injury than others who experience head injury, and thus may not report fewer premorbid than current symptoms, and their rate of premorbid symptoms might be consistent with the rate of current symptoms experienced by healthy controls or healthy athletes. If instead there is a general response bias for all individuals to view themselves as healthier in the past, all groups, including healthy controls and headache sufferers, will report fewer premorbid than current symptoms.

METHODS

Research Participants

There were six groups in the study, with a total of 141 total participants. All were drawn from the undergraduate population of a mid-sized Midwestern university, and received course credit for their participation. The first group consisted of prospective healthy controls, and included 25 individuals recruited through sign-up sheets. Group 2 was comprised of 25 individuals identified as reporting high rates of depressive symptomatology, but not currently seeking psychotherapy or receiving pharmacological treatment. Depressed individuals were recruited based on scores on the Inventory of Depressive Symptomatology (IDS; Rush et al., 1986), which about 1000 undergraduates had completed as part of a mass screening. Individuals obtaining a score greater than 18 were contacted by phone and invited to participate in the present study. The third group was 25 athletes recruited through the use of sign-up sheets who reported a history of head injury/concussion during athletic competition. Group 4 was 21 athletes without history of head injury. Group 5 was comprised of 20 chronic tension headache sufferers not seeking treatment for their headaches.

The same 1000 undergraduates screened for depression were screened for chronic tension headache with Lipchik's (1996) revision of the Headache Screening Questionnaire (HSQ) (Holm, 1983). Those individuals meeting inclusion criteria on the HSQ were asked to participate in the Structured Diagnostic Interview for Headache, Brief Version (Holyrod & French, 1995). Participants who met criteria for chronic tension headache were contacted by phone and in-

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vited to participate in the present study. Individuals were excluded from participation if they reported more than 1 migraine headache per month, cluster headaches, concurrent pain disorder, TMD or occlusional disorders, major pain or psychiatric medication use, or excessive analgesic use, or were currently seeking psychological treatment for their pain. Headache sufferers were also excluded if they reported a history of head injury. Group 6, 25 retrospective healthy controls, were recruited through the use of sign-up sheets.

Measures

All participants were asked to complete a brief questionnaire composed of demographic information, relevant medical history, and psychological history. Participants were then asked to complete a 97-item symptom checklist comprised of common neuropsychological symptoms and distractor items (see Appendix). A composite symptom checklist was developed for this study through a compilation of items from other studies (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). The symptom checklist demonstrated adequate internal reliability in a pilot study of 19 participants, with a coefficient of .97. A second pilot study found a full scale test–retest reliability was also adequate (.88) at a 2-week interval in 18 undergraduates. Mean for the first administration was 32 (SD = 15.2) and mean for the second administration was 33.5 (SD = 19.1). In this study, symptom severity was rated on a 5-point Likert scale, with responses of 3 or more being categorized as an endorsement of the symptom. However, all analyses were conducted both present–absent and severity fashion, with no differences being found between analyses. Therefore, to better match past studies, all analyses reported below were conducted in a present–absent fashion.

Procedure

Depressed individuals completed the demographic questionnaire and symptom checklist within 1 to 5 weeks following the mass screening, with a majority (about 65%) 3 and 4 weeks post screening. Individuals for all remaining groups were recruited throughout the academic quarter, with an upper limit of 9 weeks post screening.

After giving informed consent, participants were given a packet comprised of the demographic information page and the symptom checklist. At that time, all groups were asked to complete the symptom checklist by identifying the symptoms they currently experience. Following that, individuals received differential instructions, contingent upon group membership (see Table 1).

Individuals in the prospective healthy control, healthy athlete, and depressed conditions were asked to imagine a scenario in which they incur a head injury and to endorse symptoms they would anticipate experiencing after the injury. The following vignette (as per Mittenberg et al., 1992) was used.

> 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 to recover from the mild head injury. Try to imagine that you had this accident about six months ago, and answer the question below as you think you might answer the questions after an accident like this. If you aren't sure how to answer, guess.

