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1 **Vocational Outcomes after TBI; prevalence and risk factors after 1 year in a**
2 **multivariable model**

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20

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22 **Abstract**

23 Objective: To determine the prevalence of employment status(ES) or full time study after
24 traumatic brain injury(TBI) in a representative population and its predictive factors

25 Design: Prospective cohort study

26 Setting: Regional Major Trauma Centre

27 Participants: 1734 consecutive individuals of working age, admitted with TBI to a Regional
28 Trauma Centre were recruited and followed-up at 8 weeks and 1 year with face to face
29 interview. Median age was 37.2yrs (17.5-58.2); 51% had Mild TBI and 36.8% had a normal
30 CT scan

31 Main outcome measure: Complete or partial/modified return to employment or study as an
32 ordinal variable

33 Results: At 1 year only 44.9% returned to full time work/study status, 28.7% had a partial or
34 modified return and 26.4% had no return at all. In comparison to status at 6 weeks, 9.9%
35 had lower or reduced work status. Lower ES was associated with greater injury severity,
36 more CT scan abnormality, older age, mechanism of assault, and presence of depression,
37 alcohol intoxication or a past psychiatric history. The multivariable model was highly
38 significant ($p < 0.001$) and had a Nagelkerke R^2 of 0.353 (35.3%)

39 Conclusions: Employment at 1 year is poor and changes in work status are frequent,
40 occurring in both directions. While associations with certain features may allow targeting of
41 vulnerable individuals in future, the majority of model variance remains unexplained and
42 requires further investigation.

43

44

45 **Introduction**

46

47 Traumatic Brain Injury (TBI) causes a number of physical, cognitive and behavioural
48 impairments, both in the short and long term; these have a huge impact on the individual,
49 their family as well as the rest of society, given the huge incidence of TBI.¹

50 While outcome of TBI can be measured in numerous ways, employment status (ES) is often
51 considered a key outcome in recovery after injury. Work is an essential part of our daily lives
52 and affects social integration, health status, self-worth and quality of life.²⁻⁵ It should be
53 considered a major goal of any rehabilitation programme. As TBI often affects young
54 individuals, a disproportionate level of the burden of TBI falls on those in work or higher
55 education. Hence TBI often strikes at a time in lives when paid employment or study is of
56 paramount importance to future well-being.

57 The overall extent of ES after TBI is unclear and literature reports a wide range of
58 prevalence (13-73%).⁵⁻⁹ This wide range reflects on the huge variation in population
59 selection, sample size, injury severity and time of follow-up. There are also national
60 differences reflecting local benefits and payment systems and hence the pressure to return
61 to work. As a result, the exact extent of the problem remains unknown.

62 Apart from the challenges in measuring prevalence, many studies have examined potential
63 risk factors that may influence employment. A wide range of demographic and injury factors
64 have been investigated in numerous papers. These include variables such as age, gender,
65 ethnicity, marital or other support, occupational type, education level, employment at time of
66 injury and TBI severity.^{3,5,9-22} Others have examined particular aspects of cognitive and
67 neuropsychological function or levels of social support and employer support.²³⁻⁵ However
68 the findings are mixed and often contradictory with reviews failing to identify any consistent
69 risk factors although individual papers often identify particular associations with
70 employment.^{10,13} Unfortunately there is also limited evidence that vocational programmes
71 can influence outcome.²⁶ Reviewers noted that most studies are poorly designed and that
72 converting return to work into a dichotomous outcome, i.e. "yes" or "no", does not take into
73 account that many individuals return to modified jobs or part time hours; binary outcome
74 does not reflect the "real world situation".¹⁰

75 Our aim in this study was to examine the influence of a range of injury and demographic
76 features on ES; there was a particular focus on examining the role of employment type and
77 of level of CT scan abnormality, both of which have been relatively underrepresented in

78 literature. Evidence for the role of work type on outcome is mixed with some studies showing
79 an effect while others have noted none.^{3,6,7} Our previous work has shown the importance of
80 deprivation as a predictor for poor overall TBI outcome²⁷ and an examination of work type
81 seemed a useful complement to this. As a new system of socioeconomic(SEC) or work
82 type classification was introduced for national census and population categorisation,²⁸ this
83 seemed an ideal time to examine this variable which is known to predict overall human
84 mortality and morbidity.²⁹ In addition, we are unaware of any studies that have examined the
85 extent of CT scan abnormality across the entire TBI severity spectrum; this may reflect the
86 lack of appropriate methods of classifying CT scans after TBI as most systems focus on the
87 very severe end of the TBI spectrum and the need for surgical intervention.⁴⁸ We therefore
88 wished to examine this variable using a CT classification system that was suitable for a
89 mixed TBI group.

