Desdentado, L.; Cebolla, A.; Miragall, M.; Llorens Rodríguez, R.; Navarro, MD.; Baños, RM. (2021). Exploring the Role of Explicit and Implicit Self-Esteem and Self-Compassion in Anxious and Depressive Symptomatology Following Acquired Brain Injury. Mindfulness. 12(4):899-910. https://doi.org/10.1007/s12671-020-01553-w

Exploring the Role of Explicit and Implicit Self-Esteem and Self-Compassion in Anxious and Depressive Symptomatology Following Acquired Brain Injury

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Abstract

Objectives: Acquired brain injury (ABI) can lead to the emergence of several disabilities and is commonly associated with high rates of anxiety and depression symptoms. Self-related constructs, such as self-esteem and self-compassion, might play a key role in this distressing symptomatology. Low explicit (i.e., deliberate) self-esteem is associated with anxiety and depression after ABI. However, implicit (i.e., automatic) self-esteem, explicit-implicit self-discrepancies, and self-compassion could also significantly contribute to this symptomatology. The purpose of the present study was to examine whether implicit self-esteem, explicit-implicit self-discrepancy (size and direction), and self-compassion are related to anxious and depressive symptoms after ABI in adults, beyond the contribution of explicit self-esteem.

Methods: The sample consisted of 38 individuals with ABI who were enrolled in a long-term rehabilitation program. All participants completed measures of explicit self-esteem, implicit self-esteem, self-compassion, anxiety, and depression. Pearson's correlations and hierarchical regression models were calculated.

Results: Findings showed that both self-compassion and implicit self-esteem negatively accounted for unique variance in anxiety and depression when controlling for explicit self-esteem. Neither the size or direction of explicit-implicit self-discrepancy was significantly associated with anxious or depressive symptomatology.

Conclusions: The findings suggest that the consideration of self-compassion and implicit self-esteem, in addition to explicit self-esteem, contributes to understanding anxiety and depression following ABI.

Keywords: acquired brain injury; explicit self-esteem; implicit self-esteem; self-compassion; anxious symptomatology; depressive symptomatology

Exploring the Role of Explicit and Implicit Self-Esteem and Self-Compassion in Anxious and Depressive Symptomatology Following Acquired Brain Injury

Acquired brain injury (ABI) is an umbrella term used to refer to any damage to the brain that occurs after birth and is not related to a congenital or degenerative disease, with impairments that may be temporary or permanent and cause partial or functional disability and/or psychosocial maladjustment (Elbaum & Benson, 2007). Ischemic and hemorrhagic strokes, traumatic brain injuries, brain anoxia, tumors, infections (e.g., meningitis) or other inflammations, and toxic or metabolic insults (e.g., hypoglycemia) are causes of ABI (FEDACE, 2015; Turner-Stokes & Wade, 2003). ABI is considered an important global health priority, not only because of its high prevalence and incidence rates, but also because it causes disability and health loss in a large percentage of patients, which has an indirect impact on their families and caregivers (Feigin et al., 2014; GBD 2016 Traumatic Brain Injury and Spinal Cord Injury Collaborators, 2018).

In addition to neurological impairments, individuals with ABI often show emotional sequelae that also affect patients and their families and caregivers (Oddy & Herbert, 2003) and have an important negative influence on recovery and engagement with rehabilitation (Gracey et al., 2009; Khan-Bourne & Brown, 2003). For instance, high rates of anxious and depressive symptomatology are commonly found after ABI (Hackett et al., 2005; Whelan-Goodinson et al., 2009). Indeed, these distressing symptoms have been linked to poorer psychosocial functioning one year after the brain lesion (Gould et al., 2011). Therefore, it would be helpful to examine underlying processes of anxiety and depression symptoms in people with ABI.

