

Goal adjustment and well-being after an acquired brain injury: the role of cognitive flexibility and personality traits

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Objective. The tendency to flexibly adjust goals that are hindered by chronic illness is related to indicators of wellbeing. However, cognitive flexibility is often impaired in persons with an acquired brain injury (ABI), possibly affecting the ability to flexibly adjust goals. In this study we examined whether cognitive flexibility is positively related with the ability to disengage from goals and to reengage with goals in persons with ABI. Second, we explored whether goal adjustment abilities are predictive of a unique proportion of the variance inabilities are predictive of quality of life and life satisfaction after controlling for personality traits. **Method.** 78 persons with an ABI completed a set of questionnaires. Goal disengagement and goal reengagement were assessed using the Wrosch Goal Adjustment Scale (GAS). Indicators of wellbeing were the European Brain Injury Questionnaire (EBIQ) and the Satisfaction with Life Scale (SWLS). The percentage of perseverative errors on the Wisconsin Card Sorting Test (WCST) was used as an indicator of cognitive inflexibility. Big Five personality traits were assessed via the NEO-FFI. **Results.** Cognitive flexibility was positively related to goal reengagement, but not to goal disengagement. Goal reengagement was positively associated with both quality of life and life satisfaction after controlling for demographic factors, illness characteristics and personality factors. Goal disengagement was negatively related to life satisfaction. **Conclusion.** Flexible goal adjustment abilities, i.e., goal disengagement and goal reengagement, have a unique explanatory value for indicators of wellbeing, beyond personality traits. The findings indicate that in persons with lower cognitive flexibility, goal reengagement ability might be negatively affected, and should be taking into account during rehabilitation .

1 INTRODUCTION

2 An acquired brain injury (ABI) is an injury to the brain that is not hereditary, congenital,
3 degenerative, or induced by birth trauma (Brain Injury Association of America, 1997). Head
4 traumata and stroke are main causes. Less common causes are anoxia, brain tumours, substance
5 abuse and brain infections. Patients with ABI may experience a variety of consequences. Many
6 suffer from problems in mobility and communication (Lannoo et al., 2004). Cognitive and
7 behavioural consequences, such as difficulties in attention, memory, planning, and impulse
8 control are less visible but are often more challenging (Lassaletta, 2019). Most individuals with
9 ABI experience disability and a loss of quality of life (QOL) (Mar et al., 2011). Jacobson and
10 Lexell (2013) found that even 10 years after the injury, life satisfaction of people with an ABI is
11 lower than that of a sex- and age-matched group. For many, an ABI causes a discontinuity in life
12 that has proven hard to accept (Kim, 2015). Nevertheless, accepting of the reality of the problem
13 has been shown to improve the subjective quality of life (Van Bost, Van Damme & Crombez,
14 2017). Of importance, acceptance is not simply surrendering to an unwanted reality. It is
15 "recognizing the need to adapt to chronic illness while perceiving the ability to tolerate the
16 unpredictable, uncontrollable nature of the disease and handle its adverse consequences" (Evers,
17 2001, p. 1027). Diller (2005) considers acceptance to be a marker of mental health and a
18 desirable outcome of rehabilitation efforts.

19 The consequences of an ABI may jeopardize the realisation of important goals (Doering et al.,
20 2011). Goals are internal representations of states that a person aims to accomplish by their
21 behavior (Austin & Vancouver, 1996). Engagement towards personal goals is important for
22 people's subjective well-being (Carver & Scheier, 2008). Unforeseen events, such as a chronic
23 illness, or the gradual decline of capacities because of aging may hinder attainment of these

24 goals. If people persist in their striving towards goals that are no longer attainable, this has a
25 detrimental impact on their well-being (Kuenemond et al, 2013). Developed in the context of
26 life-course dynamics, dual process model of Brandtstädter and Rothermund (2002) describes
27 how assimilative coping strategies aim at a tenacious goal pursuit, whereas accommodative
28 coping strategies focus on flexible goal adjustment. When confronted with difficulties in goal
29 pursuit people may exert more effort or look for alternative strategies to obtain these goals.
30 When people are confronted with repeated failure to realise their premorbid goals despite extra
31 effort and the use of new strategies people can become more open to alter these goals, setting the
32 stage for an accommodative adaptive respons. Central to this accommodative mode is the
33 flexible adjustment of the goals to the available resources (Brandtstädter, 2009).