90 The creation of a brain injury rehabilitation pathway in our region of the UK offered the
91 opportunity to study a prospective, unselected TBI group, reflecting the “real life” outcomes
92 of individuals which clinicians treat. By capturing all TBI admissions, coupled with a
93 systematic follow-up pathway, a representative sample with minimal attrition has been
94 achieved. Use of face to face, structured interviews also allows a measure of the *extent* of
95 the return to work, i.e. full or partial. This study was designed to identify risk factors for poor
96 ES following TBI. The ability to identify at-risk individuals would provide an opportunity for
97 targeted interventions to reduce poor employment outcomes in the most vulnerable groups..

98

99

100 **Methods**

101

102 Individuals admitted with traumatic brain injury to a large Teaching Hospital between August
103 2011 and July 2017 were screened for inclusion in this study. Only individuals of working
104 age (17-58) were entered so that 1 year follow-up would definitely occur before the usual
105 retirement age of 60 yrs. All individuals had a CT(computerised tomography) of head and

106 spent at least 24 hours for observation as inpatients. Protocol for observations and decision
107 on admission and discharge are determined by use of the National Institution for Health and
108 Care Excellence Guidelines (2014).³⁰ Individuals with previous TBI requiring inpatient care,
109 residence out of region, dementia or age less than 17, were excluded. Individuals under 17
110 are admitted to the Children's Hospital.

111

112 TBI diagnosis was determined by criteria of common data elements.³¹ Systematic
113 arrangement for follow-up at 8 to 10 weeks after injury was organised. All individuals were
114 assessed by the same physician in Rehabilitation Medicine, while for those few who
115 remained inpatients at this stage, assessment took place on their ward. All individuals
116 received letters, phone calls and a text message to facilitate attendance and non-attenders
117 were further contacted to book new appointments.

118 Demographic information and injury factors, such as aetiology and ethnicity were recorded at
119 interview. A positive psychiatric history was operationally defined as a diagnosed psychiatric
120 condition or treatment and a record of alcohol intoxication at injury was taken from admission
121 records or direct history. A significant level of medical comorbidity was ascertained with the
122 Cumulative Illness Rating Scale.³²

123 Aetiology was classed by the UK Trauma Audit and Research Network system as into Falls,
124 Assault, Road Traffic Collisions, Sporting Injury and "Other" mechanisms which
125 predominantly consists of falls greater than two metres in height or workplace injuries.³³

126 Unfortunately, most CT classification systems focus on severe TBI and particularly the need
127 for Neurosurgical intervention. This is unsuitable for the entire TBI population which largely
128 constitutes mild TBI. Therefore the "overall appearance" classification system for CT scans
129 was used.³⁴ This grades severity of CT abnormalities into Normal, Mild focal injury,
130 Moderate focal injury and Diffuse or widespread injury.

131 Attendees also completed a HADS (Hospital Anxiety and Depression Scale).³⁵ This has
132 been validated in TBI populations with a cut-off score >8, signifying significant depressive
133 symptoms.³⁵⁻⁶

134

135 *Work history*

136

137 A structured interview to ascertain work status was undertaken at each appointment. This
138 included the exact type of work, hours, responsibilities and previous work history or higher
139 education. This was used to determine if a return to work was complete or
140 partial. Classification of individuals into employment type, was made by the National
141 Statistics Socio-economic Classification (NS-SEC).²⁸ This is the classification system used
142 by the National Census Office for categorising work type, consisting of nine levels. For
143 students, return to the same course, including hours of study, was used to determine
144 complete or partial recovery.

145 Individuals who were unemployed for less than a year at the time of injury but actively
146 seeking work, were not excluded; any change in their ability and attempts to seek work was
147 considered at each appointment ie if the TBI had affected their employment prospect and
148 efforts to seek it.