In recent decades, cognitions about the self, which have been conceptualized in multiple ways (e.g., self-esteem, self-compassion, self-stigma, and bodily self, among others), have received greater attention because of their involvement in

psychopathology and well-being (e.g., Corrigan & Watson, 2002; MacBeth & Gumley, 2012). As mentioned above, ABI can result in profound changes in many aspects of life, due to physical, cognitive, communication, and emotional disabilities. The impact of these ABI-related sequelae usually involves complex negative changes in self-perceived worth, one's ability, and, ultimately, the sense of self (Gracey et al., 2008; Lennon et al., 2014). In this regard, investigating self-related constructs after ABI is of particular interest because it might contribute to better understanding psychological adjustment to injury-related changes and, ultimately, guide treatments for this clinical condition (Beadle et al., 2016).

Low self-esteem has been shown to be a key factor associated with a range of clinical indicators, including depression, anxiety, lower quality of life, less functional independence, and poorer psychosocial adjustment following ABI (Curvis et al., 2018). Fennell's (1997) cognitive-behavioral model predicts that low self-esteem leads to anxiety or depression due to fear that personal standards might not be met, which could occur after ABI as a result of the emergence of negatively evaluated deficits. Indeed, a large amount of evidence suggests that individuals with ABI report significant discrepancies between the preinjury self and the current self, with the former representing a salient standard for comparison (Gracey et al., 2009; Tyerman & Humphrey, 1984). Given that self-esteem is the result of a comparative and evaluative process, decreased scores on self-esteem and their association with the presence of both anxious and depressive symptomatology are not surprising in individuals with ABI, as previous studies have found (Ponsford et al., 2014; Vickery et al., 2008).

Most of the studies examining self-esteem after an ABI have assessed this concept using questionnaires, either self-report or informant-report versions (Curvis et al., 2018). The Rosenberg Self-Esteem Scale is the most widely used self-esteem

measure, and it is based on a definition of self-esteem that involves an emotional evaluation related to judgments about self-worth or self-value (Rosenberg, 1965). However, some authors have argued that self-esteem includes not only conscious reasoned feelings of self-evaluation that are deliberately expressed through questionnaires, but it also comprises nonconscious, automatic, self-evaluations that guide spontaneous reactions to self-relevant stimuli (Moors & De Houwer, 2006; Strack & Deutsch, 2004). Based on this distinction, the former is considered explicit self-esteem, whereas the latter is called implicit self-esteem (Greenwald & Farnham, 2000).

Both implicit and explicit self-esteem are important factors in guiding behavior and influencing psychological well-being (Bos et al., 2010). Moreover, a recent line of research has emerged that considers explicit and implicit self-esteem together and examines the interaction between them. Self-esteem discrepancy –that is, the extent to which explicit and implicit self-esteem differ– seems to be relevant in understanding psychopathology (Creemers et al., 2012; Smeijers et al., 2017). Prior studies have found that a greater discrepancy "size" is related to more negative mental health outcomes (Schröder-Abé et al., 2007). The "direction" of this discrepancy distinguishes between two patterns: *damaged* self-esteem, referring to the pattern of high implicit self-esteem and low explicit self-esteem; and *fragile* self-esteem, referring to the pattern of low implicit self-esteem and high explicit self-esteem (Creemers et al., 2012). Several studies have shown that *fragile* self-esteem is more related to self-enhancement tendencies such as narcissism and aggression (Sandstrom & Jordan, 2008; Zeigler-Hill, 2006), whereas *damaged* self-esteem is more related to internalizing symptoms such as depression (Creemers et al., 2013). Hence, both implicit self-esteem and explicit-implicit self-esteem discrepancies could be important factors in understanding emotional distress (i.e., anxiety and depression) after ABI.