34 Wrosch et al. (2003) distinguish between two processes relevant for accomodative coping. Goal
35 disengagement means that an individual stops pursuing a specific goal and can let go. This may
36 help people to avoid the frustration of repetitive confrontation with failure. Goal reengagement is
37 the process of finding and engaging in new, more feasible goals, and may offer the satisfaction of
38 fulfilling new meaningful goals. The benefits of goal adjustment strategies on well-being have
39 been shown in the context of different chronic diseases, such as cancer (Mens & Scheier, 2016),
40 multiple sclerosis (Van Damme et al., 2019), and hearing loss (Garnefski & Kraaij, 2012).

41 Similar results have been found in people with an ABI (Van Bost, Van Damme, & Crombez,
42 2020). In their review of the literature concerning goal adjustment in people with long-tern
43 health conditions, such as cancer and stroke, Scobie et al. (2020) concluded that goal
44 disengagement and goal reengagement had a positive association with recovery and well-being,
45 although the findings for goal disengagement were mixed. In clinical studies (Van Bost et al.,

46 2020; Van Damme et al., 2019) goal reengagement was positively associated with subjective
47 QOL and life satisfaction. No effect of goal disengagement was found.

48 In individuals with ABI goal adjustment can be hampered because of the cognitive impairments
49 related to the brain injury. The process of disengaging from previous goals and reengaging
50 towards new goals may require a certain level of cognitive flexibility. Indeed, both flexible goal
51 adjustment and cognitive flexibility refer to an ability to change behaviour in response to
52 environmental changes. Cognitive flexibility is one of the executive functions (Lezak et al.,
53 2012) and includes seeing things from a different perspective, creative thinking, and flexible
54 adapting to changed circumstances (Diamond, 2013). Individuals with an ABI may then show an
55 impaired ability to respond to environmental feedback (McDonald, Flashman, & Saykin, 2002).
56 A clinical standard to assess cognitive flexibility is the Wisconsin Card Sorting Test (WCST,
57 Gelfo, 2019). In this test people first must find a rule for sorting cards. Once they have
58 established that, at some point without warning the rule is changed and people need to discover
59 the new rule. In this situation, some people immediately start looking for the new sorting rule,
60 whereas others perseverate in using the previous rule despite repetitively receiving the feedback
61 that their answers were false. Individuals with ABI show less cognitive flexibility on the WCST
62 than that the population norm and this is not limited to people with frontal lesions (Nyhus &
63 Barcelo, 2009). An impaired cognitive flexibility may then also reduce the ability to adjust goals.
64 As far as we know there is no research about the impact of impaired cognitive flexibility on goal
65 adjustment in general and more specifically in individuals with ABI. The present study therefore
66 investigated the relationship between cognitive flexibility and two forms of flexible goal
67 adjustment, namely goal disengagement and goal reengagement.

68 Another factor that may affect flexible goal adjustment is personality. People vary in their
69 tendency towards the use goal disengagement and goal reengagement strategies. In fact, Wrosch,
70 Scheier, & Miller (2013) see these tendencies as reflecting an underlying stable trait, influencing
71 people's responses towards unattainable goals across multiple domains and situations. The
72 traitlike character of goal adjustment tendencies raises the question to what extent they have an
73 unique role in explaining well-being beyond the general personality traits. The five-factor model
74 of personality (Costa & McCrae, 1992), comprising of Neuroticism, Extraversion, Openness,
75 Agreeableness, and Conscientiousness, is broadly adopted. The relationship between personality
76 traits and well-being in the general population is well-established. In their meta-analysis Steel,
77 Schmidt & Schultz (2008) found that the Big Five personality factors could explain between 39
78 % and 64 % of the variance in indicators of well-being. Extraversion and Neuroticism are the
79 strongest predictors of life satisfaction (Schimmack, Oishi, Furr, & Funder, 2004). Dwan &
80 Ownsworth (2017) found that in persons with a stroke a higher Neuroticism was consistently
81 related to a poorer well-being, with the effects of the other personality traits being mixed.

