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A comparison of mildly head-injured, malingering, and non-head-injured adult South Africans : neuropsychological performance and post-concussion symptoms.

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While claims have been made that postconcussive sequelae may prevent return to work (Kibby and Long, 1996), this could not be investigated, given the sample composition (see the Results section). Outcome, as with the cognitive assessment, was assessed in terms of test responses, relative to those of the noninjured group.

Three areas were considered: differential reporting of complaints (according to category of posttraumatic interval), relationships between postconcussive complaints and cognitive performance, and factors associated with the development of postconcussive complaints.

1.2.1. Differential Reporting of Complaints, according to Posttraumatic Interval

Rather than reporting greater post-injury symptoms incidence, all of the subgroups reported more favourable pre-injury symptom status than the noninjured group. This suggests support for the view that cognitive misattribution plays a role in forming post-injury experience (as suggested by, for example, Mittenberg et al, 1992). If the results of this study can be generalised, this misattribution appears to result from an underestimation of pre-injury symptoms, rather than an exaggerated experience of post-injury symptoms. This supports claims by, inter alia, Mittenberg et al. (1992), and Wong et al. (1994). This applied particularly to the intermediate and long term injured groups, whereas the

recently injured group did report an actual increase in post-injury anxiety, relative to the noninjured group. For the intermediate and long term injured subjects, complaints appear come out of a belief that deterioration has occurred, relative to pre-injury functioning, rather than experience of an absolute increase in symptoms. While the recently injured group reported an absolute increase in anxiety compared to the noninjured group, the cognitive performance of this group relative to the noninjured group does not suggest a corresponding difference in cognitive performance. This does not negate the reality of the anxiety reported, but suggests that it may result from factors other than cognitive difficulties.

If these findings are valid to a broader population, this would have implications in terms of rehabilitation. For certain subjects, the emphasis would be on creating a new personal narrative around the injury (consistent with the cognitive-behavioural perspective of Jacobson, 1995, as well as with the approach of Mittenberg et al., 1992). Given the possibilities suggested by the findings, it would be useful to have some indication of base rates of symptoms among the noninjured population.

The descriptive statistics for the noninjured group (Table 5.3.) may be useful in this regard, although it should be emphasized that the generalizability of these figures to the broader population is limited, not least by the size of the

sample. The development of norms for the general population is a priority but should be the result of more extensive research than was possible here.

Despite the insights that normative data can provide, and its potential usefulness in encouraging a change in personal narrative, it is important to be aware that the application of normative information to the individual is often problematic. As Lezak (1995) points out, real deterioration may occur, following which the individual may still be positioned favourably in relation to the general population, depending on the individual's pre-injury status. Disregarding the patient's experience may be harmful.

While the recently injured group is unique in reporting an absolute increase in complaints relative to the noninjured group, the long term injured group tended to report the greatest deterioration relative to the other injured groups. Members of the long term group perceived themselves to have deteriorated significantly more, relative to pre-injury functioning, in terms of symptom intensity and judgement difficulties, than the recently injured and intermediate injured groups, respectively. Once again, this was not associated with a corresponding decline in cognitive performance. This contrast in perceptions between the recently injured and long term injured groups is consistent with a suggested scenario of the recently injured subjects experiencing actual postconcussive complaints (although

probably not cognitively based, perhaps being stress-related, as suggested by Gouvier et al., 1992), while the long term subjects have a narrative around the injury: a belief that they have deteriorated (as posited by Mittenberg et al., 1992). At the same time, this analysis of the assessment data is based on an assumption that the noninjured group scores are valid indicators of the pre-injury status of the injured groups. Given the small numbers involved, this assumption should be treated cautiously.

While the topic of malingering is discussed more fully below, it is interesting to note at this stage the different perceptions that subjects in each or the 3 injured subgroups had regarding their post-injury deterioration, in relative to the responses of malingerers. The recently injured group reported most differently to the malingering group, in terms of number of symptoms reported. They were followed by the intermediate injured group, with the long term injured group reporting least differently to the malingering group. It would be speculative to attribute this to intentional or unintentional malingering, particularly in the absence of supporting evidence from the tests included to detect incomplete effort. Nevertheless, this finding is consistent with arguments that the more chronic symptoms are, the more likely that perceptions and interpretations surrounding the injury are involved (for example, Jacobson, 1995). The above is supported by an examination of correlations between postconcussive symptoms and time since injury. As time since

injury increased, so subjects' perception of their pre-injury status became more favourable, while they also reported greater post-injury deterioration relative to pre-injury functioning. By contrast, no corresponding evidence of cognitive deterioration was found, as was discussed previously.

1.2.2. Relationships between Postconcussive Complaints and Test Performance

It has been suggested that specific postconcussive complaints are related to specific cognitive deficits. For example, Bohnen, Twijnstra, and Jolles (1992) suggest that a reduction in the rate of information processing underlies postconcussive complaints. In addition, Lezak (1978), discussing traumatic brain injury in general, and not specifically mild head injury, states that perplexity, distractibility, and fatigue may result from "disruption of accustomed pathways" (p. 9).

Possible relationships between postconcussive complaints and tests performance were therefore investigated. Several postconcussive symptoms were significantly negatively correlated with performance on the Rey 15-item, suggesting that reporting of these symptoms may have been associated with incomplete effort (although, as has been mentioned, the injured groups did not display evidence of incomplete effort relative to the noninjured group. Any incomplete effort

within the injured group, relative to that group itself, is therefore subtle and slight).

It was decided that where such a negative relationship was found to exist between a symptom score and the Rey 15-item score, any other cognitive score also negatively related to that symptom would be difficult to accept at face value, as this effect could have resulted from incomplete effort. These relationships have therefore been disregarded, in considering links between postconcussive complaints and cognitive performance.

Evidence was found that difficulties with sustained attention were associated with perceived deterioration in terms of headache incidence. Difficulties with divided attention were also found to be associated with perceived deterioration in terms of headache incidence. Such evidence of difficulties with sustained and divided attention may, however, not necessarily be related to actual deterioration. It may be that, within the population as a whole, individuals experience different levels of complaints typically associated with concussion, and that people experiencing higher incidence of these complaints tend to perform more poorly on cognitive tasks. This is consistent with suggestions by Gouvier et al. (1992), that symptoms may vary with levels of stress. These researchers maintain that stress is known to be associated with anxiety disorders, and that anxiety levels rise, memory and concentration suffer.

Accompanying the above scenario, there may have been a tendency for those individuals with a history of concussion to attribute such complaints to the injury, believing that actual deterioration has occurred, whether or not this was the case (as suggested by Mittenberg et al., 1993).

Nevertheless, it is also possible that the differentiation noted within the injured group is in fact specifically related to physical damage. Given the findings of this study regarding chronicity, as well as injury severity (discussed above), it is more likely that such differentiation is related to differences within the injured group in terms of severity, rather than chronicity (recall that reporting of post-traumatic amnesia was found to be associated with indices of sustained attention). Nevertheless, it is also important to bear in mind that such associations, as may exist within the sample used, are subtle, and possibly not clinically significant. Consider the lack of differences between the injured group and the noninjured group, and the fairly stringent restrictions on injury severity employed, in screening injured subjects.

The above findings may be clarified by further research, investigating levels of injury severity within the category of mild head injury. It may be that, with larger groups of more finely differentiated subjects, mildly injured subjects at the more severe end of the spectrum might display cognitive deficits, relative to noninjured controls.

1.2.3. Factors associated with the Development of Postconcussive Complaints

To further investigate factors that might contribute to the incidence and development of postconcussive complaints, pre-, peri-, and post-injury factors were examined where possible.

1. Pre-injury factors

It was not possible to investigate factors predisposing subjects to injury itself, given that the injured group was not a random sample and that subjects may have possessed select characteristics as a result. Thus, this study cannot comment on previous findings regarding this issue, as reported in the literature review.

As far as factors predisposing subjects to postconcussional complaints are concerned, it was possible to look at relationships between various subjects characteristics and severity of postconcussional complaints. At the same time, however, several potential relationships could not be investigated due to the specific composition of the sample. Thus, it was not possibl to fully investigate the relationship between age and PCS, given that most subjects came from a narrow age range. The literature indicates that there is an age effect beyond the age of about 40 (Bohnen et

al., 1994) but only one injured subject in the present study fell into this category. Examination of correlations between the available ages and postconcussive complaints found no significant relationships, although this finding does not provide sufficient information to support or challenge the claims in the literature.

It was also not possible to investigate the claimed relationships between PCS and high occupational status (Kibby and Long, 1996) or low occupational status (Jacobson, 1995), given that many subjects were school pupils, while among the working subjects, there was little occupational diversity. It was also not possible to investigate the claimed relationship between severity of symptoms and previous injuries (Bohnen and Jolles, 1992; Jacobson, 1995), given that only one subject had sustained more than one injury. Finally, it was not possible to investigate previously claimed links between postconcussive symptoms and prior stress or chronic social adversity (Jacobson, 1995), given the practical limitations of the interview and assessment.

Thus, it is unfortunately not possible to comment on any of the four high risk groups identified by Gronwall (1989), namely older subjects, those having sustained previous injury, those in demanding occupations, and those experiencing many stressors. Thus, no comment can be made regarding Gronwall's claims.

One relationship which could be examined, was the claimed prevalence of symptoms among women (for example, Bohnen et al., 1994), although the findings are limited by the small numbers involved (twelve males and four females). The findings support claims by researchers such as Bohnen et al., that females are more likely to experience postconcussive complaints than males. It was not possible to extend this comparison to the injured subgroups, given the numbers available.

Region was also examined. While regional differences were found within both the injured and noninjured groups, no obvious explanation could be found for this finding. As stated previously, injured Gauteng residents reported less favourable pre-injury symptom status than injured Mpumalanga residents, while noninjured Gauteng residents reported more favourable pre- and post-injury symptom status. The effect was inconsistent, and although a predominance of females and older subjects was found within the Gauteng group, it is unclear how this may have been related to the findings.