Beyond self-esteem, many findings from the previous literature suggest that self-compassion might be a key self-construct after ABI because it has been shown to be a helpful self-related process in alleviating emotional suffering in several clinical and non-clinical samples (MacBeth & Gumley, 2012; Zessin et al., 2015). According to Neff (2003), self-compassion "involves being touched by and open to one's own suffering, not avoiding or disconnecting from it, generating the desire to alleviate one's suffering and to heal oneself with kindness. It also involves offering nonjudgmental understanding to one's pain, inadequacies and failures, so that one's experience is seen as part of the larger human experience" (p. 87). In contrast with self-esteem –which reflects positive explicit or implicit evaluations of self-representations–, self-compassion would be reflecting a non-evaluative, non-judgmental acceptance of oneself, including one's imperfections and mistakes (Neff & Vonk, 2009; Zhang et al., 2020). Self-compassion has been highlighted as an unconditional caring towards the self that especially emerges when facing personal inadequacies or painful situations that are out of our control (Neff, 2003), such as an ABI experience. In addition, it has been proposed that self-compassion might be available precisely when self-esteem fails, thus serving as a protective factor against the negative effects of low self-esteem (Leary et al., 2007). Although previous evidence seems to point in this direction, it is unknown whether self-compassion could be a protective factor associated with reducing anxiety and depression following ABI.

Overall, studies have shown that explicit self-esteem is associated with anxiety and depression following ABI (Curvis et al., 2018; Longworth et al., 2018). Although unexplored in ABI, previous research conducted in other samples supports the idea that implicit self-esteem, explicit-implicit self-esteem discrepancies, and self-compassion could contribute to anxious and depressive symptomatology. Hence, the general aim of

the present study was to examine the role of implicit self-esteem, the size and direction of the explicit-implicit self-esteem discrepancy, and self-compassion –in addition to explicit self-esteem– in the anxious and depressive symptomatology of individuals with ABI. It was hypothesized that, in addition to the amount of variance explained by explicit self-esteem, implicit self-esteem, self-esteem discrepancies, and self-compassion would also explain part of the variance in anxiety and depression symptomatology.

Method

Participants

A convenience sample of 38 participants was recruited. All the individuals with ABI who were enrolled in the long-term rehabilitation program of the neurorehabilitation service of Hospital Vithas Valencia al Mar (Valencia, Spain) were potential candidates to participate in the study. Individuals were considered eligible if they (1) had been diagnosed with any cause of ABI using either computed tomography or magnetic resonance; (2) were either in the sub-acute or chronic post-injury phase, defined as a minimum of three months since injury; (3) were over 18 years old; (4) had a moderate to good cognitive condition, as described by scores above 23 on the Mini-Mental State Examination (Folstein et al., 1975); and (5) showed good comprehension and communicative skills, reflected by scores above 45 on the Mississippi Aphasia Screening Test (Romero et al., 2012), which enable command-following and interaction. Exclusion criteria were related to having comorbid medical conditions that could potentially interfere with the results: (1) visual or hearing impairments that prevented participation; (2) unilateral spatial neglect; and (3) motor impairments that limited interaction with the instruments, such as hemiplegia.

From a total of 107 individuals initially screened, 40 subjects met the inclusion criteria and agreed to participate in the study. Two subjects were considered outliers and were removed from the analyses. Consequently, 38 individuals, 15 women and 23 men, with a mean age of 48.18 years (*SD* = 13.41; range 18-71), a mean education of 13.45 years (*SD* = 4.49), and a mean time since onset of 15.96 months (*SD* = 11.15), participated in the study. Demographic and clinical features of the participants are shown in Table 1.

Procedure

Prior to examination, participants' clinical data were obtained from their medical records. Given that patients are widely assessed every six months as part of the action protocol of the neurorehabilitation program, the clinical record from the last assessment of each patient was used to check the eligibility criteria. General demographic information was also collected in a structured interview to determine whether participants met the inclusion and exclusion criteria. After that, participants were briefly informed about the study, and they provided written informed consent prior to their participation. Participants were examined individually in a quiet room free of distractors. The approximate average length of the experiment was 45 minutes. The study protocol was approved by the Ethical Committee of the University of Valencia (Spain).