82 Carver & Connor-Smith (2010) state that there is a complex interplay between personality,
83 coping and well-being. Extraversion is linked to more approach tendencies (Lengua et al., 1999)
84 and could therefore lead to more goal reengagement. People with a high degree of neuroticism
85 are more inclined towards avoidance behavior, possibly facilitating goal disengagement.

86 Conscientiousness is associated with a deliberated problem solving approach, which can lead to
87 more goal disengagement towards unattainable goals, as well as to more goal reengagement
88 towards new, more feasible goals. People that are situated higher on certain personality traits
89 may be more or less inclined towards goal reengagement or goal disengagement. Therefore we
90 want to study if goal disengagement and goal reengagement have an unique value beyond the

91 Big Five personality traits in explaining life satisfaction and quality of life of people with an
92 ABI. In summary, this study investigates the relationship between goal disengagement, goal
93 reengagement, and cognitive flexibility and their effects on indicators of well-being in persons
94 with an ABI after controlling for personality. First, we investigate whether the score on a test for
95 cognitive flexibility is positively associated with goal disengagement and goal reengagement.
96 Second, we want to investigate whether goal adjustment strategies have a unique explanatory
97 value for disease specific QOL and life satisfaction after controlling for the Big Five personality
98 traits.

99

100 **METHOD**

101 **Participants**

102 Seventy-eight persons (49 male and 29 female) with an ABI participated in this study. The
103 majority of 68 participants was recruited from two outpatient rehabilitation centres, five were
104 recruited from a psychiatric unit specialized in caring for patients with neurological disorders,
105 and five from a specialized private practice of a psychologist. All participants lived in Flanders
106 (the Dutch speaking region in the North of Belgium). A rehabilitation psychologist or
107 occupational therapist from the participating centres asked their patients whether they wanted to
108 participate in this study. Inclusion criteria were: (1) participants were between 18 and 67 years
109 old, (2) they had a nonprogressive ABI of any aetiology confirmed by neurological data, (3) they
110 had sufficient command of the Dutch language, and (4) they are considered to be able to
111 complete questionnaires based on clinical judgement. We excluded people with a high

112 probability of relapse, such as people recovering from a brain tumour, because this prognosis
113 could have a different impact on how they experience their future goals.

114 Participants' age ranged from 19 to 66 years ($M = 44.38$; $SD = 14.50$). Forty-eight participants
115 suffered a stroke. Twenty-six had a traumatic brain injury, three participants had brain surgery
116 for a benign tumour, and one had an ABI following cardiac arrest. On average participants had
117 12.76 years of formal education ($SD = 2.69$; 9-19). The time elapsed since the injury ranged
118 from 4 to 295 months ($M = 27.42$, $SD = 40.46$). Forty-nine participants (63%) lived with their
119 partner, eighteen (23%) were single, and eleven (14%) lived with their parents or other relatives.
120 Ethical approval was obtained from the Ethical Committee of the Faculty of Psychology and
121 Educational Sciences of the Ghent University (2012/66). Written informed consent was obtained
122 from the participants. They also gave permission to the rehabilitation professional of the service
123 to give information about demographics and illness characteristics to the researcher.

124 **Measures**

125 An index of the ABI severity was obtained by asking the responsible rehabilitation professional
126 to provide an expert rating on a 7-point scale, ranging from “perfect age-appropriate functioning”
127 over “minor problems” to “severe impairment”. This professional was an experienced
128 rehabilitation psychologist or an occupational therapist who had worked with the respondent for
129 at least 3 months. We obtained separate scores for motor impairments, the communication
130 impairments, the cognitive impairments and the level of self-awareness (Van Bost et al., 2017,
131 2020).

132 Goal adjustment was measured using the Dutch version of the Wrosch Goal Adjustment Scale
133 (GAS; Wrosch et al., 2003). Each of the ten items are scored on a 5-point scale, ranging from

134 completely disagree (1) to completely agree (5). Four items form the Disengagement scale,
135 measuring how easy a person can let go of goals (e.g. “I stay committed to the goal, I can’t let
136 go”). The other six items form the Reengagement Scale (e.g. “I think that I have other
137 meaningful goals to pursue”). We found a Cronbach’s α of .73 for the Disengagement scale and
138 .89 for the Reengagement scale.