Although it may be that regional effects were more direct, another factor to consider is the greater median period of hospitalisation among the Gauteng subjects. While this may be the effect of better medical facilities in Gauteng, it may equally be that Gauteng residents sustained relatively more severe injuries than Mpumalanga residents. This suggestion is, however, weakened by the lack of significant associations

between length of hospitalisation and cognitive performance. One would also expect any effect to manifest more consistently over the scores obtained. Given the limited number of variables associated with region, it is also possible that these associations are an artifact of the small numbers of subjects involved, and a function of individual characteristics, unrelated to region. Nevertheless, the nature in which region may have interacted with responses is ultimately not clear, and should be the subject of further research.

Education was also examined, despite the narrow range available, and it was found that more educated subjects were less inclined to develop postconcussive complaints. This accords with findings in the literature that the development of postconcussive symptoms is linked to lower levels of education (Bohnen and Jolles, 1992, and Bohnen et al., 1994). The findings are also consistent with the suggestion by Kibby and Long (1996), that such subjects have reduced coping abilities, although the present study did not collect enough information to expressly support this suggestion.

2. Peri- and Post-injury factors

The study examined the two major categories of peri- and post-injury factors that were identified in the literature review, namely physical factors and psycho-social factors.

1. Physical Factors

Comorbidity and its claimed link to postconcussional sequelae (Bohnen et al., 1994) was not examined, as the definition of mild head injury employed specified hospitalization of less than 72 hours. This tended to systematically screen out other injuries that required hospitalisation. It was important that the injured and noninjured groups be as comparable as possible, and potentially confounding factors such as comorbidity were therefore excluded. It was unfortunately not practical to recruit large enough numbers of subjects with comorbidity to create an additional group of head injured subjects.

Although previous head injury has been linked to incidence of postconcussive complaints (Jacobson, 1995; Bohnen and Jolles, 1992), injury number was not examined, given the fact that there was very little diversity in the group in this regard.

Relationships between indices of injury severity and scores were investigated, although, as mentioned above in the discussion of cognitive performance, it must be stressed that

their validity is limited by the fact that subjective memory had to be relied on to obtain these indices. More specifically, length of hospitalization, loss of consciousness, and posttraumatic amnesia were examined.

Length of hospitalisation was significantly associated with incidence of post-injury complaints. Longer hospitalisation was associated greater absolute incidence of post-injury symptoms, as well as with greater perceived deterioration, relative to pre-injury functioning. As mentioned previously, this factor was associated with poorer performance on one measure of sustained attention, with limited value for interpretation.

Increased loss of consciousness was associated with increased absolute experience of memory difficulties post-injury, as well as greater perceived deterioration relative to pre-injury functioning in terms of anxiety. As mentioned previously, this factor was not associated with cognitive deficits.

With regard to length of hospitalisation and loss of consciousness, it is interesting that several relationships with post-injury symptoms were found. The more severe the injury (or the more severe the injury is recalled to have been), the more likely that an absolute increase in symptoms is reported Particularly with regard to length of hospitalisation, it is noticeable that more absolute symptoms

than relative deterioration is reported, possibly suggesting that subject experience is less likely to be based on underestimation of pre-injury functioning, and more on actual post-injury experience. Effects are possibly subtle, and not necessarily cognitively based, particularly given the lack of significant cognitive differences between the injured and noninjured groups. It may also be that subjects who are more inclined to recall their injuries as being severe, are more likely to report an increase in absolute symptoms. Nevertheless, there does appear to be a possible link between subtle differences in injury severity within the category of mild head injury and postconcussive complaints. It may be that more severe injuries are followed by a greater incidence of post-injury symptoms. This should be investigated in further research.

An interesting difference was found with correlations between posttraumatic amnesia and postconcussive complaints. All associations were with pre-injury symptoms, and all were positive. Recall that posttraumatic amnesia was the variable that was found to be most convincingly linked to actual cognitive difficulties (with regard to post-injury sustained attention). If such subjects were experiencing actual difficulties, they may have been less inclined to underestimate pre-injury functioning. It is nevertheless then difficult to understand why there was no significant positive relationship between posttraumatic amnesia and post-injury symptom incidence.

Overall, as with cognitive performance, there appear to be possible subtle links between indicators of injury severity and postconcussive injury experience. Such differences were, however, not striking enough for significant differences to be found between the injured and noninjured groups. Thus, although the findings provide some support for claims that postconcussive complaints are linked to actual physical dysfunction (as claimed, for example, by Wrightson, 1989), such support is greatly weakened by the lack of convincing evidence of cognitive deficits, relative to the noninjured group. Nevertheless, such deficits as may exist, may not have been sufficiently visible, given the small numbers of subjects employed. The findings suggest an area of further research.

2. Psychosocial Factors

It was beyond the scope of this study to examine the claimed relationship between postconcussional complaints, and excessive social demands and inadequate social support (Parker and Rosenblum, 1993), since it was impractical to obtain measures of the latter two factors. The study examined possible associations between postconcussive complaints and circumstances of injury, expectations, and motivation. Although these are presented in separate sections in order to focus the discussion, they are not mutually exclusive, as will become clear in the course of the discussion.

1. Circumstance of injury

It has been claimed that sports injuries are less likely to be followed by persistence of postconcussive complaints (Mittenberg et al., 1992, and Binder, 1986), and this study did indeed find that sports injuries were less likely than violent injuries to be related to development of postconcussive complaints. It is not certain what factors were at play, but several suggestions appear plausible. It seems reasonable to assume that violent incidents involve particularly high levels of stress, although the stresses and pressures that exist in the world of sport may also be intense. Expectations may also play a significant role. Sports players may tend not to contextualize their head injuries as potentially severe enough to have cognitive consequences, while that fear may well exist to a larger degree among victims of violence. Violent experiences may also have more wide reaching emotional consequences, such as increased feelings of vulnerability and fear, which may have behavioural consequences not necessarily linked to cognitive capacity. Jacobson (1995) claims that stress may in fact result in post-traumatic stress disorder, the symptoms of which overlap with typical postconcussive complaints.

A rival explanation may be posited in terms of the different gender composition of the two groups. The sports injured group was entirely male, while the violently injured group

was half male and half female. In this and other studies, female gender has been found to be associated with development of postconcussive symptoms (for example, Bohnen and Jolles, 1992, and Bohnen et al., 1994).

A third possibility, however, is that an interaction between circumstances of injury and demographic characteristics may account for the different responses. This explanation is the one preferred by this researcher, given that the importance of both factors have been established in the literature.

2. Expectations

The study supports findings by Mittenberg et al. (1996) that subjects tend to underestimate premorbid incidence of symptoms, thus reattributing benign symptoms to the injury. They do not report a higher incidence of current symptoms than noninjured subjects, but tend to perceive such symptoms that may occur as non-benign. This suggests that subjects may misinterpret symptoms rather than suffer an actual increase in symptoms. The issue is therefore one of interpretation and narration of present experience, rather than any exaggeration of symptoms. This impression is supported by the fact that performance among mildly head injured subjects on tests specifically intended to detect incomplete effort, did not suggest poor motivation.

The present study therefore did not find evidence that expectations caused symptoms in a direct sense. Expectations seem to have played a role in the interpretation of present symptoms in relation to perceptions of supposed pre-injury functioning.

For clarification, the process might be verbalised as follows: "Injury should change me. This is how I function now; therefore I must have been a lot better before." If expectations resulted in an actual increase in symptoms, the (conscious or unconscious) process might be: "Injury will ch_ e me. I have an idea of what I will typically become, so this is what I will become."

This explanation appears to accord with the above comparison between the sports injured group and the violently injured group. The sports injured group may have had fewer expectations of deterioration, whereas the violently injured group may have expected more substantial deterioration.

Gouvier et al. (1992) claim a similar incidence of typical postconcussive complaints in injured and noninjured subjects, and concludes that the constellation is not unique to mild head injury. The present study found evidence to suggest that this is in fact the case: the total injured group and the noninjured group were not different in reporting of current symptoms, but only in memory of pre-injury symptom occurrence.

It has also been claimed that injury leads to symptom expectancies and stress, resulting in selective attention and perceptual bias regarding experience, with resulting emotional responses reinforcing these (Mittenberg et al., 1992). While the present study did not specifically measure stress, and is not able to reach any conclusions in this regard, the findings of this study are nevertheless compatible with Mittenberg's claims (see the above discussion of circumstances of injury).

3. Motivation and Compensation

Blame has been linked to prevalence of post-concussive complaints (Rutherford, 1981; Jacobson, 1995), as has involvement in compensation claims (Binder, 1993). Recovery has been linked to feelings of personal culpability (Jacobson, 1995). The present study, by contrast, found no effects for blame. It must, however, be noted that this study did not include any subjects who were seeking compensation. It is therefore not possible to comment on claims that incidence of post-concussive symptoms is linked to litigation (Binder and Rohling, 1996), or to comment on the concept of compensation neurosis (Jacobson, 1995). Nevertheless, it does not appear, from the findings of this study, that blame alone affected outcome. This impression should, however, be treated cautiously, given the small numbers involved.

3. Conclusions

Three major types of models have been proposed to explain postconcussive complaints: the organic view, the psychogenic view, and the cognitive-behavioural perspective (Jacobson, 1995).

The findings of this study do not appear to support the organic perspective, given that no evidence of cognitive deficits was found within the injured group.

The evidence suggests support for the view that subjective complaints exist independently from cognitive deficits (for example, Gouvier et al., 1992), but it is less easy to state more specifically whether complaints have their origin in an organic-psychogenic sequence (the psychogenic view, towards which the arguments of Gouvier et al. tend), or as a more complex interaction of pre-, peri-, and post-injury factors, producing a narrative that in turn affects behaviour and emotions (the cognitive-behavioural perspective as put forward by Jacobson, 1995). The psychogenic perspective refers to actual symptoms may arise organically, but then later have their origin in the psychological. For example, it has been claimed by Bohnen and Jolles (1992) that chronic effort, fatigue and stress lead to symptoms. The cognitive-behavioural perspective, however, stresses attention to and interpretation of events (Jacobson, 1995).