Measures

Explicit self-esteem

It was assessed with the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The RSES is a self-reported 10-item questionnaire that measures a single global dimension of explicit self-esteem. It is composed of positive and negative items rated on a 4-point Likert scale, with values ranging from 1 (strongly disagree) to 4 (strongly

agree). The total score ranged from 10 to 40 and was calculated by adding up the points on the five positive items and the five negative items reversed. The RSES has been widely used in people with ABI, showing good reliability and validity (Anson & Ponsford, 2006; Carroll & Coetzer, 2011). Scores below 25 are indicative of significant low self-esteem (Anson & Ponsford, 2006). The Spanish version of the RSES has shown adequate psychometric properties in healthy samples (Baños & Guillén, 2000). In this study, internal consistency was adequate (Cronbach alpha α = .80).

Implicit self-esteem

It was assessed with the Self-Esteem Implicit Association Test (SE-IAT) (Greenwald et al., 1998; Greenwald & Farnham, 2000), using the same procedure and instructions as in previous studies (McDonald et al., 2011; Milne & Grafman, 2001). It is a timed two-button computed-based task requiring stimuli to be sorted in four categories (two "target" and two "attribute"). This task measures the relative strength of the association between two target categories ("self" and "other") and two attribute categories ("positive" and "negative") (Greenwald & Farnham, 2000). A full description of the IAT can be found in Lane et al. (2007). For the SE-IAT used in this study, in the "target categories", 6 stimuli belonging to "self" (e.g., First name, I, etc.) and 6 stimuli belonging to "other" (others, people, etc.) were included (a total of 12 stimuli). For the "attribute" categories, 14 "positive" adjectives (e.g., valuable, attractive, etc.) and 14 "negative" adjectives (e.g., weak, useless, etc.) were included (a total of 28 adjectives), with no significant differences in word length or emotional intensity, as in Valiente et al. (2011). In each case, the grammatical gender of the adjectives was adapted to match the participant's sex (because in Spanish there is a grammatical gender for adjectives).

The SE-IAT, as Table 2 shows, consisted of 7 blocks, 5 of which were *practice* blocks, whereas 2 were *test* blocks assessing implicit self-esteem. Regarding the *test*

blocks, the first block requires the participant to press the same specific key (“E”) for stimuli belonging to both the “self” target category and the “positive” attribute category as quickly as possible, whereas another key (“I”) has to be pressed for stimuli belonging to the “others” and “negative” categories (“self/positive – other/negative” block). The second *test* block asks the participant to press the same key (“E”) when stimuli belonging to the “self” target category and the “negative” attribute category appear, whereas the other key (“I”) must be used to classify stimuli belonging to the “other” target category and the “positive” attribute category (“self/negative – other/positive” block). Scores were computed using the improved scoring algorithm (Greenwald et al., 2003). If an individual performs better on the “self/positive - other-negative” block (which is congruent with high implicit self-esteem) than on the “self/negative – other/positive” block (which is incongruent with high implicit self-esteem), a positive score is obtained that represents high implicit self-esteem. Negative scores support better performance on the “self/negative – other/positive” block than on the “self/positive – other/negative” block, which represents low implicit self-esteem (Greenwald & Farnham, 2000). Stimuli randomly appear in the middle of the screen several times, for a total of 180 trials across blocks. Specific instructions for each block are provided both orally and in written form before running each one. In addition, target and attribute category names corresponding to each key ("E" and "I") are shown at the top of the screen for each block.

The SE-IAT has shown good psychometric properties in terms of reliability and validity in the general population (Greenwald & Farnham, 2000; Izuma et al., 2018). Studies have found that individuals with severe traumatic brain injury perform normally on an IAT measuring gender stereotypes (McDonald et al., 2011; Milne & Grafman, 2001). The SE-IAT used in this study was programmed using Inquisit 5.0 (Millisecond

software, Seattle, WA, USA). The test was administered using a conventional 13.3-inch laptop running Windows 10 (Microsoft, Redmond, WA, USA).