139 The Big Five personality factors were measured with the Dutch version (Hoekstra, Ormel, & de
140 Fruyt, 2002) of NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992). This self-report
141 questionnaire consists of 60 items. The person has to respond whether he strongly disagrees,
142 disagrees, hold a neutral position, agrees, or strongly agrees with each item. There are five
143 factors: Neuroticism (e.g. “I am seldom sad or depressed”), Extraversion (e.g. “I really enjoy
144 talking to people”), Openness (e.g. “I often try new or foreign food”), Agreeableness (e.g. “I
145 would rather cooperate with others than compete with them”), and Conscientiousness (e.g. “I am
146 a productive person who always get the job done”). The instrument has good psychometric
147 properties in the general population and in people after a stroke (Dwan et al., 2017). In this study
148 we obtained a Cronbach’s α of .83 for Neuroticism, .71 for Extraversion, .68 for Openness, .70
149 for Agreeableness, and .77 for Conscientiousness.

150 The Illness Cognitions Questionnaire (Evers et al., 2001; Lauwerier, Crombez, Van Damme,
151 Goubert, & Evers, 2010) was used to measure Acceptance (e.g. “I have learned to live with the
152 disease.”). Other scales are the Helplessness-scale (e.g. “My illness controls my life”) and the
153 Disease Benefits scale (e.g. “My illness has helped me realise what is important in life.”), but
154 these scales were not used in this study. Each of the 18 items was to be scored on a 4-point scale.
155 Cronbach’s α for the Acceptance-scale was .91

156 The Dutch version of the 5-item Satisfaction with Life Scale (Diener, Emmons, Larssen, &
157 Griffin, 1983) measures judgements about global life satisfaction (e.g. “I am satisfied with my
158 life”). Participants indicated how much they agree on a 7-point scale. We found a Cronbach’s α
159 of .80. The scores are summed up to a total score from 5 to 35. The European Brain Injury
160 Questionnaire (EBIQ; Teasdale, Christensen, Willmes, Deloche, & Braga 1997) is a measure of
161 disease specific quality of life. It consists of 63 items, reflecting frequent occurring complaints
162 after a brain injury, each of which are scored on a 3-point-scale (“Not at all”, “A little”; “A lot”).
163 There are eight specific scales: (1) Somatic, (2) Cognitive, (3) Motivation, (4) Impulsivity, (5)
164 Depression, (6) Isolation, (7) Physical, (8) Communication and one general Core scale, which
165 consisted of those items with the highest communality in factor analysis (e.g. “Problems in
166 general.”). The psychometric properties are sufficient (Sopena, Dewar, Nannery, Teasdale, &
167 Wilson, 2007). Van Bost, Van Damme, & Crombez (2017) made a Dutch translation. For the
168 Core scale, which will also be used in this study, they found a Cronbach’s α of .90.

169 Cognitive flexibility was measured with the paper version of Winsconsin Card Sorting Test
170 (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1981). People must match a card to one of
171 four sample cards that vary in colour (red, blue, yellow, green), form (triangle, circle, cross, star)
172 or number (1-4). They are not given the sorting rule and have to find this through trial-and-error
173 from feedback after each trial. Without warning, after ten consecutive correct answers the rule is
174 changed. Participants have to complete six series or maximum 128 cards. Responses as a result
175 of following the previous rule, instead of the actual rule, are called perseverative errors. The
176 percentage of perseverative errors is an indication of the difficulty people have with flexible rule
177 shifting.

178 **Procedure**

179 Data were collected in the participants' therapeutic service, which in the majority of cases was a
180 rehabilitation centre. The rehabilitation professional, a clinical psychologist or an occupational
181 therapist, was asked to provide information about the demographics and the aetiology of the
182 ABI. Rehabilitation professionals also provided expert ratings about the consequences of the
183 injury. Assessment started with the EBIQ, because people were most familiar with reporting
184 complaints, followed by the ICQ, the GAS and the SWLS, the NEO-FFI and the WCST. The
185 ICQ was not included in the analyses. In most cases this was done in two sessions of 60 minutes.
186 Some people needed three sessions, because the procedure was too demanding for them. The
187 participants filled out the questionnaires in the presence of a researcher, who could help them to
188 stay focused or could clarify the items of the questionnaire. Some people had difficulties reading
189 the questions or ticking the right boxes. In these cases help was provided by the researcher.