Head-injured athletes, chronic tension headache sufferers, and the second set of healthy controls were asked to report the rate of symptoms experienced at some point in the past. Specifically, head-injured athletes had the following instructions (Mittenberg et al., 1992):

> Head injuries or concussions are a fact of life and can happen to anyone. We are interested in how your head injury or concussion has (or has not) affected your ability to do everyday things. Answer the questions below as you currently experience them. If you aren't sure how to answer, guess.
>
> Now we would like you to answer the questions below as you would have before the accident (how you used to be). If you aren't sure how to answer, guess.

Table 1. Research paradigm

Retrospective symptoms	Actual symptoms	Expected symptoms
Head-injured athletes	Head-injured athletes	
Chronic tension headache	Chronic tension headache	
Healthy controls	Healthy controls	
	Healthy controls	Healthy controls
	Depressed	Depressed
	Healthy athletes	Healthy athletes

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Table 2. Demographic variables in each respective condition

Group	Total *N*	No. male	No. minority	*M* Age	*M* years education
Healthy controls 1	25	3	1	18.4	13.5
Head-injured athletes	25	18	2	18.8	13.4
Healthy athletes	21	6	4	19.4	13.2
Depressed	25	4	3	18.7	13.2
Headache	20	3	2	19.0	13.4
Healthy controls 2	25	5	1	19.8	13.9

Participants with chronic tension headache had the following instructions:

> Headaches are a fact of life and can happen to anyone. We are interested in how your headaches do (or do not) affect your ability to do everyday things. Answer the questions below as you notice the symptom now (after the onset). If you aren't sure how to answer, guess.
>
> Now, we would like you to answer the questions below as you would have before the onset of headaches (how you used to be). If you aren't sure how to answer, guess.

Finally, individuals in the retrospective healthy control condition were given the following instructions:

> Now we would like for you to respond to the items on the questionnaire in the way you would have two or three years ago. If you aren't sure how to answer, guess.

RESULTS

There were no differences among groups in age, educational attainment, or race (see Table 2). A sex difference appeared ($\chi^2 = 24.8$, $p < .01$), with more men than expected in the head-injured athlete group.

Within groups, female chronic tension headache sufferers reported more current symptoms than did male headache sufferers ($F(1,18) = 7.327$, $p < .02$). No additional within group gender differences emerged. The sex difference for headache sufferers should be weighed carefully, as the result comes from a small amount of individuals. Further, when collapsing across groups, no sex difference in the number of current symptoms appeared ($F(1,136) < 1$), so sex was not used as a covariate in subsequent analyses.

Current Symptoms

One-way ANOVA revealed group differences in the number of current symptoms endorsed ($F(5,135) = 5.17$, $p < .01$). Bonferroni-corrected posttests demonstrated depressed participants endorsed more current symptoms than did prospective controls, athlete controls, or retrospective controls (see Table 3). No additional between-group differences appeared.

Expected Symptoms

Repeated-measures ANOVA revealed a significant interaction in expected symptoms among healthy controls, depressed individuals, and healthy athletes ($F(2,68) = 8.56$, $p < .01$). Follow-up *t* tests showed that, although all three groups expected more symptoms than they currently experience, athlete controls expected fewer symptoms than normal controls or depressed individuals following mild head injury. However, contrary to expectations, depressed individuals did not expect more symptoms than nondepressed individuals.

Retrospective Symptoms

To examine the predictions of the "expectation as etiology" hypothesis and the possibility of a more general response bias, we examined whether head-injured athletes, chronic tension headache sufferers, and healthy controls would report fewer premorbid symptoms than they currently experience. Repeated measures ANOVA revealed a nonsignificant Group × Time of Measurement interaction ($F(2,67) = 2.95$, $p < .10$). Time of measurement was significant ($F(1,67) =$

Table 3. Means and standard deviations for each respective condition

Group	Retrospective *M* (*SD*)	Actual *M* (*SD*)	Expected *M* (*SD*)
Head-injured athlete	19.32 (23.30)	34.60 (23.80)	
Headache	21.15 (20.53)	33.05 (15.18)	
Healthy controls	27.60 (14.79)	29.36 (12.56)	
Healthy controls		26.92 (15.87)	74.04 (21.24)
Depressed		43.56 (16.26)	68.68 (22.29)
Healthy athletes		20.19 (13.50)	46.23 (32.57)

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15.55, $p < .001$), and follow-up tests revealed that both head injured athletes and headache sufferers reported less symptoms premorbidly than currently, while the difference in premorbid and current reports of healthy controls was not significant. There were no significant between groups differences in either current or retrospective symptom reporting ($F(2,67) < 1$ for current symptoms, $F(2,67) = 1.19$, p = n.s. for retrospective symptoms).