The cognitive-behavioural perspective is supported by the finding that injured subjects tend to report post-injury incidence of symptoms that is not significantly different to the noninjured group, but that they tend to perceive their pre-symptom incidence as significantly lower, suggesting that they may underestimate their pre-injury symptoms. If this is the case, their perceptions of themselves do not appear to be based on an exaggerated perception of persistence of post-injury symptoms in relation to an accurate perception of pre-injury functioning, but rather on an accurate perception of present functioning, in relation to an idealised view of their pre-injury functioning. This appears to be more of a narrative than a psychogenic phenomenon.

2. Malingering

In a clinical or medico-legal setting, in addition to examining cognitive performance and postconcussive complaints, it would be important to investigate possible motivational factors in poor performance. This would have application not just with regard to accurate assessment of deficits, but also with regard to rehabilitation. This study therefore undertook to examine the area of incomplete effort. Two areas were examined: a) comparisons of test performance by the total injured group with that of the malingering group, to provide suggestions as to the nature of the malingering observed, and b) identification of scores that best differentiated the malingering and injured groups, with

the development of tentative score cutoffs, in the hope that they might provide suggestions for further research, despite their limited present usefulness.

The results suggest that the malingering group performed worse on many more scores than just those specifically intended to detect incomplete effort. The discussion will therefore not be restricted to an examination of only those tests included to detect incomplete effort. All of the assessment tools will be examined in relation to their ability or inability to detect incomplete effort.

2.1. Evidence suggesting the Nature of Malingering.

It was not meaningful to calculate a malingering rate, as subjects were assigned to malingering group. Therefore, no comment can be made regarding incidence of malingering.

2.1.1. Cognitive Performance

Performance by malingerers on the BVRT (examining copying ability and visual memory) suggests that this test is in fact a useful tool for suggesting malingering (as reported by Lezak, 1995). Malingerers performed significantly worse than injured subjects on both the copy task and the recall task of the BVRT, in both cases producing significantly more errors and significantly fewer correct responses. In addition, idiosyncratic error styles were noted among malingerers.

The findings of this research partially support observations by Lezak (1983) concerning the specific pattern of malingering. Malingerers did have a propensity for distortions, but not for omissions, whereas Lezak reports a preference for both. Lezak's claim that malingerers also show a propensity for errors involving the peripheral figures, was supported on the copy task for both left and right visual fields, but significant effects were only noted on the left visual field for the recall task. This study did not, however, find a propensity for perseverations among malingerers, as reported by Lezak. Instead, high levels of errors of rotation were noted on the copy task.

The differences in responses found within the injured and malingering groups may constitute useful suggestors of incomplete effort, but they should be used cautiously. The error types mentioned above are by no means firm evidence of incomplete effort, given their prevalence among injured subjects as well (often occurring among the majority of injured subjects - see Table 12). There was therefore much overlap in response styles, and malingerers were not clearly differentiated from injured subjects in this regard. That undue weight may be given to production of specific error types, is indicated by a comparison of the percentage incidence of error types in the noninjured group, compared with those of the injured group (see Table 12). In several cases, more subjects within the noninjured group displayed at

least one incidence of a particular error type than those in the injured group. For example, in the case of right-sided errors on the copy task, more noninjured subjects produced at least one error of this type than even the malingering group. When the total occurrence of each error type within each group is considered (that is, taking into account the number of times the error type appeared in the protocol, and not just the presence or absence of the error type per se), however, the injured and noninjured groups are not significantly different from each other, while the malingerers are clearly distinguishable on several scores, as discussed above.

Consideration of the presence of specific error types should therefore be combined with an examination of the number of times each error type occurs. Table 7.7. indicates the ability of the total incidence of each error type to differentiate the three groups. Means and medians for each error type, within each of the main groups, are provided in Table 12.1.. It is nevertheless important to emphasize that a propensity for certain error types may suggest malingering, but does not confirm it.

Regarding the other cognitive tests, malingerers tended to perform more poorly than injured subjects on the test of divided attention (the PASAT-R). They also displayed deficits in sustained attention (measured by the Stroop), specifically with regard to accuracy of performance, rather than speed of

performance (by contrast, the injured group did not appear to have deficits in either respect in relation to the noninjured group).

2.1.2. Subjectively Reported Postconcussive Complaints.

This study did not find, as did Wong et al. (1994), that malingerers produced convincing postconcussion symptom profiles. Whereas the overall trend was for noninjured subjects to report lower pre-injury symptoms than the noninjured group, but comparable post-injury symptoms, malingerers differed. They tended to report lower incidence of pre-injury symptoms than the noninjured group, as well as greater incidence of post-injury symptoms. This was evident on both postconcussive questionnaires. This emphasis on post-injury complaints is in sharp contrast to the responses of genuinely injured subjects. While further research is needed, it may be that this pattern is characteristic of malingerers. If this is the case, it may be possible to detect signs of malingering by examining specific patterns of responses to the PCSC and PCL. Such an approach would have to be employed extremely cautiously, and conclusions be corroborated by other sources of information, especially given that symptom patterns are likely to be different in the first three months of injury, when cognitive difficulties are common (Mittenberg et al., 1996).

While the present study suggests different conclusions to those reached by Wong et al. (1994), the studies are not directly comparable for several reasons. Whereas the present study compared genuinely injured subjects to instructed malingerers, and to noninjured subjects, Wong et al. compared subjects who were instructed to imagine that they were head injured malingerers, with subjects who were instructed to imagine that they were head injured nonmalingerers. It is maintained by this author that Wong et al. in fact examined simulated simulation, with two levels of potential confounding variables, and that the generalizability of their findings to genuine injury and malingering are problematic. This is especially the case as they have did effectively deal with the potentially complex interactions of injury with motivation, even within their simulated setting.

In addition, the information derived by Wong et al. (1994) was limited. These researchers only compared absolute post-injury symptom incidence with that of a base rate noninjured group, concluding that the reporting of more symptoms by the simulated injured malingering group, as well as by the simulated injured nonmalingering group, was evidence of effective simulation. The present study found that differences were most apparent when comparing both pre-injury symptom reporting, and post-injury symptom reporting in the injured and malingering groups, with the noninjured base rate. Using this approach, different response styles were noted within the malingering and the injured groups, which

this author would attribute to different perceptions and expectations surrounding the injury.

It is also maintained by this author that Wong et al. (1994) did not deal adequately with the performance of their groups, relative to a noninjured base rate. The claims by Wong et al., that simulated injured malingerers and simulated injured nonmalingerers did not exaggerate their symptoms, relative to genuinely injured subjects, can be criticized. These researchers compared the performance of their two subject groups with noninjured base rate information cited in another study (Gouvier et al., 1992), but the research to which they refer, included subjects that the current author would hesitate to consider as mildly head injured. Gouvier et al. (1992) included subjects with loss of consciousness ranging from 5 seconds to 4 days (the current study set the maximum length of loss of consciousness at 60 minutes). Thus, this author would suggest that it is debatable whether the comparable symptom levels found by Wong et al. are the result of subtlety on the part of their subjects, or the result of high symptom incidence on the part of the injured subjects with which they were compared.

2.1.3. Specific Tests of Incomplete Effort

As was expected, malingerers preformed more poorly than injured subjects on all tests of incomplete effort (the Rey 15-item test, the RDS, and the BVRT). This suggests that

these tests are indeed useful as suggestors of incomplete effort, as reported in the literature (for example, Lezak, 1995, and Greiffenstein et al., 1994). Nevertheless, as mentioned above, other tests were also found to differentiate effectively between malingerers and injured subjects.

2.2. Use of Scores in Differentiating Malingerers.

As described in the Procedure above, those scores that effectively differentiated injured subjects from malingerers, were identified. It was then investigated whether cutoffs could be developed that would effectively differentiate mildly head injured subjects from malingerers. Given the limitations of this study, however, such cutoffs would have to be regarded as extremely tentative and merely guidelines as a precursor to further research.

An examination of the incremental hit rates in Table 14 suggests that several scores are of limited use in suggesting malingering. It appears that, given the results obtained, the following scores should be discarded from the list of potential cutoffs: PCSC1TOT, PASAT3, HEADACH2, DIZZIDIF, MEMDIF, FATIGDIF, VISIODIF, and ROTAT_C.

Of the remaining scores, it is interesting to note that the highest incremental hit rates pertain to scores denoting subjectively reported postconcussive symptoms. Particularly high incremental hit rates are associated with the following

scores: PCL1 and PCLPCS1 (with lower limit cutoffs), and PCLDIFF, PCLPCDIF, TOTDIFF, FRQDIFF, ANXIETY2, and ANXDIFF. All with upper limit cutoffs). All had hit rates at or above 31.25 percent (This percentage represents the highest incremental hit rate found for any score in the tests that were specifically intended to detect incomplete effort). Despite having lower incremental hit rates, many other scores were nevertheless also acceptable (see Table 14).

Of the remaining scores, the Rey 15-Item tied with the BVERR_C score as having the best incremental hit rate (31.25 percent). This is unsurprising, given that the Rey 15-Item test was specifically included to detect possible incomplete effort. Another test specifically included to detect possible malingering is the RDS. While the three RDS subscores which were included in the table all had good incremental hit rates, two other cognitive scores, not specifically included to suggest malingering, had higher rates than the highest RDS rate (21.88 percent). PASAT2 and PASAT4 both had incremental hit rates of 25 percent.

Another test that was specifically intended to detect possible malingering was the BVRT. Unsurprisingly, then, very good incremental hit rates were found for several subscores on this test. BVERR_C had the highest incremental hit rate for this test (31.25 percent), followed by the distortion scores (DISTOR_C and DISTOR_D, both with a rate of 28.13 percent). The high incremental hit rate found for the

distortion scores accords well with the opinion of Lezak (1983) that malingerers have a propensity for errors of distortion. BVCORR_C also had a particularly good incremental hit rate (25 percent). It is clear from an inspection of the table that many other cognitive scores also have acceptable incremental hit rates. The above scores, however, are distinguished by being at or above the highest rate calculated for the RDS.