190 **Analysis**

191 Descriptive statistics were provided for the demographic information, time since injury, the
192 expert ratings of the illness characteristics, personality factors, percentage perseverative answers,
193 goal adjustment and QOL and life satisfaction. Associations between those variables were
194 examined using Pearson correlation coefficients. Two hierarchical multiple regression analyses
195 were then conducted. The first analysis tested the effect of cognitive flexibility on goal
196 adjustment tendencies. The following predictors were entered: age, gender and education (Step
197 1), time since injury, cognitive impairments, self-awareness, communication impairments and
198 motor impairments (Step 2), and percentage of perseverative errors (Step 3). The second analysis
199 tested whether goal adjustment has a predictive value for life satisfaction and QOL beyond
200 personality. Predictors were entered in the following order: age, gender and education (Step 1),
201 time since injury, cognitive impairments, self-awareness, communication impairments and motor

202 impairments (Step 2), Neuroticism, Extraversion, Openness, Agreeableness and
203 Conscientiousness (Step 3), and Goal Disengagement and Goal Reengagement (Step 4). To
204 investigate whether there was a difference between the personality of this group of individuals
205 with an ABI and that of the general population the average scores of the Big Five personality
206 factors were compared to the norms of the Dutch version of the NEO-FFI (Hoekstra, Ormel, &
207 de Fruyt, 2002) using five unpaired t-tests. All analyses were conducted in SPSS Version 27
208 using two-sided hypothesis testing with an alpha level of .05.

209

210 **RESULTS**

211 Table 1 displays mean scores, standard deviations, and correlations. The percentage of
212 perseverative responses is positively correlated to time since injury and negatively to goal
213 reengagement. Life satisfaction and disease specific QOL correlated also with goal
214 reengagement, but not with goal disengagement. Neuroticism and Extraversion are also related to
215 life satisfaction and QOL, the latter also being related to Consciousness.

216

217

Insert Table 1 about here

218

219 The average scores of the personality factors and the corresponding scores from the Dutch
220 speaking reference group are presented in Table 2. We found no significant difference of the
221 scores of the ABI group with those of the general population.

222

223

Insert Table 2 about here

224

225 The results of a first set of hierarchical regression analyses are presented in Table 3. The
226 percentage of perseverative responses predicted negatively goal reengagement beyond the
227 previous steps ($F_{Change} (1,60) = 4.27, p=.043$), but had no effect on not goal disengagement ($F_{Change} (1,60) = .66, p=.421$).

229

230

Insert Table 3 about here

231

232 Results from the second set of hierarchical regression analyses predicting disease specific QOL
233 and life satisfaction are presented in Table 4. The impact of the ABI characteristics was
234 significant for life satisfaction ($F_{Change} (5,65) = 4.27, p=.002$) and did not reach significance for
235 QOL ($F_{Change} (5,65) = 2.29, p=.056$). The Big Five personality traits predicted life satisfaction ($F_{Change} (5,60) = 5.37, p<.001$) and disease specific QOL ($F_{Change} (5,60) = 9.10, p<.001$).

237 Neuroticism was the only significant predictor of disease specific QOL and life satisfaction.

238 Goal adjustment was associated with life satisfaction ($F_{Change} (2,58) = 5.64, p=.006$) beyond the
239 previous steps, but did not reach statistical significance for disease specific QOL ($F_{Change} (2,58)$

240 $= 2.95, p=.060$). Goal reengagement was associated with QOL and life satisfaction. After

241 controlling for the previous steps, goal disengagement only predicted life satisfaction.

242

243

Insert Table 4 about here

244

245 **DISCUSSION**

246 This study investigated whether goal adjustment abilities of individuals with an ABI were
247 influenced by cognitive flexibility, which is often affected by brain injury. Previous research
248 with this population (Van Bost, Van Damme, & Crombez 2020) has reported that goal
249 reengagement was positively associated with quality of life and life satisfaction. In this study we
250 investigated whether this effect is still present after controlling for personality.