149 Appointments were repeated at one year. Those who failed to attend were contacted and
150 further appointments encouraged and rearranged.

151 The study was approved by the Teaching Hospital Trust and the University of Sheffield
152 Ethics Committees (STH16208).

153

154 *Statistics*

155

156 Descriptive data are presented as frequency and percentages. Data approximating a
157 normal distribution is presented as mean and standard deviation or otherwise as median and
158 range.

159 In univariable analysis, ES (an ordinal variable) was compared with other variables as
160 follows; for binary independent variables (ethnicity, gender, comorbidity, alcohol intoxication,
161 psychiatric history) a Mann-Whitney test was applied; for nominal independents with >2

162 categories (aetiology), a Kruskal-Wallis test was applied; for ordinal independent variables
163 (severity, work type/SEC, CT scan abnormality) a Kendall- τ was applied as appropriate.
164 While a simply Y/N work outcome could have been easily analysed in a logistic regression
165 model, in order to incorporate a partial return to work, an ordinal regression model was
166 created with ES at the dependent variable.
167 Independent variables entered were injury severity, age, work type, CT scan abnormalities,
168 gender, ethnicity, aetiology, alcohol intoxication, psychiatric history, medical comorbidity and
169 pre-injury employment.
170 Features of interest were entered as continuous or categorical predictors. Further post-hoc
171 tests were applied to variables that were significantly different but had more than two
172 categories (NS-SEC, aetiology and CT scan). Statistical analysis was performed using
173 SPSS version 23.

174

175

176 **Results**

177

178 Over the study period (2011 – 2017) there were 2642 individuals with TBI admitted to the
179 hospital. Out of these, 46 met the exclusion criteria (out of area residence, previous treated
180 TBI or dementia), 261 could not have TBI confirmed with the CDE criteria and 473 were
181 aged over 58 years. The remaining 1803 individuals had follow-up appointments arranged
182 for 8 to 10 weeks and 1734 attended their first appointment. After one year, appointments
183 were repeated at which point there had been 29 deaths (1.7%) and 79 (4.6%) cases were
184 lost to follow-up despite repeated attempts to re-appoint. The study group had “milder” TBI
185 as judged by a higher GCS score and higher prevalence of medical comorbidities than the
186 “lost” group. Otherwise there were no differences between the two groups (Table 1).
187 The final study population at one year therefore consisted of 1626 individuals with a work
188 outcome recorded after one year. In terms of the original recruited group this equates to a
189 one year follow-up of 93.7%.

190 The demographics of the group is shown in Table 1. Mean age of the cohort was 40.7 years
191 (SD 15.1); the median age was 37.2 (a range 17.5 to 58.2 years). The majority of cases
192 were male (1148, 69.2%), and of white ethnicity (1547, 93.1%), a further breakdown of the
193 groups found that women with TBI were slightly older than men, reflecting a higher
194 frequency of falls as aetiology but fewer RTC or assault cases. They also had a higher GCS
195 suggesting less severe TBI.

196 The median length of stay in hospital was 3 days (range 1 – 211) with 84.1% of inpatient
197 stays less than 10 days. This reflects the high proportion of mild TBIs, most of whom had an
198 overnight stay in hospital.

199 Using GCS to classify injury severity (GCS 9-12 for moderate TBI) the group consisted
200 largely of mild TBI (814, 50.1%), while moderate TBI consisted of 552 (33.9%) and STBI 260
201 (16.0%). This high proportion of mild TBI is a much closer representation of the real life
202 distribution of TBI than many other studies.

203 Normal CT scan was found in 612 (36.8%) of individuals with only 5.7% demonstrating
204 diffuse CT abnormalities affecting non-adjacent lobes.

205 In terms of aetiology, falls (36.3%) and road traffic collisions (27.2%) were the most frequent
206 cause of injury, with assaults making up 18.4%. Based on the operational definition of past
207 psychiatric history, there was a positive history in 287 (17.3%) as well as intoxication at
208 injury of 391 (23.5%) of individuals and significant medical comorbidity in 422 (25.4%)
209 individuals.

210 For employment status prior to injury, the majority were in employment (85.9%) or study
211 while 14.1% were unemployed. Employment type is also shown in Table 1. While there is
212 an even distribution across all groups, this pattern reflects a slight difference to the Regional
213 Census data of 2011 with a slightly lower proportion of individuals in professional and lower
214 management groups. There was a substantial number of full time students and individuals
215 who had never worked or been on long term sick leave.