Self-compassion

It was assessed with the short-form of the Self-Compassion Scale (SCS) (Raes et al., 2011). The SCS is composed of 12 items rated on a Likert-type scale with values ranging from 1 (almost never) to 5 (almost always). The test assesses overall self-compassion (total score ranging from 1 to 5) (Neff et al., 2019). Both the original and Spanish versions of the SCS have shown adequate internal consistencies and similar characteristics to the long forms (Garcia-Campayo et al., 2014; Raes et al., 2011). In this study, internal consistency was considered adequate (Cronbach alpha α = .81).

Anxious and depressive symptomatology

They were assessed with the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS consists of a 14-item rating scale that provides anxiety and depression subscores. Each item is rated from 0 to 3, and the total subscore ranges from 0 to 21. This questionnaire has been shown to have adequate reliability and validity in people with ABI (Schönberger & Ponsford, 2010). The HADS has widely demonstrated optimal psychometric properties in several Spanish samples (Terol-Cantero et al., 2015). In this study, the HADS was found to have adequate internal consistency (Cronbach alpha α = .89 for anxiety and α = .84 for depression).

Data Analyses

SPSS version 26 for Windows was used for all statistical analyses. First, descriptive statistical analyses were conducted for all sociodemographic, clinical, and study variables. Preliminary analyses were conducted to ensure that relevant assumptions for carrying out statistical analyses (i.e., normality, linearity, homoscedasticity, and absence of multicollinearity) were met. Subjects with a score 2.5

standard deviations above or below the mean on any measure were removed to prevent spurious conclusions disproportionally influenced by these atypical observations. As mentioned in the "participants" subsection, two subjects were excluded from the analyses because their scores on the SE-IAT and RSES were outliers.

Second, the size and direction of the explicit-implicit self-esteem discrepancy were computed as in previous studies (Creemers et al., 2012; Kim & Moore, 2019). The size of the discrepancy between explicit and implicit self-esteem was computed as the absolute difference between standardized scores on the RSES and SE-IAT. Higher scores on this variable indicate a larger discrepancy between explicit and implicit self-esteem. The direction of these discrepancies, that is, higher implicit self-esteem than explicit self-esteem or vice versa was also analyzed. To do so, a dummy variable was computed where 0 was assigned to participants who scored higher on explicit self-esteem than on implicit self-esteem (*fragile* self-esteem), and 1 was assigned to participants who scored higher on implicit self-esteem than on explicit self-esteem (*damaged* self-esteem). In the present study, 18 participants had higher implicit self-esteem than explicit self-esteem (*damaged* self-esteem), and 20 participants had higher explicit self-esteem than implicit self-esteem (*fragile* self-esteem).

Third, Pearson's correlations were performed to explore the degree of associations between anxious and depressive symptomatology and explicit self-esteem, implicit self-esteem, the size and direction of the explicit-implicit self-esteem discrepancy, and self-compassion.

Fourth, two hierarchical regression analyses were computed to investigate whether anxiety and depression symptoms were explained -in addition to explicit self-esteem- by implicit self-esteem, self-compassion, and the size and direction of the explicit-implicit self-esteem discrepancy. To do so, explicit self-esteem was entered in

the first block using the *enter* method to force the inclusion of this variable in the regression equation model. Implicit self-esteem, self-compassion, and the size and direction of the explicit-implicit self-esteem discrepancy were entered as explanatory variables in the second block using the *stepwise* method in order to test the relevance of the extra explained variance of these variables on the dependent variables (i.e., anxiety and depression) once the effect of the explicit self-esteem was controlled for. Specifically, in the second block, the *stepwise* method was used because it is well known that explicit self-esteem is related to anxiety and depression (Curvis et al., 2018), but no theoretical predictions have been made about the contribution of implicit self-esteem, self-compassion, and the size and direction of the explicit-implicit self-esteem discrepancy to the dependent variables. Thus, the stepwise method in second block will provide information about what specific explanatory variables significantly explain part of the variance in the dependent variables. Consequently, several models can arise depending on the number of explanatory variables that are statistically significant (i.e., models with "explicit self-esteem" *plus* "implicit self-esteem", "self-compassion", *and/or* "the size" and "direction" of the explicit-implicit self-esteem discrepancy as explanatory variables of the anxiety and depression symptoms). Associations were displayed using standardized beta (β) values and 95% confidence intervals (CIs). Two-tailed significance tests were considered at $p < .05$.