251 The results can be readily summarized. First, cognitive flexibility, as measured by the percentage
252 perseverative errors on the WCST, was negatively associated with goal reengagement, but not
253 with goal disengagement, even after controlling for demographic factors, time since injury and
254 illness characteristics. Second, goal reengagement explained a unique portion of the variance of
255 both QOL and life satisfaction after controlling for demographic factors, time since injury,
256 severity and the Big Five personality traits. Third, goal disengagement was only negatively
257 associated with life satisfaction. Fourth, neuroticism was the only personality factor predicting
258 both QOL and life satisfaction.

259 The impact of goal disengagement and goal reengagement on a large number of outcomes is well
260 established (Barlow, Wrosch, & McGrath, 2020). Less is known about the factors contributing to
261 people's ability to a flexible goal adjustment. The ability to flexibly change one's behaviour as a
262 response to a changing situation may be a prerequisite for goal adjustment. This is in particular
263 relevant for people with an ABI, because a brain injury often results in a reduction of cognitive
264 flexibility. Our measure of cognitive flexibility, the percentage of perseverative errors on the
265 WCST, did explain an additional part of the variance of goal reengagement, but not goal

266 disengagement. As far as we know this is the first study investigating the impact of executive
267 functioning, i.e. cognitive flexibility, on goal adjustment. The effect of cognitive flexibility was
268 significant beyond the illness characteristics, estimated by the therapist of the participant. It is
269 therefore unlikely that these results could be attributed to a more general impairment. Goal
270 reengagement may require a certain level of cognitive functions as divergent thinking and
271 concept formation (Drago & Heilman, 2012). Interestingly, recent research has shown that the
272 results on the WCST are not only related to cognitive flexibility but also to cognitive persistence
273 or the tendency to put effort in cognitive demanding tasks (Teubner-Rhodes et al., 2017). People
274 with a higher tendency to put effort in these cognitive tasks may also be more inclined towards
275 putting effort in the search for new life goals and engagement towards them.

276 The finding that goal reengagement explained a unique proportion of the variance of both
277 indicators of QOL corroborates the conclusions of earlier research with people with an ABI (Van
278 Bost et al., 2020). It is also in concordance with an overall positive relationship between goal
279 reengagement and well-being in long-term health conditions, reported by Scobie et al. (2020). In
280 their review mixed results for goal disengagement were reported. A majority of the studies
281 included in this review found a positive relationship with indicators of wellbeing. In our study
282 we found no relationship of goal disengagement with disease specific QOL and a negative
283 relationship with life satisfaction. This may be surprising, because goal disengagement could
284 help to avoid confrontation with repeated failures and may free up resources for other goals
285 (Wrosch et al., 2003). Barlow, Wrosch, & McGrath (2020) concluded in their meta-analysis that
286 goal disengagement has a negative association with negative indicators of wellbeing, such as
287 anxiety or negative affect, but not with positive indicators, such as life satisfaction or purpose in
288 life. Goal reengagement was negatively associated with the negative indicators, as well as

289 positively with the positive indicators. This is in contradiction with our results, because goal
290 disengagement was negatively related to life satisfaction, a positive indicator of wellbeing, and
291 not with the EBIQ, essentially a list of possible negative consequences of an ABI. Nevertheless,
292 others had found similar results in patients with chronic pain (Esteve et al., 2018). Their
293 interpretation was that people understood that they had to abandon cherished life goals, but they
294 did so with frustration and distress. In people with multiple sclerosis a high goal disengagement,
295 in combination with a low goal reengagement, was even related to more depression (Van
296 Damme et al., 2019).

297 The reason why there is a negative effect of goal disengagement on life satisfaction may relate to
298 the content of particular items of the SWLS. Two of the five items of the SWLS require the
299 respondents to reflect on their life as a goal-oriented project (“So far I have gotten the important
300 things I want in life.”, “If I could live my life over, I would change almost nothing.”). People
301 with a high score on disengagement report that they easily let go of goals. This may lead to less
302 accomplishment and therefore less satisfaction with what they realised in life. As a follow up of
303 this interpretation, we performed a post hoc analysis of the effect of goal disengagement on those
304 two items. We found that goal disengagement was negatively related to those two items, but not
305 to the remaining three. After an ABI people often realise that they have no other choice than to
306 disengage from their previous goals. However, this absence of goals to strive for may lead to a
307 sense of emptiness.