As a further test of the "expectation as etiology" hypothesis, we compared the premorbid rates endorsed by head-injured athletes and headache sufferers to the current base rates seen in healthy controls and athlete controls. No differences emerged between the estimated premorbid levels of head-injured athletes or headache sufferers and the number of current symptoms reported by normal controls ($F < 1$) or by the athlete controls ($F < 1$). This is in contradiction to the findings of Mittenberg et al. (1992), who found that PCS patients endorsed premorbid symptoms at a rate far below that experienced currently by their controls. This finding is also inconsistent with those of Ferguson et al. (1999) who found that head-injured athletes reported premorbid symptoms at a rate lower than baseline of controls.

Subscales

In addition to overall numbers of symptoms reported, groups were also compared on the memory/cognition, somatic, distractor, affect, and metamemory/memory strategy subscales of the symptom checklist.

Current symptoms

ANOVA revealed between-group differences in four of the five subscales. Depressed individuals reported more current memory/cognition problems ($F(5,135) = 3.61$, $p < .01$) and more distractor items ($F(5,135) = 2.739$, $p < .02$) than healthy athletes. Depressed individuals also reported more current somatic ($F(5,135) = 4.15$, $p < .01$) and affective symptoms ($F(5,135) = 4.82$, $p < .01$) than either the healthy athletes or first group of normal controls. No other between-group differences emerged for current symptoms.

Expected symptoms

Holm's (1979) corrected repeated measures ANOVA showed that individuals in the normal control, depressed, and healthy athlete condition all expected to experience increased symptoms in all subscales, including distractor items (see Table 4). ANOVA also revealed between-group differences for all expected symptoms, as healthy athletes expected fewer memory/cognitive problems ($F(2,68) = 6.02$, $p < .005$), somatic complaints ($F(2,68) = 7.747$, $p < .001$), distractor items ($F(2,68) = 9.635$, $p < .001$), affective symptomatology ($F(2,68) = 6.077$, $p < .005$), and less use of memory devices ($F(2,68) = 5.52$, $p < .006$) than depressed individuals or controls.

Retrospective symptoms

Results of Holm's (1979) corrected repeated measures ANOVA found that head-injured athletes reported using fewer

Table 4. Within-group differences for subscales on a PCS symptom checklist

Group	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Prospective normals				
Current	26.92 (15.87) expected	76.04 (21.24)		
Memory	8.56 (6.53)	25.00 (7.51)	78.334	.000*
Somatic	2.48 (1.90)	12.88 (4.02)	164.711	.000*
Distract	2.52 (2.42)	11.6 (4.05)	98.132	.000*
Affect	6.52 (4.06)	16.56 (5.26)	62.548	.000*
Metamemory	5.24 (3.5)	9.28 (2.34)	23.044	.000*
Depressed				
Current	43.56 (16.26) expected	68.68 (22.29)		
Memory	13.88 (5.92)	23.28 (6.85)	49.743	.000*
Somatic	5.04 (3.32)	11.88 (3.96)	92.535	.000*
Distract	3.72 (2.82)	9.72 (4.88)	78.261	.000*
Affect	10.8 (4.99)	14.92 (6.61)	19.562	.000*
Metamemory	6.92 (2.52)	8.88 (2.35)	13.973	.000*
Healthy athletes				
Current	20.19 (13.50) expected	46.23 (32.57)		
Memory	6.43 (4.41)	16.48 (11.49)	23.183	.000*
Somatic	1.85 (1.79)	7.76 (5.80)	20.357	.000*
Distract	1.14 (1.19)	5.62 (5.08)	21.958	.000*
Affect	4.38 (4.40)	10.00 (7.75)	12.666	.002*
Metamemory	4.90 (3.46)	6.57 (4.01)	9.067	.007*

Note. * Denotes repeated measures significance with Holm's correction.