It is suggested that with the use of a table in the style of Table 14 (a final table should be the result of more intensive and extensive research than was possible here), malingering be identified from as wide a range of sources as possible. It is argued that such a suspicion not be pursued lightly, given the harm that could result from incorrect assumptions of incomplete effort. Nevertheless, it is important to identify poor motivation where it does exist, not least in order to provide effective intervention and rehabilitation. It is reiterated that the present table of cutoffs, despite the discussion above, is merely an exercise in developing tentative guidelines, in the hope that these will be built upon by further research. The cutoffs produced should be considered in this context, and while they may possibly be used to suggest incomplete effort, they are certainly not able to confirm it. Final confirmation should come from other, less tentative sources.

3. Limitations of the Present Study

The investigation of subgroups and the relationship between their defining characteristics and sequelae (for example, recency of injury, blame, gender, and type of injury) is limited by the small numbers involved. The strongest results from this study come from the larger groups (the total injured, malingering, and noninjured groups), given that parametric techniques were employed. The smaller group comparisons provide weaker results that may be useful as suggestions.

The heterogeneity of the injured subgroups limits the certainty of any conclusions derived from their comparison. This applies particularly to the recently injured group, which possibly incorporates subjects in very different stages of post-injury development. Ideally, this group should have had a more restricted nature, but this was not possible, given the small numbers available.

Related to this, the inclusion of PTA intervals that could be regarded as borderline, may have increased the range of injury severity within the injured group. This has been discussed above.

Relating to this, the demographic dissimilarity of several of the groups compared is a problem in unambiguously identifying associations. Possibly the most serious limitation in this

regard is the regional dissimilarity between two of the main groups: the malingering and injured groups. Ideally, all subjects should have been drawn from the same region, but the difficulty in finding sufficient injured subjects who met the criteria for mild head injury, made it difficult to control for this difference.

It was not possible to fully investigate predisposing factors to postconcussive sequelae, or to comment on a malingering rate, given that the groups were assigned or specifically recruited. The nonrandom nature of the groups may be a confounding factor in that they may possess select characteristics that present possible rival explanations for findings. Related to this, the restricted characteristics of the injured group made it impossible to fully investigate age, occupational status, previous injury, and comorbidity factors, and their possible contribution to development of postconcussive complaints.

A demographic factor that was not considered at all in the analysis was the potential difference between those subjects drawn from high school, and those drawn from the adult education college. This is a potentially serious confounding factor, as these groups may represent very different personal characteristics and histories. Without further investigating these two groups, it is difficult to comment on differences, but several possibilities appear plausible. The school pupils may more fully represent the population, given that their

status is not unusual. The adult education sample, however, may consist of those with previous academic difficulties. Conversely, they may constitute socio-economically disadvantaged individuals with an unusually high level of determination and academic potential. The reality is possibly a combination of various contexts. With regard to both groups of subjects, the interaction of the factor of volunteering with demographic factors is another potentially confounding factor.

Given the potential confounding variables that this difference suggests, the study should perhaps have restricted recruitment of subjects to high school pupils. A less favourable alternative would have been to introduce place of recruitment as a variable in the analysis.

It was not practical, given the time constraints of the assessment, to investigate prior stress or chronic social adversity. This study is therefore not able to comment on these factors. This omission of an important perspective limits the overall understanding of postconcussive sequelae, particularly given the important potential rival explanations involving the role of stress.

It was also not possible to investigate the nature and identification of incomplete effort among genuinely injured individuals. Given that many malingerers may have in fact sustained a genuine injury, this limits the generalizability

of the findings of this report.

An important limitation regarding the selection of subjects, as well as the analysis itself, was the reliance on personal reporting in obtaining a personal history. It was not feasible to require documentation, but the potential invalidity of these measures needs to be considered when evaluating the results of this research.

Another limitation to the study is the lack of reliability and validity information for several of the assessment instruments used. In mitigation, however, these instruments are well established within the literature. The present battery was a direct result of, and response to, the use of these instruments within the literature.

Finally, it is possible that the questionnaires regarding postconcussive symptoms may have played a confounding role in alerting subjects to the nature of typical complaints. While this is a matter of concern, this study is not unlike other studies in this regard.

4. Summary and Conclusions

The findings of this study seem to concur with Mittenberg et al. (1996) that the patient's problem is largely one of lacking an alternative explanation for symptoms. There does appear to be evidence of cognitive misattribution of symptoms to changes in cerebral capacity. At the same time, it does not appear that patients exaggerate their present symptoms, only that they contextualize these symptoms in terms of the injury. This has implications for rehabilitation, which would have to involve a component of education about expectations and typical recovery patterns, such as was done in the rehabilitation manual designed by Mittenberg et al.. Nevertheless, further research needs to be done into degrees of severity within the category of mild head injury, and the possibility of corresponding deficits in cognitive ability.

This study argues that a full assessment of post-concussive complaints should include a consideration of subjective perceptions and attributions, environmental stressors, cognitive factors, emotional factors, and motivational factors. The identification or development of suitable instruments to detect these factors is therefore of important consideration.

This study was not able to examine environmental stressors and emotional factors, but the tools used appear to provide useful information regarding subjective perceptions,

cognitive fact ·d motivational factors. A comprehensive approach to rehabilitation would need information on all of these components of subject functioning, and future research should give consideration to the use of tools that would rovide insight into stressors and emotional status, and d. relop strategies to translate multiple insights into effective intervention.

It has been suggested by Wong et al. (1994) that information is needed regarding 1) the public's knowledge of typical sequelae, 2) base rates of injury in the population, and 3) vulnerability of instruments to malingering. In this regard, the present study is able to provide information regarding 1) the present sample's knowledge of typical sequelae, 2) base rates in a) the noninjured and b) the injured samples, and 3) vulnerability of neuropsychological instruments to simulation of head injury by the sample. This may provide guidelines that could be built on by future research.

Descriptive statistics for performance by each main group on each score are included in Table 5. This provides an indication of base rates within each of the main groups. It is also hoped that the list of cutoffs could provide some indication of those scores least vulnerable to simulation by malingerers.

It is, however, important to bear in mind that the three groups may not necessarily represent the population, particularly given their numbers and their limitations in terms of composition. It is also important to bear in mind that the groups are not exhaustive in terms of range of possible disorders (for example, psychiatric conditions such as depression or schizophrenia could be considered as rival possibilities). It is believed that contextualization of the assessment within a broader examination, as well as a comprehensive case history, are crucial to understand the individual client. Interpretation and use of the results of this research, and generalization of these findings to the individual client, should be done with extreme caution.

CHAPTER 7: APPENDICES

APPENDIX 1: SUBJECT INFORMATION FORM

My name is Terence Kuun and I am doing research on testing and treatment for head injury.

The problem with a lot of existing tests and treatment is that they have been developed for Americans. To improve treatment for South Africans, it is important to do research using South Africans. This is why I am doing this research and asking for your help.

I need you to have passed Standard 8 or its equivalent will need to talk to you and ask you to do some exercises. This will take just under one hour, for which I will pay you R25.00.

The information I get about you will be completely confidential No-one will ever know who you are, apart from me, and I will not discuss you with anyone. You are also free to withdraw at any time.

The exercises are also not the kind of exercises you can pass or fail. The answers will just give me information about people with and without head injury, and hopefully make it easier to help South Africans who have had head injuries.

If you are interested in helping me, please phone me. I will need to ask you some questions to decide if you are able to help me. I can also answer any questions you have. I need all kinds of people, including people who have never had head injury, as well as people who have had head injury. At the same time, I need to make sure that I don't have too many people of one type (for example, sex, age, etc.). We can then arrange an appointment for you to see me.

Thank you

Terence Kuun

(Telephone number provided)

APPENDIX 2: CONSENT FORM

I,_____

am willing to participate in the assessment, and for the results to be used for research. I understand that the research will be written up as a research dissertation, and may appear in other publications. I understand that my responses will be kept confidential and that no-one other than the researcher will know what my responses are. My name will also not be released. I understand that I am free to decide not to participate at any point.

FIRST NAME(S): _____

_____

SURNAME: _____

SIGNATURE: _____

DATE: _____

APPENDIX 3: INTERVIEW FORM/QUESTIONNAIRE

PERSONAL INFORMATION

This information will help me decide if you can help me with my research. The information will also help me understand the information I get from my research.

SECTION 1:

1. NAME: _____

2. SURNAME: _____

3. SEX: _____

4. RACE: _____

5. FIRST LANGUAGE: _____

6. AGE: _____

7. What is the highest standard you have already passed?

   _____

8. What is your job? _____

9. Have you ever had a head injury (being knocked hard on your head)?

(a) Yes

(b) No

10. Please add anything you want to:

_____

_____

_____

_____

_____

_____

If you have had a head injury, please answer SECTION 2. If you have never had a head injury, If you have never had a head injury, you may still be able to help me with my research. Please skip SECTION 2 and go to SECTION 3.

SECTION 2:

Please tell me about your head injury by answering the following questions:

1. How many times have you been injured?

_____

2. How old were you at the time (please tell me for each injury)?

INJURY	AGE
INJURY 1:	_____
INJURY 2:	_____
INJURY 3:	_____
INJURY 4:	_____

3. YOUR MOST RECENT HEAD INJURY:

Please tell me about your most recent injury by answering the following questions:

1. What were you doing when you were hurt?

_____

_____

2. Whose fault was the accident? (Please tick).

(a) Your own fault

(b) Someone else's fault

(c) No-one's fault

(d) Other (please specify)

3. On which part of your head were you hurt? (For example, the back left hand side).

_____

_____

4. Was your head cut open?

(a) Yes

(b) No

5. Did you lose consciousness (faint)?

(a) Yes

(b) No

6. If you did lose consciousness, how long was it before you woke up (in minutes or hours).

_____

7. Do you find that you can't remember what happened for some time after the accident?

(a) Yes

(b) No

8. How many minutes are blank?

_____

9. How many minutes are fuzzy?

_____

10. What other injuries did you have?

---

11. Did you go to the hospital after the accident?

    (a) Yes

    (b) No

12. If you did, please tell me about the hospital by answering the next section:

THE HOSPITAL:

1. How soon after the accident did you go to the hospital (in hours)?

---

2. When you got to the hospital, were you conscious (awake)?

    (a) Yes

    (b) No

3. Could you talk to people and understand them, or were you too confused?

    (a) Yes (I could communicate)

    (b) No (I could not communicate)

4. If you had problems, please describe these in a few words.

_____

_____

_____

5. Could you do what the doctors and nurses asked you to do?

(a) Yes

(b) No

6. If not, please tell me what you couldn't do and why.

_____

_____

_____

_____

_____

7. How long were you in hospital (number of hours)?

_____ _____

8. Did you, or are you going to, go to court to claim damages?

(a) Yes (I have, or will, claim damages)

(b) No

9. Please add anything you want to:

_____

_____

_____

_____

Now please complete Section 3.