308 We found no differences on the Big Five personality factors between our sample of people with
309 an ABI and the general population. Other studies, with different designs and using information of
310 a significant other (Leonhardt, Schmukle, & Exner, 2016; Norup & Mortensen, 2015; Lannoo et
311 al., 1997) reported a decline in extraversion and conscientiousness following an ABI. It is not

312 possible to give an unambiguous interpretation of our results. Nevertheless, we found no
313 evidence for such a personality change. As expected (Schimmack, Oishi, Furr, & Funder, 2004;
314 Dwan & Onsworth, 2017), neuroticism had an important impact on QOL and life satisfaction.
315 This was not unexpected, given the conclusions of the review of Dwan & Onsworth (2017) in
316 individuals with a stroke. None of the other personality factors yielded a significant result on life
317 satisfaction or on the disease specific QOL.

318 This study has some limitations. First, this study has a cross-sectional design, making causal
319 interpretations impossible. Second, sample size was small, as a result of which the study might
320 have been underpowered to detect smaller effects. Third, most measures were based on self-
321 report measures. It could be argued that people with an ABI, due to their cognitive deficits, rely
322 more on their pre-injury self-image than on their analysis of the present situation. Moreover, for
323 some of our respondents it was difficult to use abstract and generalized concepts about their
324 personality and goal adjustment strategies. Fourth, cognitive flexibility was assessed only by
325 means of the Wisconsin Card Sorting Test. It is not possible to make strong statements based on
326 a single test. The choice for the full version of the WCST prevented us to test for cognitive
327 persistence. Teubner-Rhodes et al. (2017) developed a measure of cognitive persistence based
328 on the short version of the Wisconsin Card Sorting Test.

329 Our study has clinical implications, in particular our findings about goal reengagement. It means
330 that helping patients with an ABI reengage towards new goals is useful, regardless of their
331 personality profile. We have to take into account that it may be more challenging for people with
332 an ABI to reengage towards new goals, especially if they suffer from deficits in cognitive
333 flexibility. This may require standard procedures in the rehabilitation plan to test the executive
334 functioning of the patients. In the work with people with cognitive impairments it is always

335 necessary to make specific adaptations to therapeutic interventions (Gallagher, McLeod, &
336 McMillan, 2019). People with problems in cognitive flexibility may need more active guidance
337 to reengage themselves towards more feasible life goals.

338

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Table 1 (on next page)

Intercorrelations between indicators of QOL, acceptance, goal adjustment and impairments

1 Intercorrelations between indicators of QOL, goal adjustment and impairments

Scale	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Gender			1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Education (years)	12.76	2.69	-.26*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Age	44.38	14.50	-.06	.06	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Time since injury	27.42	40.86	.09	-.19	-.04	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Cognitive problems	3.12	1.17	.01	-.22	-.31**	-.21	1	-	-	-	-	-	-	-	-	-	-	-	-
6. Self-awareness	5.45	1.39	-.01	.04	.27*	-.02	-.57***	1	-	-	-	-	-	-	-	-	-	-	-
7. Commun problems	2.17	1.26	-.04	-.06	-.19	.23*	.11	-.22	1	-	-	-	-	-	-	-	-	-	-
8. Motor problems	3.59	1.13	.01	-.27	-.13	.21	.09	-.20	.32**	1	-	-	-	-	-	-	-	-	-
9. Neuroticism	32.12	8.97	-.20	.14	.03	.14	.01	.07	.01	-.01	1	-	-	-	-	-	-	-	-
10. Extraversion	40.03	6.54	-.03	-.04	-.15	-.06	-.00	-.11	.01	-.07	-.46***	1	-	-	-	-	-	-	-
11. Openness	35.26	6.62	-.30**	.47**	.12	-.04	.33*	.32**	-.13	-.26*	.18	.03	1	-	-	-	-	-	-
12. Agreeableness	43.61	6.15	-.27*	-.02	.22	-.10	-.28	.33**	.01	-.07	-.19	.21	-.09	1	-	-	-	-	-
13. Conscientiousness	44.86	7.16	-.08	-.17	-.06	-.08	-.05	.02	.22	.05	-.36**	.39***	-.19	.32**	1	-	-	-	-
14. % perseverations	24.88	21.71	-.05	-.19	.19	.40**	-.22	-.05	.21	.21	.01	-.03	-.18	.05	-.01	1	-	-	-
15. GAS Disengage	10.53	3.61	.18	-.15	.20	-.09	.05	.04	-.01	-.12	.04	-.08	-.14	-.10	.00	.09	1	-	-
16. GAS Reengage	20.95	5.69	-.14	.19	.00	-.04	-.25*	.09	-.15	-.15	-.13	.26*	.26*	-.01	.20	-.27*	.07	1	-
17. SWLS	20.09	7.42	.04	.08	.09	-.07	-.18	-.17	-.30**	-.29**	-.43***	.40***	.06	-.05	.17	-.11	-.12	.40**	1
18. EBIQ Core	55.40	11.74	-.08	.13	.04	.11	.05	.21	.01	-.02	.64***	-.47***	.17	-.16	-.42***	.09	-.04	-.34**	-.54***