216 The main outcome of the study, ES at one year is shown in Table 2.

217 At 6-8 weeks, 25.9% of the cohort had returned to full time work in the same role and
218 capacity that they previously enjoyed. A further 34.5% were working part time or in a
219 modified job and 39.6% had returned to no employment or study at all. By comparison, at 1
220 year,, the corresponding figures were 44.9%, 28.7% and 26.4%. The one year picture
221 therefore represents a considerable improvement from the early weeks after injury. The
222 breakdown of these figures divided by work type shows similar proportions of employed
223 individuals within most of the categories. However, professional group and students had a
224 higher proportion of full return than the other categories and this was significant on a
225 univariable test. Other significant univariable analyses are also shown in Table 3.

226 While most individuals had improved there was a considerable proportion of individuals
227 (9.9%) whose ES had deteriorated between the initial appointment and 1 year. That is to say
228 that their employment status had declined e.g. moved into the “no work” or “partial work”
229 from a full time role or into “no work” from a “partial work”. In fact 2.5% dropped from full
230 return at 8 weeks to no work after 1 year; 37.7% had improved their status and 52.5% had
231 maintained the same level as the initial appointment.(Table 2)

232 A multi-ordinal regression model was calculated with return to work at 1 year as the
233 dependent outcome (Table 4). The independent variables of age, gender, ethnicity,
234 socioeconomic group, pre-injury employment, depression, medical comorbidity, GCS,
235 aetiology, alcohol intoxication at time of injury, past psychiatric history, and CT scan
236 abnormality were all entered. Post hoc tests were required for categorical variables greater
237 than 2 groups (aetiology, work type, CT scan). The model was highly significant with a
238 Nagelkerke R^2 of 0.353 ($p < 0.001$). Features that were found to be significant for poorer ES
239 than this model were older age, lower GCS (a more severe TBI), aetiology (assault versus
240 falls or sport as mechanism), positive psychiatric history, presence of depression, alcohol
241 intoxication and worse CT scan abnormality. These are therefore the independent predictors
242 of work outcome.

243

244

245

246 **Discussion**

247

248

249 With the exception of the huge multicentre TBIMS studies,⁵ this is one of the largest and
250 most comprehensive studies of ES after TBI. We documented that a very high proportion of
251 individuals at one year had a deterioration in employment status. Indeed only 44% had a full
252 and complete recovery to work/study in a cohort in which over half of individuals had
253 sustained MTBI. In fact, over a quarter of the group could not return to any form of work or
254 study at all. Few studies have shown any improvement in job status beyond one year,
255 suggesting that this is likely to be the best scenario that we will find in this cohort.^{9,11,16,21}

256 While the 1 year picture represented considerable improvement from the situation after 8
257 weeks, it is likely that the first appointment is far too early to make definitive statements
258 about the likelihood of an individual's return to work.

259 While many individuals had improved, it was interesting that a considerable number of
260 individuals had shown a deterioration in their work status between the earlier appointment
261 and one year. This included several who had dropped two levels in the scale from Full return
262 to No work. It is possible that some individuals optimistically integrate themselves back into
263 the workplace early on but that the demands of work prove too difficult in subsequent weeks
264 and months.²⁵ This only emphasises how difficult the return to work can be, as well as timing
265 the moment of return.

266 The proportion of pseudovariance attributable in the model was fair and similar to others
267 including Ponsford *et al* who identified a similar proportion of variance from only three
268 variables.^{11,37} Indeed these long-term models of outcome are comparable to predictive short-
269 term models of acute prognosis.³⁸ Nevertheless it is clear that there is a complex interplay of
270 many unmeasured environmental and personal factors, which makes the overall prediction
271 of employment so difficult. The importance of personal coping styles and personality has

272 been identified as an important factor in determining brain injury outcomes^{3,6,39} but we were
273 unable to incorporate any such measures. This would be a useful project in future work.

274 Interpreting the outcome of a multi-ordinal regression can be difficult, especially for
275 categorical variables and it is certainly easier to dichotomise ES and analyse a logistic
276 regression model. However, as has been noted in systematic reviews,¹⁰ this does not allow
277 for the considerable variation in the extent to which individuals can return to work including
278 modifications to the job and responsibilities or the hours worked. We have tried to account
279 for this in this study.