SECTION 3:

1. Please mark the times when you are available for the research. I will need to see you for about an hour.

DAY	MORNING	AFTERNOON
Monday	_____	_____
Tuesday	_____	_____
Wednesday	_____	_____
Thursday	_____	_____
Friday	_____	_____
Saturday	_____	_____
Sunday	_____	_____

2. If possible, please provide a contact telephone number:

_____

I will contact you as soon as possible. If you do not have a telephone number, please call me to arrange a time for us to meet.

Thank you for your time.

Terence Kuun

(Telephone number provided)

APPENDIX 4: ASSESSMENT BATTERY

Both the PCL and the PCSC were administered verbally. Where relevant, the questionnaires were repeated in the past tense.

1.1. POSTCONCUSSION CHECKLIST (PCL) - present experience

NAME:_____ DATE:_____

This is a list of difficulties and feelings which people sometimes have. Please say 'YES' for the difficulties or feelings which you are having now (the previous 2 months), and 'NO' for those which you are not having.

1. Often feel unwell _____
2. Have blackouts (seizures) _____
3. Sometimes start to put clothes on backwards _____*
4. Sometimes knock things over _____
5. Often have headaches _____*
6. Have trouble remembering things _____*
7. Find difficulty in becoming interested in anything _____
8. Often lose temper _____*
9. Have felt unwanted _____
10. Feel the need to keep things tidy _____
11. Sometimes suffer from noise inside the head _____
12. Often feel anxious or tense _____

13. Suffer from dizziness _____*
14. Suffer from ringing in the ears _____*
15. Have difficulty concentrating when reading _____*
16. Have often been in trouble _____
17. Sometimes bump into things _____
18. Talk too much _____
19. Very easily affected by alcohol _____*
20. Sometimes lose way, despite having been there many times before _____*
21. Have difficulty hearing _____
22. Have lost sense of taste and/or smell _____*
23. Have difficulty with eyes _____*
24. Often troubled by too much noise _____*
25. Have difficulty following a conversation _____*
26. Have lost interest in life _____
27. Have difficulty speaking _____
28. Occasionally hear voices inside head _____
29. Often irritable _____*
30. Refuse to admit difficulties _____
31. Have had a nightmare in the last two weeks _____
32. Often feel restless _____
33. Have difficulty holding a conversation _____*
34. Become tired very easily _____*
35. Sometimes laugh for no reason at all _____
36. Often impatient _____*
37. Sometimes behave childishly _____

1.2. POSTCONCUSSION SYNDROME CHECKLIST (PCSC) - present experience

NAME:_____ DATE:_____

Please tell me how often each of the following problems affect you now (in the past 2 months). Also tell me how badly they affect you. I also need to know how long the problem lasts for.

1. HEADACHE

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

2. DIZZINESS

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

3. IRRITABILITY

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes
4) A few hours 5) All the time

4. MEMORY PROBLEMS

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

1. PROBLEMS CONCENTRATING

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

6. TIREDNESS

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

7. PROBLEMS SEEING

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

8. IRRITATED BY NOISE

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

9. JUDGEMENT PROBLEMS (MAKE MISTAKES OR CAN'T MAKE PROPER DECISIONS)

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing

5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

10. ANXIETY (SCARED OR WORRIED)

How often does this happen?

1) Not at all 2) Seldom 3) Often 4) Very often 5) All the time

How badly? 1) Not at all
2) Slightly present
3) Definitely present
4) Interferes with what I'm doing
5) So bad that I can't function

How long? 1) Not at all 2) A few seconds 3) A few minutes 4) A few hours 5) All the time

APPENDIX 5: DATASET

5.1. Total Injured Group

5.1.1. Demographic Data for the Injured Group

CODE	STATUS	SEX	INJNO	LOC	PTA	HRSHOSP	BLAME	INJTYPE	REGION	INJTIME	TIMECLAS	AGE	YRSED
INJ1	1	F	1	0	0	0	Y	VIOLENCE	M	15	I	28	10
INJ2	1	M	1	0	0	0	N	SPORT	G	14	I	21	12
INJ3	1	F	1	0	0	0	N	VIOLENCE	G	13	I	50	11
INJ4	1	M	1	15	60	24	N	NMACC	G	1	R	17	9
INJ5	1	M	1	0	5	0	N	NMACC	M	11	R	16	11
INJ6	1	M	1	0	0	0	N	SPORT	M	24	I	24	12
INJ7	1	M	1	0	8	0	N	SPORT	M	17	I	21	12
INJ8	1	M	1	1	5	0	N	SPORT	M	17	I	22	12
INJ9	1	M	1	10	2	24	Y	VIOLENCE	G	23	I	20	9
INJ10	1	M	1	20	0	48	Y	MVA	G	24	I	17	9
INJ11	1	M	1	10	60	0	Y	VIOLENCE	M	4	R	38	12
INJ12	1	M	1	11	0	0	Y	NMACC	G	7	R	26	12
INJ13	1	M	1	0	0	2	N	REC	G	72	L	29	12
INJ14	1	F	1	15	60	48	N	REC	G	96	L	17	9
INJ15	1	F	1	10	10	3	Y	REC	G	168	L	27	11
INJ16	1	M	2	0	0	1	N		G	156	L	28	11

Note. Information is missing regarding circumstances of injury for subject INJ16

5.1.2. PCL Scores for the Injured Group

CODE	PCL1	PCL2	PCLDIFF	PCLPCS1	PCLPCS2	PCLPCDIF
INJ1	6	14	8	2	5	3
INJ2	7	8	1	4	5	1
INJ3	23	26	3	10	14	4
INJ4	13	15	2	6	7	1
INJ5	10	17	7	4	8	4
INJ6	10	10	0	2	2	0
INJ7	6	8	2	2	2	0
INJ8	11	13	2	5	6	1
INJ9	23	25	2	10	11	1
INJ10	12	25	13	5	11	6
INJ11	14	17	3	9	10	1
INJ12	3	3	0	0	0	0
INJ13	7	7	0	4	5	1
INJ14	16	24	8	5	13	8
INJ15	16	26	10	5	13	8
INJ16	5	6	1	2	3	1

5.1.3. PCSC Scores for the Injured Group

CODE	PCSC1TOT	PCSC1FRQ	PCSC1INT	PCSC1DUR	PCSC2TOT	PCSC2FRQ	PCSC2INT	PCSC2DUR	TOTDIFF	FRQDIFF
INJ1	30	10	10	10	74	25	27	22	44	15
INJ2	58	16	19	23	58	16	19	23	0	0
INJ3	59	17	21	21	98	25	33	40	39	8
INJ4	75	23	23	29	75	23	23	29	0	0
INJ5	67	20	20	27	81	25	21	35	14	5
INJ6	58	21	16	21	58	21	16	21	0	0
INJ7	48	14	15	19	53	16	16	21	5	2
INJ8	41	13	15	13	52	16	20	16	11	3
INJ9	74	24	25	25	74	24	25	25	0	0
INJ10	30	10	10	10	111	37	41	33	81	27
INJ11	59	21	19	19	59	21	19	19	0	0
INJ12	37	12	12	13	44	14	14	16	7	2
INJ13	47	16	14	17	60	20	18	22	13	4
INJ14	46	15	14	17	126	44	40	42	80	29
INJ15	59	22	16	21	90	31	28	31	31	9
INJ16	33	11	11	11	45	14	14	17	12	3

5.1.3. PCSC Scores for the Injured Group - continued

CODE	INTDIFF	DURDIFF	HEADACH1	DIZZINE1	IRRITAB1	MEMORY1	CONCENT1	FATIGUE1	VISION1	NOISEIN1
INJ1	17	12	3	3	3	3	3	3	3	3
INJ2	0	0	11	3	7	3	7	3	3	7
INJ3	12	19	10	6	10	6	6	3	3	6
INJ4	0	0	7	3	10	6	10	10	7	6
INJ5	1	8	7	8	7	3	7	10	8	6
INJ6	0	0	9	3	10	3	3	3	3	8
INJ7	1	2	3	3	3	3	3	7	3	7
INJ8	5	3	3	6	3	3	3	3	3	11
INJ9	0	0	3	3	3	10	8	11	7	10
INJ10	31	23	3	3	3	3	3	3	3	3
INJ11	0	0	3	6	6	7	6	6	7	6
INJ12	2	3	3	3	3	3	3	3	3	3
INJ13	4	5	8	3	7	3	3	8	3	3
INJ14	25	25	7	3	3	6	3	3	3	3
INJ15	12	10	9	6	7	3	3	3	13	9
INJ16	3	6	3	3	3	3	3	6	3	3

5.1.3. PCSC Scores for the Injured Group - continued

CODE	JUDGEME1	ANXIETY1	HEADACH2	DIZZINE2	IRRITAB2	MEMORY2	CONCENT2	FATIGUE2	VISION2	NOISIN2
INJ1	3	3	13	11	8	[illegible]	3	13	3	3
INJ2	7	7	11	3	[illegible]	[illegible]	7	3	3	7
INJ3	6	3	11	7	9	19	11	12	11	11
INJ4	9	7	7	3	10	6	10	10	7	6
INJ5	4	7	9	6	7	3	7	10	11	9
INJ6	7	9	9	3	10	3	3	3	3	8
INJ7	8	8	3	3	3	3	3	7	6	7
INJ8	3	3	10	10	3	3	3	3	3	11
INJ9	9	10	3	3	3	10	8	11	7	10
INJ10	3	3	14	8	3	13	9	12	15	13
INJ11	6	6	3	6	6	7	6	6	7	6
INJ12	7	6	3	7	3	3	3	6	3	6
INJ13	6	3	8	3	8	3	9	8	3	7
INJ14	7	8	9	14	7	15	15	9	15	14
INJ15	3	3	13	6	14	10	7	12	3	10
INJ16	3	3	7	6	3	3	3	7	3	3