Finally, since a convenience sample of 38 was used given the difficulties of recruiting such participants, a *post hoc* power analysis was conducted using G-Power v. 3.1.9.7 (Faul et al., 2009) to detect if the study had enough power to detect effects greater than or equal to $d = 0.40$ for a F test *"Linear multiple regression: Fixed model, R^2 increase"*. The power was calculated based on the total sample size ($N = 38$), an and

effect size of f = 0.20[1] or f^2 = 0.12, and considering 5 explanatory variables in total and 4 tested explanatory variables. Results indicated that this study had 31.61% power to detect a medium effect size at $p < .05$.

Results

Pearson's correlations between the study variables are presented in Table 3. Anxious symptomatology was significantly and negatively correlated with explicit self-esteem, implicit self-esteem, and self-compassion. Depressive symptomatology was significantly and negatively correlated with explicit self-esteem and self-compassion, whereas correlations with implicit self-esteem did not reach significance. Neither the size nor the direction of the explicit-implicit self-esteem discrepancy showed significant correlations with anxiety or depression.

The results of the two multiple regression models to explain anxiety and depression scores with explicit self-esteem, implicit self-esteem, the size and direction of the explicit-implicit self-esteem discrepancy, and self-compassion are shown in Table 4. The Variance Inflation Factor ranged from 1.096 to 1.570, indicating that there were no problems with multicollinearity (Bowerman & O'Connell, 1990; Myers, 2000).

On the one hand, regarding the multiple regression model to explain anxiety, the model that included explicit self-esteem in the first block (with the *enter* method) as independent variable was significant, $F(1, 37) = 15.99$, $p < .001$, explaining 28.8% of the variance. Moreover, after simultaneously including the rest of the independent variables (i.e., implicit self-esteem, size and direction of explicit-implicit self-esteem discrepancy, and self-compassion) in the second block (with the *stepwise* method), only implicit self-esteem and self-compassion contributed to explaining anxiety. The regression model that included explicit and implicit self-esteem was significant, $F(2,$

[1] We used this effect size because data in this field are limited, and $d = 0.40$ is a standard in psychology, according to Brysbaert (2019)

37) = 13.87, $p < .001$, accounting for 41.0% of the variance; and the regression model that included explicit self-esteem, implicit self-esteem, and self-compassion was also significant, $F(3, 37) = 12.61$, $p < .001$, explaining 48.5% of the variance. Nevertheless, explicit self-esteem made a marginally significant contribution to this latter model ($p = .059$).

On the other hand, regarding the multiple regression model to explain depression, the model that included explicit self-esteem in the first block (with the *enter* method) as independent variable was significant, $F(1, 37) = 18.32$, $p < .001$, explaining 32.0% of the variance. Moreover, after simultaneously including the rest of the independent variables (i.e., implicit self-esteem, size and direction of explicit-implicit self-esteem discrepancy, and self-compassion) in the second block (with the *stepwise* method), only self-compassion contributed to explaining depression. The regression model that included explicit self-esteem and self-compassion was significant, $F(2, 37) = 12.53$, $p < .001$, accounting for 38.4% of the variance.

Discussion

The purpose of the present study was to gain a better understanding of the mechanisms underlying anxious and depressive symptoms following ABI, by examining the role of implicit self-esteem, self-compassion, and explicit-implicit self-esteem discrepancy as factors explaining anxiety and depression symptoms, in addition to explicit self-esteem. In the current sample of individuals with ABI, people suffering from higher anxiety severity scored lower on explicit self-esteem, implicit self-esteem, and self-compassion. As hypothesized, our findings provide evidence that the link between anxious symptomatology and both implicit self-esteem and self-compassion exists, even when controlling for explicit self-esteem. Indeed, our results suggest that implicit self-esteem and self-compassion contributed to explaining anxiety after ABI

(i.e., the more implicit self-esteem and self-compassion, the less anxiety), whereas explicit self-esteem marginally contributed to the model. Regarding depression, in addition to explicit self-esteem, self-compassion also had a role in explaining this type of symptomatology (i.e., the more explicit self-esteem and self-compassion, the less anxiety), whereas implicit self-esteem did not.