280 The systematic recruitment of prospective admissions from a large Teaching Hospital
281 serving a region of over half a million and the distribution of TBI severity should ideally reflect
282 the “real-life” picture as admitted to hospital. The categorisation of outcome was also aimed
283 to reflect that many individuals manage a *partial* ES rather than a simple dichotomous
284 outcome. Many other studies have focussed on small, selective groups, e.g. STBI and have
285 much higher attrition rates to follow-up. Indeed, the loss of individuals in TBI outcome
286 studies to follow-up is well documented.⁴⁰ Excluding deaths, this study included face to face
287 assessments with >96% of cases. This was undoubtedly ameliorated by a team of
288 specialists who phoned up and encouraged follow-up in individuals who missed
289 appointments. Although any study population is subject to selection bias, we believe that
290 this cohort with higher representation of MTBI, is characteristic of admissions with TBI and is
291 of relevance to any clinicians who work within the field of Brain Injury.

292 As already noted, ES shows considerable variation between studies, largely reflecting
293 differences in work definition, population selection and time of follow-up.^{3,9,17,19,22,37,41} A large
294 systematic review quoted a similar proportion of 40% return to work at 2 years.⁷ Studies of
295 moderate to severe TBI may be expected to show less successful return but in fact have a
296 similar proportion including a study with ten years follow-up and 58% successful return of
297 which a half were part-time work.^{5,16,18,20}

298 Our finding of strong association with injury severity confirms what has been noted by
299 others^{3,5,8,11,14,18} although others find no effect of severity^{12,15,22,42} or that it was the weakest of

300 predictor variables.³ A systematic review found that overall evidence for severity was poor¹⁰
301 while an earlier review noted an effect.⁶ A review of mild TBI alone noted poor quality and
302 heterogeneity of most studies.^{8,12} It is clear that there is still room for debate but our results
303 in a representative group of all TBI severities clearly points to a strong effect.

304 One of the main aims of the study was to assess employment type using a detailed
305 classification of work type as used in the National Census.²⁸ We do not know of any other
306 study that has used a similar system or with as many separate groups. Professional and
307 student groups showed a higher return of ES than other groups which was significant in
308 univariable analysis. However this was not confirmed in the regression model which is the
309 important analysis and suggests that any effect is likely to be small and effectively
310 overshadowed by other variables. It had been postulated that self-employed individuals may
311 feel more pressured to return to work or that professional classes may enjoy more work
312 support, benefits or job flexibility. The role of employment support was an important factor in
313 a small study²⁵ and it has been noted that those in managerial positions had a threefold
314 higher rate of return than those in a manual role.²² Others have found no link.³ While the
315 negative association is disappointing, it is hoped to look at aspects of work support in a
316 future study, trying to identify the elements of both social and employer support that can
317 make a difference. Although we did not measure the educational level of individuals, this has
318 been noted by others to determine employment after injury although not all.^{12,24,42,43}

319 There is limited evidence for an association of CT findings and ES^{18,23} with a review finding
320 no effect.⁴⁷ However, most studies have used CT classifications that are heavily geared
321 towards identification of very severe injuries requiring neurosurgical intervention⁴⁸ and which
322 are not suited for large TBI groups including MTBI. The “overall appearance” system of CT
323 classification is much better designed for this and has been successfully used in other TBI
324 outcome studies.^{49,50} There was a clear association with most severe scan abnormalities
325 compared to normal scan or minor changes though not with a moderate abnormal scan. We
326 are unaware of any other study that has shown this association.

327 While we noted a negative association with age, such that older age reduced the ES, others
328 have found no association,³ while other studies have confirmed the finding.⁴² Indeed, it has
329 been suggested that a cut off at 40 years distinguishes a turning point in likelihood of any
330 return to employment.³⁷

331 Pre-injury unemployment was a poor predictor as noted by others.^{13,18,19,23} The clinic
332 assessment ensured that unemployed individuals were actively seeking work rather than
333 long-term unemployed and had been in paid employment or study within the last year. It is
334 also known that TBI is more common in the unemployed¹ and therefore it is important not to
335 exclude such individuals from analysis as is often the case.