5.1.3. PCSC Scores for the Injured Group - continued

JUDGEME2	ANXIETY2	HEADADIF	DIZZDIF	IRRITDIF	MEMDIF	CONCDIF	FATIGDIF	VISIODIF	NOISEDIF	JUDGDIFF	ANXDIFF
3	3	10	8	5	11	0	10	0	0	0	0
7	7	0	0	0	0	0	0	0	0	0	0
6	10	1	1	-1	4	5	9	8	9	0	7
9	7	0	0	0	0	0	0	0		0	0
10	7	2	0	0	0	0	0	3	3	6	0
7	9	0	0	0	0	0	0	0	0	0	0
8	8	0	0	0	0	0	0	5	0	0	0
3	3	7	4	0	0	0	0	0	0	0	0
9	10	0	0	0	0	0	0	0	0	0	0
12	12	11	5	0	10	6	9	12	10	9	9
6	6	0	0	0	0	0	0	0	0	0	0
3	7	0	4	0	0	0	3	0	3	-4	1
6	3	0	0	1	0	6	0	0	4	2	0
15	13	2	11	4	9	12	6	12	11	8	5
7	8	4	0	7	7	4	9	-10	1	4	5
7	3	4	3	0	6	0	1	0	0	4	0

5.1.4. Stroop Scores for the Injured Group

CODE	STROOP1	STROOP2	STROOP3	STROOP4	SUBT32	SUBT42	STR1ACC	STR2ACC	STR3ACC	STR4ACC
INJ1	86	138	207	245	69	107	95	85	90	98
INJ2	55	86	126	131	40	45	100	99	99	97
INJ3	50	80	111	184	31	104	100	94	100	99
INJ4	58	85	142	114	57	29	100	97	96	96
INJ5	66	87	171	140	84	53	98	97	94	96
INJ6	53	106	181	188	75	82	99	94	95	85
INJ7	51	85	100	116	15	31	100	96	96	89
INJ8	57	93	148	155	55	62	100	99	100	99
INJ9	59	95	144	117	49	22	98	97	96	97
INJ10	137	148	240	210	92	62	94	96	96	97
INJ11	52	89	140	148	51	59	100	100	97	97
INJ12	60	86	114	142	28	56	99	100	100	98
INJ13	66	101	156	155	55	54	100	99	95	98
INJ14	45	72	125	101	53	29	100	97	94	94
INJ15	57	67	107	112	40	45	100	100	100	98
INJ16	76	96	168	171	70	75	98	100	95	100

5.1.5. RDS Scores for the Injured Group

CODE	RDSFORW	RDSBACK	RDSTOT	RDSDIFF
INJ1	5	3	8	2
INJ2	4	4	8	0
INJ3	5	4	9	1
INJ4	7	4	11	3
INJ5	6	3	9	3
INJ6	5	4	9	1
INJ7	5	5	10	0
INJ8	7	2	9	5
INJ9	5	3	8	2
INJ10	6	4	10	2
INJ11	5	3	8	2
INJ12	5	5	10	0
INJ13	5	3	8	2
INJ14	6	4	10	2
INJ15	6	4	10	2
INJ16	4	3	7	1

5.1.6. PASAT-R Scores for the Injured Group

CODE	PASAT1	PASAT2	PASAT3	PASAT4	PASATTOT
INJ1	7	7	7	5	26
INJ2	12	12	16	11	51
INJ3	13	13	12	11	49
INJ4	12	12	11	4	39
INJ5	10	10	5	7	32
INJ6	11	11	10	6	38
INJ7	23	23	17	12	75
INJ8	8	8	7	5	28
INJ9	8	8	6	6	28
INJ10	8	8	4	7	27
INJ11	16	16	15	9	56
INJ12	19	19	20	11	69
INJ13	13	13	8	9	43
INJ14	14	14	13	9	50
INJ15	17	17	16	11	61
INJ16	16	16	7	7	46

5.1.7. Rey 15 Scores

CODE	FIFTEEN
INJ1	12
INJ2	15
INJ3	15
INJ4	15
INJ5	15
INJ6	13
INJ7	13
INJ8	15
INJ9	14
INJ10	10
INJ11	13
INJ12	15
INJ13	12
INJ14	9
INJ15	15
INJ16	15

5.1.8. BVRT Scores for the Injured Group

CODE	BVRCOR_C	BVRERR_C	OMIS_C	DISTOR_C	PERSEV_C	ROTAT_C	MISPLA_C	SIZE_C	LEFT_C	RIGHT_C
INJ1	9	1	0	0	0	0	0	0	1	0
INJ2	8	2	0	0	0	0	2	0	1	1
INJ3	7	3	1	0	0	0	2	0	0	3
INJ4	3	7	0	0	0	0	7	0	3	4
INJ5	7	3	2	1	0	0	0	0	0	3
INJ6	10	0	0	0	0	0	0	0	0	0
INJ7	10	0	0	0	0	0	0	0	0	0
INJ8	9	1	0	0	0	0	1	0	0	1
INJ9	9	1	0	0	0	0	1	0	0	1
INJ10	8	2	0	1	0	0	1	0	0	1
INJ11	10	0	0	0	0	0	0	0	0	0
INJ12	9	1	0	0	0	0	1	0	0	1
INJ13	7	3	0	1	0	1	0	1	3	0
INJ14	10	0	0	0	0	0	0	0	0	0
INJ15	10	0	0	0	0	0	0	0	0	0
INJ16	10	0	0	0	0	0	0	0	0	0

5.1.8. BVRT Scores for the Injured Group - continued

CODE	BVRCOR_D	BVRERR_D	OMIS_D	DISTOR_D	PERSEV_D	ROTAT_D	MISPLA_D	SIZE_D	LEFT_D	RIGHT_D
INJ1	3	8	1	1	3	0	3	0	2	4
INJ2	6	5	0	3	0	0	2	0	3	1
INJ3	2	11	1	4	3	2	1	0	5	5
INJ4	4	13	0	3	4	1	5	0	1	12
INJ5	10	0	0	0	0	0	0	0	0	0
INJ6	5	7	0	2	1	2	2	0	2	3
INJ7	9	2	0	0	0	0	2	0	0	2
INJ8	5	8	0	1	3	3	1	0	2	6
INJ9	8	3	0	0	1	1	1	0	1	1
INJ10	2	12	1	2	2	2	4	0	3	7
INJ11	3	11	1	5	1	3	0	1	4	7
INJ12	5	5	0	1	1	3	0	0	0	5
INJ13	5	10	0	4	0	3	1	2	6	3
INJ14	5	6	1	3	1	1	0	0	4	1
INJ15	9	2	0	2	0	0	0	0	1	1
INJ16	8	3	0	2	0	1	0	0	1	2

5.2. Malingering Group

5.2.1. Demographic Data for the Malingering Group

CODE	STATUS	SEX	REGION	AGE
MAL1	2	M	M	21
MAL2	2	M	M	18
MAL3	2	F	G	23
MAL4	2	M	M	16
MAL5	2	F	M	29
MAL6	2	F	M	16
MAL7	2	M	M	30
MAL8	2	M	M	22
MAL9	2	F	M	18
MAL10	2	M	M	20
MAL11	2	M	M	21
MAL12	2	F	M	16
MAL13	2	M	G	17
MAL14	2	F	G	35
MAL15	2	F	G	26
MAL16	2	M	M	25

5.2.2. PCS Scores for the Malingering Group

CODE	YRSED	PCL1	PCL2	PCLDIFF	PCLPCS1	PCLPCS2	PCLPCDIF
MAL1	12	3	27	24	0	14	14
MAL2	11	5	28	23	2	13	11
MAL3	11	1	22	21	1	10	9
MAL4	10	2	27	25	1	14	13
MAL5	12	2	34	32	1	15	14
MAL6	10	4	20	16	1	6	7
MAL7	12	1	10	9	0	8	8
MAL8	12	1	21	20	0	12	12
MAL9	12	5	31	26	0	14	14
MAL10	12	4	21	17	1	9	8
MAL11	12	2	32	30	0	16	16
MAL12	11	7	24	17	2	10	8
MAL13	10	9	31	22	2	15	13
MAL14	11	3	32	29	1	14	13
MAL15	12	7	35	28	2	16	14
MAL16	12	2	35	33	0	17	17

5.2.3. PCSC Scores for the Malingering Group

CODE	PCSC1TOT	PCSC1FRQ	PCSC1INT	PCSC1DUR	PCSC2TOT	PCSC2FRQ	PCSC2INT	PCSC2DUR	TOTDIFF	FRQDIFF	INTDIFF	DURDIFF
MAL1	52	17	15	20	108	35	35	38	56	18	20	18
MAL2	52	19	15	18	111	38	36	37	59	19	21	19
MAL3	30	10	10	10	66	23	24	19	36	13	14	9
MAL4	37	13	13	11	87	37	31	19	50	24	18	8
MAL5	41	13	13	15	106	37	36	33	65	24	23	18
MAL6	38	13	13	12	102	33	35	34	64	20	22	22
MAL7	30	10	10	10	62	20	19	23	32	10	9	13
MAL8	30	10	10	10	99	31	38	30	69	21	28	20
MAL9	59	16	20	23	126	45	48	33	67	29	28	10
MAL10	41	16	11	14	113	42	35	36	72	26	24	22
MAL11	32	11	10	11	107	39	34	34	75	28	24	23
MAL12	52	14	19	19	105	35	37	33	53	21	18	14
MAL13	34	13	11	10	98	39	29	30	64	26	18	20
MAL14	46	14	16	16	105	38	30	37	59	24	14	21
MAL15	46	15	15	16	111	32	42	37	65	17	27	21
MAL16	41	13	13	15	110	35	42	33	69	22	29	18