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Table 5. Within-group differences on subscales of a PCS symptom checklist

Group	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Head-injured athletes				
Current	34.60 (23.80) premorbid	19.32 (23.30)		
Memory	12.16 (9.24)	7.80 (9.26)	3.665	.068
Somatic	3.68 (3.38)	2.08 (3.72)	2.965	.098
Distract	2.88 (2.65)	2.36 (2.97)	<1	
Affect	7.00 (5.85)	4.12 (5.76)	4.352	.049
Metamemory	5.76 (3.17)	2.96 (3.18)	12.5111	.002*
Headache				
Current	33.05 (15.18) premorbid	21.15 (20.53)		
Memory	10.55 (6.35)	7.15 (5.15)	9.525	.006*
Somatic	4.10 (2.10)	2.95 (3.75)	2.600	.123
Distract	2.80 (2.82)	2.00 (3.20)	1.942	.179
Affect	7.80 (4.16)	5.15 (5.20)	10.087	.005*
Metamemory	6.05 (2.04)	3.90 (3.57)	12.498	.002*
Retrospective normals				
Current	29.36 (12.56) premorbid	27.60 (14.79)		
Memory	10.44 (6.08)	10.44 (6.23)	<1	
Somatic	3.80 (2.89)	2.48 (2.29)	8.122	.009*
Distract	2.46 (2.04)	2.68 (2.06)	<1	
Affect	7.16 (3.76)	7.08 (4.68)	<1	
Metamemory	5.88 (2.46)	4.92 (2.96)	4.355	.048

Note. * Denotes significance with Holm's correction.

memory aids prior to their head injury (see Table 5). Chronic tension headache sufferers reported experiencing fewer memory and cognition problems, having less affective symptomatology, and using fewer memory compensation devices prior to the onset of their headaches. Controls reported experiencing less somatic symptoms "2 or 3" years ago.

No differences in premorbid symptom rates emerged among head-injured athletes, chronic tension headache sufferers, or normal controls.

DISCUSSION

In all, results from this study do not completely support the "expectation as etiology hypothesis." We expected that individuals with chronic headache and depressive symptoms would report more current "PCS" symptoms than would healthy controls, healthy athletes, or athletes with a history of mild head injury. This hypothesis was partially supported: depressed individuals did report more current symptoms than other groups. Depressed individuals showed similar elevations on various subscales, with elevated rates of memory/cognitive complaints, distractor items, somatic symptoms, and affective symptomatology. This finding is consistent with other studies that demonstrate that self-report "PCS" instruments are not specific to PCS (Fox et al., 1995a, 1995b; Gfeller et al., 1996). It is unclear the mechanism through which depressed affect may lead to increased symptom endorsement, though Seidenberg (1994) posited negative affectivity leads to negative appraisal of cognitive functioning.

Most notable is that the head injured athletes, despite having a documentable mild head injury, did not report any more current PCS symptoms than other groups. What nonneurological factors differentiate mild head injured athletes from others with mild head injury? Expectation for recovery is certainly one possibility; treatment seeking behavior is another. "Expectation as etiology" theory would predict that individuals can accurately report PCS symptoms following a hypothetical head injury. This was supported by our findings. Healthy controls, healthy athletes, and depressed individuals all expected to experience more symptoms following a mild head injury than they currently experienced. We also predicted that, because of negative affectivity, depressed individuals would expect to experience more symptoms than controls and healthy athletes; this was not supported by our results. One explanation is that our depressed individuals, though having scores in the clinical range on the IDS, were not seeking any form of treatment for their depressive symptoms. Future studies should continue to examine the role of depression in the expectation of PCS symptoms, and should include both participants recruited from treatment settings and others who are not seeking treatment, to further explore the contribution of treatment seeking to symptom presentation.

Consistent with "expectation as etiology," we also predicted that healthy athletes would expect to experience fewer post-head-injury symptoms than healthy controls and depressed individuals, which was confirmed by the results of the study. Similar findings emerged in the subscales, with healthy athletes expecting fewer memory/cognitive problems, somatic complaints, distractor items, affective symp-

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tomatology, and less reliance on memory compensation devices than other groups. These findings support the idea that athletes may have a general expectation of health and recovery. This expectation may come from experience (frequently being present when mild head injuries occur, and witnessing individuals who recover quickly from such injuries) or may come from a general expectation or pressure from their peers and coaches to recover.