336 In terms of aetiology, the negative association with violent injury mechanisms has been
337 noted by others.¹⁵ It is possible that emotional trauma and psychological reaction from a
338 violent mechanism of injury may have a negative impact on the ability to perform in the
339 workplace and studies to evaluate such emotions would be useful future work.

340

341 Depression is common after a TBI and is known to influence many outcomes including
342 ES.^{36,41,44-5} There was a very strong association in this study between the two although
343 again, systematic review suggests poor overall evidence in studies.¹⁰ It is, of course,
344 impossible to determine causality in regression analysis and it is equally possible that
345 inability to work causes depression. Our aim is to conduct a study of the treatment of
346 depression and the effect on ES especially as the increased risk of depression is known to
347 last for many years.⁴⁶ If this could be successfully identified as a successful treatment, then it
348 would be a very useful intervention for clinicians.

349 We noted no association with gender or ethnicity, although others have found that women
350 are less likely to return to work or become part-time and that ethnic minorities have a poorer
351 ES.^{3,5,13,19,20,51} Our study population had a relatively low proportion of ethnic minority
352 compared to many other study populations particularly in north America and has limited
353 scope for drawing any conclusions.

354 There are a number of strengths of this study, including size and systematic recruitment of a
355 cohort that should closely reflect the picture of TBI as seen by clinicians. An attempt to
356 incorporate partial return of work with modifications has also been made and there is
357 minimal attrition. Even very large multicentre studies have a very high proportion of missing
358 values and loss to follow-up of upto 75%.^{11,40} Use of structured interviews by a single
359 observer is another key strength and should minimise inter-observer bias. However, it also
360 introduces the possibility of a systematic bias.

361 Other weaknesses should be noted. It was not possible to perform any cognitive evaluations
362 and several studies have shown a link with specific cognitive domains.²³⁻⁴ As this was a
363 single centre study, it may have limited ability to reflect the situation in other countries
364 although we tried to reflect the true range of TBI. We also cannot account for the level of
365 employer support that may be available to an individual. It is also important to note that there
366 are significant differences in social security and benefits systems between countries with
367 differing levels of compensation offered. This different compensation is likely to either
368 promote or discourage return to work in some instances.

369 In future we would like to continue follow-up for employment and other brain injury outcomes
370 in the long term. Reviews suggest that in contrast to functional outcome, e.g. GOSE, return
371 to work does not improve beyond one year and some have shown increased unemployment
372 with time.⁵² It is known that work history can be unstable with individuals changing jobs or
373 moving into alternative employmen¹⁴⁰ and therefore it would be useful to document the
374 situation in this cohort at further time points. Indeed it has been shown that employment
375 *stability* may be a more useful measure than simply employment at a single time point.⁵ If we
376 could gain a better understanding of certain predictive factors in ES, we may be able to
377 provide more focussed interventions. This study has led to changes in the individuals that
378 are prioritised in the community rehabilitation service and to further projects to examine
379 treatment for depression and measurement of the extent of employer support that may make
380 a difference.

381 It is known that people who are employed have a better sense of wellbeing, greater social
382 inclusion, better overall health and less need of health facilities.⁴ Overall quality of life is also
383 much improved compared to the unemployed. By gaining a better understanding of the role
384 of predictive factors in ES, rehabilitation programmes may provide more focussed
385 interventions. This could improve the proportion of individuals who can attain a work status
386 and hence benefit from the protection that work seems to offer.