In the case of self-compassion, the current results are in line with previous studies demonstrating its role as an explanatory variable in mental health outcomes (MacBeth & Gumley, 2012; Zessin et al., 2015). In the ABI context, people who have more self-compassion might show better emotion regulation (Scoglio et al., 2018) because self-compassion is characterized by low self-criticism and self-judgment, leading in turn to less distressing symptoms, including anxiety and depression (Sloan et al., 2017).

Regarding self-esteem, dual process models of cognition can help to understand our results. Overall, these models postulate the existence of implicit (also known as automatic, nonconscious, associative) processing and explicit (also known as reflective, controlled, strategic, conscious) processing (Smith & DeCoster, 2000). Implicit processing refers to quick and effortless information processing, which can be experienced as intuitive responses to stimuli, as occurs in SE-IAT. Explicit processing involves deliberation and awareness, and it is more effortful and slower. A central assumption is that the explicit and implicit systems operate in parallel, interacting with each other (Strack & Deutsch, 2004). However, each system is likely to be engaged under different circumstances (Beevers, 2005). Implicit processes can be assumed to influence anxious symptomatology to a greater extent than explicit processes, given that anxiety can be understood as a primary activation response to variable eliciting stimuli (Norton & Paulus, 2017). Based on the core assumptions of dual process models, strong

threat-related associations, high levels of arousal associated with the threatening stimulus, and low levels of working memory capacity have been identified as potential factors contributing to cognitive vulnerability to anxiety (Ouimet et al., 2009). Working memory is precisely one of the most common cognitive processes affected after ABI (Elbaum & Benson, 2007), which makes these automatic processes even more influential in vulnerability to anxiety in this clinical condition. In this line, automatic negative appraisals of the self (i.e., low implicit self-esteem) may be considered particularly self-threatening and, thus, anxiogenic, in the ABI context, given that the vulnerability of the self might have become more accessible and present due to experiencing such a traumatic event. However, further research is needed to examine the specific role of implicit self-esteem in vulnerability to anxiety and possible mediating variables. Moreover, the non-significant contribution of explicit self-esteem to the anxiety model should be interpreted with caution because the study may not have been sufficiently powered to find this effect.

Regarding vulnerability to depression, explicit cognitions have been considered key variables in this condition, which is empirically supported by findings indicating that explicit processes are better predictors of enduring depressive symptoms than implicit cognitions (Haeffel et al., 2007). This difference has particularly been observed when exploring implicit and explicit self-esteem (Kim & Moore, 2019). As measured with the RSES, explicit self-esteem refers to a global self-appraisal based on several cognitive beliefs about what the self is (e.g., thoughts that I am a failure). Such cognitive beliefs usually involve negatively biased elaboration processing, which has been widely theorized to play a key role in depression (Beck, 1979; Ingram, 1984). Therefore, it is not surprising to find a significant role of explicit self-esteem in depressive symptomatology in the current study. Indeed, our findings seem to be in line

with a previous meta-analytic study investigating the prospective reciprocal relationships between self-esteem and anxiety and depression (Sowislo & Orth, 2013). This meta-analysis showed that explicit self-esteem has a robust vulnerability effect on depression (β = -0.16), but this effect does not occur with anxiety because bidirectional effects between self-esteem and anxiety were found (predicting anxiety from self-esteem: β = -0.10; predicting self-esteem from anxiety: β = -0.08). However, the cross-sectional nature of our study does not allow us to draw temporal conclusions.