Further support for the "expectation as etiology" theory is seen by the finding that head-injured athletes reported significantly more current symptoms than premorbid symptoms. However, this finding was not specific to the head-injured group. Persons with chronic headaches also reported more "PCS" symptoms currently than prior to the onset of their headache problems, and headache sufferers actually showed increases in a greater number of subscales than did head-injured athletes. Furthermore, despite these differences, neither head-injured athletes nor chronic tension headache sufferers reported premorbid symptoms at a rate lower than the baseline of normal controls, nor were there between group differences in either premorbid symptom levels, current symptom levels, or any subscales. These findings are contrary to those of Mittenberg et al. (1992) and Ferguson et al. (1999) who found that individuals with PCS tended to underestimate the normal baseline of PCS-type symptoms, believing that they themselves had many fewer of these symptoms prior to their injury. One possible explanation for the difference may be found in the amount of time between head injury and assessment. In this study, head-injured athletes were assessed an average of 2.1 years following their injury. This time interval may allow a return to near normal levels in both symptoms and subjective distress, and individuals may thus report a relatively lower rate of symptoms.

There are several possible explanations for these findings. One explanation might be a general response bias to view oneself as healthier in the past. This hypothesis predicts that all groups would show lower estimates of premorbid symptoms relative to baseline symptoms. However, findings did not support this hypothesis either. Healthy controls did not report significantly fewer PCS symptoms in the past. This finding may have been due to the vagueness of the question they were asked (rate symptoms "2 or 3 years ago"). However, the overall pattern of results also suggests that "expectation as etiology" need not be as specific as expectations for the consequences of head injury. In other words, experience of any negative event, be it accident or illness, head injury or non-head-injury, may be required for one to focus on the past as "better" than one's current state, for one to think about the "good old days" prior to the negative event.

Another explanation suggesting a cognitive mechanism is Kirsch's (1985) response expectation theory, and the more specific nocebo effect. The nocebo effect suggests an individual's pessimistic expectations about an experience cause that experience (Hahn, 1999). To illustrate the nocebo effect, Hahn (1999) offers examples from both research and clinical settings. 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 acknowledged the experience of headache pain. Similar work has been conducted with asthma patients (Luparello et al.,1968), and psychogenic seizure patients (Lancman et al., 1994). With ambiguous stimuli, especially something as ambiguous as an internal state or condition, an individual's experience may be based largely upon one's expectation of that experience. Expectation as etiology theory would suggest that specific expectations about head injury lead to the report of specific PCS symptoms. However, more consistent with a generalized expectation of negative outcome regardless of the nature of the event or experience (Hahn, 1997), we found that both head-injured and headache groups saw the past as being better than the present with regard to PCS-type symptoms. In fact, the headache group endorsed an increase in a greater number of PCS subscales than the head-injured athletes.

Another possible explanation is that, for individuals injured in athletic competition, lingering deficits and symptoms do exist as a result of the injury. However, both the group that had experienced head injury (head injured athletes) and the group that had *not* experienced head injury (chronic tension headache) reported they had more PCS symptoms currently than prior to their accident/illness, again supporting the idea that PCS symptoms are not specific to PCS. This is consistent with the more general "good old days" hypothesis, which suggests that any negative life event becomes the salient landmark for viewing current state as a negative change from the past. An important issue to examine in future studies is whether there are specific PCS symptoms or symptom clusters that are associated with particular illnesses or injuries; we may find that there are PCS symptoms specific to having a prior head injury that are still consistent with the more specific "expectation as etiology" hypothesis. Results of this study suggest that nonneurologic factors alter reports of symptoms in all domains of functioning in addition to overall symptom rates, as depressed individuals showed elevated symptom reports in four of five subscales. Future studies should further explore the nonneurologic factors that can contribute to self report of PCS symptoms, by including persons with psychiatric complaints who are treatment-seeking or non-treatment-seeking, and persons with mild head injury but who may have different expectations for recovery (involvement in litigation, nonathletes, etc.).

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Appendix

POSTCONCUSSIVE SYMPTOM CHECKLIST BY 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 judgment
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
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

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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
95. 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
94. 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
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
96. Using a tape recorder to record important conversations

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