387

388

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530

531 Table 1: cohort demographics and comparison with individuals lost to follow-up at 1 year
 532 *includes 29 deaths

	Followed up n= 1655*	lost n=79	χ^2 or t-test, df, p-value
Mean Age yrs (SD)	40.72 (15.07)	40.07 (16.46)	0.330 df1732 p=0.741
Gender			
Male N(%)	1148 (69.1%)	55(76.3)	1.738 df1 p=0.187
Ethnicity N(%)			
White	1547 (93.1)	65 (90.3)	0.829 df1 p=0.363
(Non-white)	115 (6.9)	7 (9.7)	
Work Class N(%)			
Professional	114 (6.9)	3 (4.2)	13.375 df8 p=0.100
Lower managerial	235 (14.1)	5 (6.9)	(Fisher Exact Test)
Intermediate	147 (8.8)	8 (11.1)	
Self-employed	142 (8.5)	8 (11.1)	
Lower supervisor	278 (16.7)	13 (18.1)	
Semi-routine	371 (22.3)	11 (15.3)	
Routine	220 (13.2)	18 (25)	
Never worked	80 (4.8)	4 (5.5)	
Students	75 (4.5)	2 (2.8)	
Unemployed N(%)			
Yes	235 (14.1)	14 (19.4)	1.579 df1 p=0.209
Social Isolation			
No	683 (41.1)	28 (38.9)	0.139 df1 p=0.709
Aetiology N(%)			
Fall	604 (36.3)	24 (33.3)	5.029 df4 p=0.284
RTC	452 (27.2)	24 (33.3)	
Assault	305 (18.4)	17 (23.6)	
Sport	101 (6.1)	3 (4.2)	
Other(work)	200 (12.0)	4 (5.6)	
On Warfarin N(%)	112 (6.7)	0 (0)	5.187 df1 p=0.023*
Med Comorbidity N (%)	422 (25.4)	9 (12.5)	6.14 df1 0.013*
Alcohol at injury N (%)	391 (23.5)	7 (9.7)	7.436 df1 p=0.006*
Previous Psych Hx N(%)	287 (17.3)	7 (9.7)	2.791, df1 p=0.095
Mean admission GCS	11.91 (3.10)	10.54 (3.06)	-3.667 df1732 p<0.001*
Severity of TBI N(%)			
Severe	266 (16.0)	17 (23.6)	10.37 df2 p=0.006*
Moderate	568 (34.2)	33 (45.8)	
Mild	828 (49.8)	22 (30.6)	
CT Scan Findings N(%)			
Nil	612 (36.8)	14 (19.4)	11.94 df3 p=0.008*
Mild	345 (20.8)	24 (33.3)	
Moderate	610 (36.7)	31 (43.1)	
Diffuse	95 (5.7)	3 (4.2)	

Table 2: Return to Work at 8 weeks and 1 yr with change in work status N(%)

Work status	8 weeks	1 year	Wilcoxon Signed Rank Test
No work	644(39.6)	429(26.4)	z=-13.35, p<0.001
Partial Work	561(34.5)	467(28.7)	
Full Return	421(25.9)	730(44.9)	

Change in status	
Full→None	40(2.5)
1-step loss	120(7.4)
No change	854(52.5)
1-step gain	500(30.8)
None→Full	112(6.9)

Variable	Number at 1yr	Return to Work			Correlation with ES (Mann-Whitney, Kendall- τ , Kruskal Wallis), p-value
		Full	Partial	None	
Severity	Mild (814)	466(57.3)	206(25.3)	142(17.4)	-0.262, p<0.001*
	Moderate(552)	207(37.5)	182(33.0)	163(29.5)	
	Severe(260)	57(22.0)	79(30.4)	124(47.6)	
Gender	Male(1125)	497(44.2)	331(29.4)	297(26.4)	-0.604, p=0.546
	Female(501)	233(46.5)	136(27.1)	132(26.3)	
Ethnicity	White (1511)	685(45.3)	427(28.3)	399(26.4)	-0.844,p=0.399
	Non-white (115)	45(39.1)	40(34.8)	30(26.1)	
Aetiology	Fall(574)	281(49.0)	159(27.7)	134(23.3)	7.226, p=0.027*
	RTC(449)	199(44.3)	133(29.6)	117(26.1)	
	Assault(305)	108(35.4)	105(34.4)	92(30.2)	
	Sport(101)	65(69.3)	19(18.8)	17(16.8)	
	Other(197)	77(39.1)	51(25.9)	69(35.0)	
NS-SEC	Professional(113)	65(57.5)	27(23.9)	21(18.6)	0.060, p=0.003*
	Lower Manager(231)	112(48.5)	68(29.4)	51(22.1)	
	Intermediate(145)	66(45.5)	47(32.4)	32(22.1)	
	Small Employer(135)	56(41.5)	45(33.3)	34(25.2)	
	Lower Supervisor(272)	127(46.7)	73(26.8)	72(26.5)	
	Semi-routine(363)	149(41.0)	100(27.5)	114(31.4)	
	Routine(219)	86(39.3)	63(28.7)	70(32.0)	
	Never worked(73)	21(28.5)	21(28.5)	31(43)	
	Student(75)	48(64)	23(30.7)	4(5.3)	
	Employed(1395)	668(47.9)	397(28.5)	330(23.6)	
Pre-injury Employment	Unemployed(231)	62(26.8)	70(30.3)	99(42.9)	47.48, p<0.001*
	Yes (392)	168(42.9)	110(28.1)	114(29.0)	
Comorbidity	No (1234)	562(45.5)	357(28.9)	315(25.5)	-1.262,p=0.207
	Yes(277)	65(23.5)	87(31.4)	125(45.1)	
Psych Hx	No(1349)	665(49.3)	380(28.2)	304(22.5)	-8.87,p<0.001*
	Yes(277)	65(23.5)	87(31.4)	125(45.1)	
Alco Intox	Yes(385)	122(31.7)	134(34.8)	129(33.5)	-5.69,p<0.001*
	No (1241)	608(49.0)	333(26.8)	300(24.2)	
CT Scan	Normal(602)	345(57.3)	147(24.4)	110(18.3)	-0.255, p<0.001*
	Mild(341)	170(49.9)	103(30.2)	68(19.9)	
	Moderate(591)	199(33.7)	187(31.6)	205(34.7)	
	Severe(92)	16(17.4)	30(32.6)	46(50)	
Depression	Yes(502)	44(8.8)	205(40.8)	253(50.4)	407,p<0.001*
	No(1124)	686(61)	262(23.3)	176(15.7)	