5.2.3. PCSC Scores for the Malingering Group - continued

CODE	HEADACH1	DIZZINE1	IRRITAB1	MEMORY1	CONCENT1	FATIGUE1	VISION1	NOISEIN1	JUDGEME1	ANXIETY1	HEADACH2	DIZZINE2
MAL1	3	3	6	11	3	6	3	7	6	6	14	7
MAL2	6	6	8	3	7	6	3	3	7	3	12	11
MAL3	3	3	3	3	3	3	3	3	3	3	13	3
MAL4	3	3	3	3	3	3	3	10	3	3	11	9
MAL5	3	3	3	6	3	3	3	3	7	7	9	9
MAL6	6	3	4	3	3	3	3	3	6	4	12	11
MAL7	3	3	3	3	3	3	3	3	3	3	6	7
MAL8	3	3	3	3	3	3	3	3	3	3	10	9
MAL9	6	6	7	5	5	7	6	5	5	5	12	10
MAL10	9	4	3	3	3	5	3	3	5	3	14	9
MAL11	3	3	5	3	3	3	3	3	3	3	10	8
MAL12	3	3	3	3	3	7	3	10	7	10	8	12
MAL13	3	3	6	3	3	5	3	3	3	3	12	8
MAL14	9	3	3	3	6	6	3	7	3	3	15	9
MAL15	3	3	3	6	3	7	3	6	3	6	11	11
MAL16	7	7	3	3	3	5	3	6	3	3	13	13

5.2.3. PCSC Scores for the Malingering Group - continued

CODE	IRRITAB2	MEMORY2	CONCENT2	FATIGUE2	VISION2	NOISIN2	JUDGEME2	ANXIETY2	HEADADIF	DIZZDIF	IRRITDIF	MEMDIF
MAL1	12	12	7	10	12	11	12	11	11	4	6	1
MAL2	10	15	11	11	7	11	12	11	5	5	2	12
MAL3	3	3	11	14	10	3	3	3	10	0	0	0
MAL4	9	9	9	3	9	10	11	11	8	6	6	6
MAL5	10	12	8	7	7	15	15	14	6	6	7	6
MAL6	12	3	3	10	10	15	12	14	6	8	8	0
MAL7	3	8	6	8	7	7	3	7	3	4	0	5
MAL8	10	10	10	10	8	10	13	9	7	6	7	7
MAL9	13	13	13	14	12	13	13	13	4	4	6	8
MAL10	12	10	12	10	11	15	9	11	5	5	9	7
MAL11	9	8	10	10	14	13	12	13	7	5	4	5
MAL12	10	11	11	13	3	14	3	14	5	9	7	8
MAL13	9	10	9	9	12	13	3	13	9	5	3	7
MAL14	6	15	6	12	3	14	12	13	6	6	3	12
MAL15	15	8	11	14	3	11	12	15	8	5	12	2
MAL16	10	11	10	12	11	13	9	10	6	6	7	8

5.2.3. PCSC Scores for the Malingering Group - continued

CODE	CONCDIF	FATIGDIF	VISIODIF	NOISEDIF	JUDGDIFF	ANXDIFF
MAL1	4	4	9	4	6	5
MAL2	4	5	4	8	5	9
MAL3	8	11	7	0	0	0
MAL4	6	0	6	0	8	8
MAL5	5	4	4	12	8	7
MAL6	0	7	7	12	6	10
MAL7	3	5	4	4	0	4
MAL8	7	7	5	7	10	6
MAL9	8	7	6	8	8	8
MAL10	9	5	8	12	4	8
MAL11	7	7	11	10	9	10
MAL12	8	6	0	4	2	4
MAL13	6	4	9	10	0	10
MAL14	0	6	0	7	9	10
MAL15	8	7	0	5	9	9
MAL16	7	9	8	5	6	7

5.2.4. Stroop Scores for the Malingering Group

CODE	STROOP1	STROOP2	STROOP3	STROOP4	SUBT32	SUBT42	STR1ACC	STR2ACC	STR3ACC	STR4ACC
MAL1	128	121	104	84	-17	-37				
MAL2	85	108	169	161	61	53	100	97		91
MAL3	82	90	147	166	57	76	100	91	94	90
MAL4	50	79	110	110	31	31	96	96		78
MAL5	59	97	132	255	35	158	100	93	100	97
MAL6	70	89	177	155	88	66	85	82	94	93
MAL7	55	148	184	157	36	9	100	99	100	100
MAL8	197	167	185	117	18	-50	59	69	67	79
MAL9	45	105	185	176	80	71				94
MAL10	54	83	118	106	35	23	100	81	79	8[illegible]
MAL11	55	63	75	135	12	72		24	12	29
MAL12	213	215	217	215	2	0	71	89	56	62
MAL13	177	150	147	140	-3	-10	68		62	
MAL14	264	232	283	300	51	68				
MAL15	53	74	117	122	43	48	99	92	97	96
MAL16	91	122	222	247	100	125	79	80	91	79

5.2.5 RDS Scores for the Malingering Group

CODE	RDSFORW	RDSBACK	RDSTOT	RDSDIFF
MAL1	5	3	8	2
MAL2	3	2	5	1
MAL3	6	3	9	3
MAL4	0	2	2	-2
MAL5	3	2	5	1
MAL6	0	3	3	-3
MAL7	5	4	9	1
MAL8	0	3	3	-3
MAL9	6	4	10	2
MAL10	6	3	9	3
MAL11	0	2	2	-2
MAL12	0	2	2	-2
MAL13	3	3	6	0
MAL14	0	0	0	0
MAL15	6	4	10	2
MAL16	5	3	8	2

5.2.6. PASAT-R Scores for the Malingering Group

CODE	PASAT1	PASAT2	PASAT3	PASAT4	PASATTOT
MAL1	12	8	7	3	30
MAL2	10	6	4	3	23
MAL3	15	7	6	5	33
MAL4	6	5	4	1	16
MAL5	12	5	7	4	28
MAL6	13	8	6	2	29
MAL7	21	12	11	7	51
MAL8	13	7	12	8	40
MAL9	18	14	0	10	52
MAL10	20	18	11	9	58
MAL11	8	5	2	1	16
MAL12	4	0	7	5	16
MAL13	6	4	3	0	13
MAL14	2	3	3	4	12
MAL15	9	15	10	3	37
MAL16	15	10	7	9	41

5.2.7. Rey 15 Scores

CODE	FIFTEEN
MAL1	9
MAL2	6
MAL3	9
MAL4	8
MAL5	9
MAL6	7
MAL7	13
MAL8	5
MAL9	15
MAL10	13
MAL11	6
MAL12	0
MAL13	6
MAL14	3
MAL15	12
MAL16	7

5.2.8. BVRT Scores for the Malingering Group

CODE	BVRCOR_C	BVRERR_C	OMIS_C	DISTOR_C	PERSEV_C	ROTAT_C	MISPLA_C	SIZE_C	LEFT_C	RIGHT_C
MAL1	2	13	0	2	0	9	2	0	5	6
MAL2	3	11	1	5	1	3	1	0	6	4
MAL3	9	1	0	1	0	0	0	0	0	0
MAL4	1	16	8	5	0	1	2	0	5	8
MAL5	7	4	0	2	0	2	0	0	2	1
MAL6	2	11	0	5	0	2	4	0	4	5
MAL7	10	0	0	0	0	0	0	0	0	0
MAL8	10	0	0	0	0	0	0	0	0	0
MAL9	3	13	1	10	0	1	1	1	4	8
MAL10	10	0	0	0	0	0	0	0	0	0
MAL11	1	12	0	8	0	3	1	0	4	5
MAL12	4	6	0	5	0	0	1	0	2	3
MAL13	9	1	0	0	0	1	0	0	0	0
MAL14	1	13	1	8	0	1	1	2	4	6
MAL15	6	6	1	3	0	2	0	0	1	5
MAL16	7	4	0	2	0	2	0	0	1	1

5.2.8. BVRT Scores for the Malingering Group - continued

CODE	BVRCOR_D	BVRERR_D	OMIS_D	DISTOR_D	PERSEV_D	ROTAT_D	MISPLA_D	SIZE_D	LEFT_D	RIGHT_D
MAL1	3	16	0	4	1	9	2	0	10	6
MAL2	0	17	1	11	0	3	1		6	8
MAL3	5	8	1	4	1	1	1	0	3	2
MAL4	2	20	8	7	0	4	1	0	8	10
MAL5	3	9	0	6	0	0	2	1	3	6
MAL6	4	8	0	5	0	3	0	0	3	4
MAL7	7	5	2	2	1	0	0	0	2	3
MAL8	8	3	0	2	0	0	1	0	3	0
MAL9	2	14	0	7	1	3	3	0	8	5
MAL10	7	4	0	1	1	1	1	0	1	3
MAL11	0	17	0	9	1	6	1	0	6	8
MAL12	4	12	0	9	1	1	1	0	6	5
MAL13	1	21	9	8	0	4	0	0	9	11
MAL14	1	22	0	13	0	2	7	0	18	10
MAL15	0	21	1	8	3	4	4	1	7	11
MAL16	4	11	2	1	1	3	4	0	3	5

5.3. Noninjured Group

5.3.1. Demographic Information for the Noninjured Group

CODE	STATUS	SEX	REGION	AGE	YRSED
NON1	3	F	G	24	11
NON2	3	F	G	27	12
NON3	3	F	G	40	11
NON4	3	F	G	27	11
NON5	3	M	G	24	12
NON6	3	M	M	17	11
NON7	3	M	M	16	11
NON8	3	M	M	19	11
NON9	3	M	M	17	12
NON10	3	M	M	18	11
NON11	3	F	M	20	12
NON12	3	M	M	15	9
NON13	3	M	M	25	12
NON14	3	F	M	20	12
NON15	3	M	M	25	12

5.3.2. PCL Scores for the Noninjured Group

CODE	PCL1	PCL2	PCLDIFF	PCLPCS1	PCLPCS2	PCLPCDIF
NON1	10	10	0	6	6	0
NON2	10	10	0	6	6	0
NON3	12	12	0	5	5	0
NON4	5	5	0	2	2	0
NON5	12	12	0	6	6	0
NON6	2	2	0	2	2	0
NON7	22	22	0	13	13	0
NON8	11	11	0	5	5	0
NON9	12	12	0	8	8	0
NON10	6	6	0	2	2	0
NON11	13	13	0	6	6	0
NON12	26	26	0	13	13	0
NON13	12	12	0	5	5	0
NON14	15	15	0	6	6	0
NON15	11	11	0	7	7	0