2 * $P < .05$. ** $P < .01$. *** $P < .001$ Abbreviations: SWLS: Satisfaction With Life Scale; EBIQ: European Brain Injury Questionnaire; GAS: Goal Adjustment Scale

Table 2 (on next page)

Mean scores, SD of the personality factors and comparison with the general population

1	Personality factor	Average ABI group	SD ABI group	Average general population	SD general population	t-score
2	Neuroticism	32.2	8.7	31.1	8.2	t (78) = 1.17, p = .24
	Extraversion	40.1	6.4	40.1	6.6	t (78) = 0.00, p = 1.0
3	Openness	35.2	6.6	35.9	6.4	t (78) = 0.92, p = .35
	Agreeableness	43.3	6.1	44.1	5.2	t (78) = 1.34, p = .18
4	Conscientiousness	44.7	7.0	45.3	5.6	t (78) = 0.92, p = .35
5	*p < .05.					

6

Table 3 (on next page)

Hierarchical regression analysis of goal disengagement and goal reengagement

		Goal disengagement				Goal reengagement			
Step	Predictors	β final	F Change	ΔR^2	Adj. R^2	β final	F Change	ΔR^2	Adj. R^2
		(standardized)				(standardized)			
1	Gender	.19	1.95	.08	.04	-.16	.94	.04	-.00
3	Age	.21				-.00			
4	Education	-.11				.07			
2	Time since injury	-.17	.87	.06	.03	.14	.80	.06	-.02
	Cognitive problems	.16				-.06			
	Self-awareness	.04				.14			
	Communicative problems	.07				-.07			
	Motor problems	-.17				-.02			
3	% of perseverative errors	.11	.66	.01	.03	-.28*	4.27*	.06	.03

* $p < .05$

Table 4(on next page)

Hierarchical regression analysis (final model) of QOL and life satisfaction

Abbreviations: SWLS: Satisfaction with Life Scale; EBIQ: European Brain Injury Questionnaire

Step	Predictors	EBIQ Core				SWLS			
		β final (standardized)	F Change	ΔR^2	Adj. R^2	β final (standardized)	F Change	ΔR^2	Adj. R^2
1	Gender	-.07	1.17	.05	.01	.02	.54	.02	-.02
	Age	-.0				.20			
	Education	.18				-.09			
2	Time since injury	.02	2.29	.14	.09	.09	4.27**	.24	.17
	Cognitive problems	.27*				-.21			
	Self-awareness	.32*				-.38**			
	Communicative problems	.03				-.21**			
3	Motor problems	.06	9.10***	.35	.44	-.31**	5.37***	.23	.38
	Neuroticism	.44***				-.34**			
	Extraversion	-.09				.12			
	Openness	-.02				.01			
	Agreeableness	-.03				-.18			
4	Conscientiousness	-.14	.04	.04	.47	.05	5.64**	.08	.37
	Disengagement	-.03				-.22*			
	Reengagement	-.23*				.29**			

1 * $p < .05$; ** $p < .01$; *** $p < .001$.