Table 3: return to work and univariable association with variables of interest; Correlation with Kendall- τ for ordinal data, Kruskal-Wallis for nominal variables (>2 categories) and Mann-Whitney for binary variables, *significance for $p < 0.05$

Table 4: Ordinal Regression Model of 1 year ES. Categories described in text. OR odds ratio, *significant for p<0.05

	B	p-value	OR	95% CI for OR	
				Lower	Upper
Non-white Ethnicity	-0.046	0.819	0.955	0.642	1.420
Female Gender	-0.171	0.147	0.843	0.669	1.062
Age at injury	-0.008	0.011*	0.992	0.988	0.998
Socioeconomic Class					
<i>Professional-baseline</i>	-	-			
<i>Lower Manager</i>	-0.244	0.321	0.783	0.484	1.268
<i>Intermediate</i>	-0.284	0.285	0.752	0.447	1.268
<i>Small Employer</i>	-0.475	0.075	0.622	0.369	1.050
<i>Lower Supervisory</i>	-0.298	0.213	0.743	0.465	1.186
<i>Semi-routine</i>	-0.411	0.077	0.663	0.421	1.045
<i>Routine</i>	-0.319	0.199	0.727	0.447	1.183
<i>Never Worked</i>	-0.357	0.294	0.700	0.359	1.363
<i>Student</i>	0.174	0.604	1.191	0.616	2.303
Unemployed	-0.390	0.018	0.677	0.490	0.936
Social Isolation					
<i>Yes</i>	-0.156	0.164	0.856	0.686	1.066
Aetiology					
<i>Assault - baseline</i>	-	-			
<i>Falls</i>	0.481	0.002*	1.618	1.193	2.194
<i>RTC</i>	0.168	0.282	1.183	0.871	1.606
<i>Sports</i>	0.521	0.038*	1.683	1.029	2.753
<i>Other</i>	0.011	0.954	1.011	0.702	1.456
GCS	0.170	<0.001*	1.186	1.138	1.235
Psychiatric Hx	-0.415	0.004*	0.660	0.499	0.874
Warfarin	0.119	0.590	1.434	0.542	3.795
Comorbidity	-0.169	0.206	0.844	0.650	1.097
Intoxicated	-0.278	0.036*	0.757	0.584	0.982
Depression	-1.811	<0.001*	0.164	0.129	0.207
CT Scan					

<i>Diffuse-baseline</i>	-	-			
<i>Moderate</i>	0.178	0.437	1.195	0.763	1.870
<i>Mild</i>	0.710	0.003*	2.034	1.265	3.271
<i>NAD</i>	0.489	0.049*	1.631	1.002	2.651
Constant	2.284	0.069	9.814		