5.3.3. PCSC Scores for the Noninjured Group

CODE	PCSC1TOT	PCSC1FRQ	PCSC1INT	PCSC1DUR	PCSC2TOT	PCSC2FRQ	PCSC2INT	PCSC2DUR	TOTDIFF	FRQDIFF	INTDIFF	DURDIFF
NON1	55	15	21	19	55	15	21	19	0	0	0	0
NON2	82	21	23	33	82	21	28	33	0	0	0	0
NON3	71	19	24	28	71	19	24	28	0	0	0	0
NON4	51	14	17	20	51	14	17	20	0	0	0	0
NON5	60	16	22	22	60	16	22	22	0	0	0	0
NON6	53	15	17	21	53	15	17	21	0	0	0	0
NON7	82	24	30	28	82	24	30	28	0	0	0	0
NON8	61	19	17	25	61	19	17	25	0	0	0	0
NON9	47	17	13	17	47	17	13	17	0	0	0	0
NON10	49	16	17	16	49	16	17	16	0	0	0	0
NON11	73	24	28	21	73	24	28	21	0	0	0	0
NON12	102	32	29	41	102	32	29	41	0	0	0	0
NON13	59	20	20	19	59	20	20	19	0	0	0	0
NON14	83	25	28	30	83	25	28	30	0	0	0	0
NON15	55	16	16	23	55	16	16	23	0	0	0	0

5.3.3. PCSC Scores for the Noninjured Group - continued

CODE	HEADACH1	DIZZINE1	IRRITAB1	MEMORY1	CONCENT1	FATIGUE1	VISION1	NOISEIN1	JUDGEME1	ANXIETY1	HEADACH2	DIZZINE2
NON1	8	8	3	3	3	9	3	3	7	8	8	8
NON2	7	3	11	6	7	8	13	10	6	11	7	3
NON3	3	3	3	3	7	7	11	14	9	11	3	3
NON4	11	7	3	3	3	7	3	3	3	8	11	7
NON5	10	3	3	3	12	3	3	10	3	10	10	3
NON6	3	3	3	9	3	3	3	9	8	9	3	3
NON7	13	10	7	7	3	11	3	9	9	10	13	10
NON8	8	3	3	3	3	8	10	14	6	3	8	3
NON9	3	3	3	8	3	3	3	9	3	9	3	3
NON10	9	3	3	6	3	9	3	7	3	3	9	3
NON11	10	7	7	7	7	7	3	9	7	9	10	7
NON12	10	9	11	9	10	13	11	11	9	9	10	9
NON13	3	3	3	8	6	9	3	11	3	10	3	3
NON14	9	3	3	12	7	13	3	12	8	13	9	3
NON15	8	3	7	7	3	9	3	3	3	9	8	3

5.3.3. PCSC Scores for the Noninjured Group - continued

CODE	IRRITAB2	MEMORY2	CONCENT2	FATIGUE2	VISION2	NOISIN2	JUDGEME2	ANXIETY2	HEADADIF	DIZZDIF	IRRITDIF	MEMDIF
NON1	3	3	3	9	3	3	7	8	0	0	0	0
NON2	11	6	7	8	13	10	6	11	0	0	0	0
NON3	3	3	7	7	11	14	9	11	0	0	0	0
NON4	3	3	3	7	3	3	3	8	0	0	0	0
NON5	3	3	12	3	3	10	3	10	0	0	0	0
NON6	3	9	3	3	3	9	8	9	0	0	[illegible]	0
NON7	7	7	3	11	3	9	9	10	0	0	0	0
NON8	3	3	3	6	10	14	6	3	0	0	0	0
NON9	3	8	3	3	3	9	3	9	0	0	0	0
NON10	3	6	3	9	3	7	3	3	0	0	0	0
NON11	7	7	7	7	3	9	7	9	0	0	0	0
NON12	11	9	10	13	11	11	9	9	0	0	0	0
NON13	3	8	6	9	3	11	3	10	0	0	0	0
NON14	3	12	7	13	3	12	8	13	0	0	0	0
NON15	7	7	3	9	3	3	3	9	0	0	0	0

5.3.3. PCSC Scores for the Noninjured Group - continued

CODE	CONCDIF	FATIGDIF	VISIODIF	NOISEDIF	JUDGDIFF	ANXDIFF
NON1	0	0	0	0	0	0
NON2	0	0	0	0	0	0
NON3	0	0	0	0	0	0
NON4	0	0	0	0	0	0
NON5	0	0	0	0	0	0
NON6	0	0	0	0	0	0
NON7	0	0	0	0	0	0
NON8	0	0	0	0	0	0
NON9	0	0	0	0	0	0
NON10	0	0	0	0	0	0
NON11	0	0	0	0	0	0
NON12	0	0	0	0	0	0
NON13	0	0	0	0	0	0
NON14	0	0	0	0	0	0
NON15	0	0	0	0	0	0

5.3.4. Stroop Scores for the Noninjured Group

CODE	STROOP1	STROOP2	STROOP3	STROOP4	SUBT32	SUBT42	STR1ACC	STR2ACC	STR3ACC	STR4ACC
NON1	54	[illegible]	151	153	60	62	98	95	87	94
NON2	54	[illegible]	125	113	57	45	93	90	99	99
NON3	[illegible]	66	112	179	46	113	100	100	99	98
NON4	[illegible]	76	97	123	21	47	98	97	98	97
NON5	[illegible]	88	137	132	49	44	99	100	100	97
NON6	45	84	111	113	27	29	100	[illegible]	99	97
NON7	55	76	112	121	36	45	98	98	91	93
NON8	48	84	139	128	55	44	100	95	90	96
NON9	57	92	126	125	34	33	100	100	96	100
NON10	61	95	189	152	74	57	100	95	97	96
NON11	47	92	150	120	58	28	100	98	92	95
NON12	51	73	122	123	49	50	100	100	99	97
NON13	57	85	147	197	62	112	100	99	99	95
NON14	42	81	136	120	55	39	100	98	96	94
NON15	48	84	142	155	48	61	99	99	97	98

5.3.5. RDS Scores for the Noninjured Group

CODE	RDSFORW	RDSBACK	RDSTOT	RDSDIFF
NON1	6	3	9	3
NON2	6	3	9	3
NON3	7	4	11	3
NON4	5	3	8	2
NON5	6	5	11	1
NON6	5	4	9	1
NON7	5	3	8	2
NON8	5	5	10	0
NON9	5	3	8	2
NON10	4	4	8	0
NON11	6	6	12	0
NON12	6	3	9	3
NON13	5	5	10	0
NON14	4	4	8	0
NON15	6	5	11	1

5.3.6. PASAT-R Scores for the Noninjured Group

CODE	PASAT1	PASAT2	PASAT3	PASAT4	PASATTOT
NON1	14	12	9	6	41
NON2	5	7	11	9	32
NON3	25	17	16	7	65
NON4	25	22	21	21	89
NON5	22	21	16	10	69
NON6	17	14	13	9	53
NON7	15	14	10	8	47
NON8	12	8	6	9	35
NON9	12	9	7	7	35
NON10	22	15	8	9	54
NON11	21	18	13	11	63
NON12	18	[illegible]	6	8	42
NON13	11	11	5	6	33
NON14	21	17	15	9	62
NON15	19	13	9	9	50

5.3.7. Rey 15 Scores

CODE	FIFTEEN
NON1	13
NON2	12
NON3	13
NON4	13
NON5	12
NON6	13
NON7	10
NON8	15
NON9	15
NON10	13
NON11	15
NON12	13
NON13	13
NON14	12
NON15	13

5.1.8. BVRT Scores for the Noninjured Group

CODE	BVRCOR_C	BVRERR_C	OMIS_C	DISTOR_C	PERSEV_C	ROTAT_C	MISPLA_C	SIZE_C	LEFT_C	RIGHT_C
NON1	6	4	1	1	0	0	2	0	1	2
NON2	9	1	0	1	0	0	0	0	0	0
NON3	10	0	0	0	0	0	0	0	0	0
NON4	5	5	0	0	0	0	5	0	3	2
NON5	6	2	1	1	0	0	0	0	0	1
NON6	9	1	0	0	0	0	1	0	0	1
NON7	9	1	0	0	0	1	0	0	0	0
NON8	9	1	0	0	0	0	1	0	0	1
NON9	8	2	1	0	0	0	1	0	1	2
NON10	9	1	1	0	0	0	0	0	0	1
NON11	8	2	0	0	0	0	2	0	0	2
NON12	7	3	0	0	0	0	3	0	1	2
NON13	3	9	0	0	0	2	6	1	2	7
NON14	0	12	8	4	0	0	0	0	4	6
NON15	8	4	0	2	0	2	3	0	2	2

5.3.8. BVRT Scores for the Noninjured Group - continued

CODE	BVRCOR_D	BVRERR_D	OMIS_D	DISTOR_D	PERSEV_D	ROTAT_D	MISPLA_D	SIZE_D	LEFT_D	RIGHT_D
NON1	5	7	0	2	0	3	2	0	2	3
NON2	5	6	0	4	0	1	1	0	3	3
NON3	7	4	0	2	1	1	0	0	2	2
NON4	3	7	0	1	0	0	6	0	1	6
NON5	4	10	0	5	0	2	3	0	4	3
NON6	3	8	2	1	1	1	3	0	2	5
NON7	8	2	0	0	1	1	0	0	0	2
NON8	5	4	0	1	0	3	1	0	1	4
NON9	9	1	0	0	1	0	0	0	0	1
NON10	10	0	0	0	0	0	0	0	0	0
NON11	7	4	1	1	1	1	0	0	2	2
NON12	5	12	0	5	5	1	1	0	5	7
NON13	1	16	0	9	3	3	1	0	7	8
NON14	2	8	8	0	0	0	0	0	3	5
NON15	7	6	0	1		0	1	0	3	1

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