Finally, unlike in some previous studies (e.g., Creemers et al., 2012, 2013; Kim & Moore, 2019), discrepancies in the size and direction of the difference between implicit and explicit self-esteem did not show significant associations with anxious and depressive symptomatology. There could be at least two reasons for this result. First, scores on self-esteem discrepancies are sample-dependent (see Data Analyses). Thus, future studies should consider alternative methods to identify self-esteem discrepancies (e.g., based on normative data). Second, our study could be underpowered to detect significance in these relationships, given the small sample size. Indeed, it should be noted that the magnitudes of the correlations between the size and direction of the self-esteem discrepancy and depression found in this study are quite similar to those reported by Kim and Moore (2019) (r = 0.21 and r = 0.27, respectively).

Limitations and Future Research

Some limitations of the current study should be carefully considered when interpreting the results. First, the small sample size of individuals with ABI due to several heterogeneous etiologies might have compromised the statistical power of the analyses performed. Indeed, the post hoc power analyses confirm that our study is underpowered, which could lead to not only missing relevant significant effects, but also to false positive results. Further research using larger sample sizes would be useful

to better understand the role of these self-related processes in emotional distress in individuals with ABI.

Second, a convenience sample of patients attending a neurorehabilitation program was recruited, without including some highly prevalent conditions following ABI (e.g., residual hemiparesis) that could affect performance on any task. This was particularly true in the case of the SE-IAT, given that this task requires the use of both hands and is based on response times. Therefore, the results found in the present study may also be biased in this regard in the sample. Future research examining implicit self-esteem in individuals with ABI should use measures that require only one hand to respond, such as go/no-go tasks (Nosek & Banaji, 2001).

Third, this study had a cross-sectional design, and, therefore, no causal relationships can be established. Therefore, longitudinal studies would be of interest in order to understand the direction of the associations that emerged in the present study.

Fourth, all the psychological variables except implicit self-esteem were collected using self-report questionnaires, and no informant-reported or clinician-reported measures were included in the current study. Even though we are interested in the individual subjective perception because it is the most salient aspect of self-related constructs and emotional distress, future studies could explore other measures by caregivers or clinicians as external reports of patients' daily emotional functioning.

Finally, in this study we explored self-compassion as an overall construct because we used a reduced version of the SCS, calculating only an overall total score due to the low reliability of its subscale scores (Garcia-Campayo et al., 2014; Raes et al., 2011). However, although the theory proposes that self-compassion consists of six different components representing a more compassionate self-attitude (i.e., self-kindness, common humanity, and mindfulness) and a less uncompassionate self-attitude

(i.e., self-judgment, isolation, and over-identification) (Neff et al., 2019), the exact factor structure of the SCS is a topic of current debate. Whereas some authors argue that a two-factor model fits the SCS better than the commonly used unidimensional model (Brenner et al., 2017; Muris & Petrocchi, 2017), other authors provide support for the idea that an overall score on the SCS and the scores on all six subscales are more valid indicators of self-compassion than the two-factor model (Neff et al., 2019; Tóth-Király & Neff, 2020). Beyond the need for empirical evidence from testing criterion validity to resolve the debate, future research should also examine whether each specific component of self-compassion plays a differentiated role in anxious and depressive symptomatology after ABI.

Despite these limitations, this study shows the contribution of implicit self-esteem and self-compassion, in addition to explicit self-esteem, to explaining anxiety and depression following ABI. This study provides insights for developing future studies to disentangle the underlying self-related processes of emotional distress after brain injury.

Acknowledgments

The authors thank all the people who participated in the study and professionals supporting recruitment, especially Silvia Cerezo for her assistance with coordinating schedules. Lorena Desdentado is supported by a FPU doctoral scholarship (FPU18/01690) from the Spanish Ministry of Universities. This work was supported by CIBEROBN, an initiative of the ISCIII (ISC III CB06 03/0052).

Data Availability Statement

Raw data and measures used in the study are available at the Open Science Framework: https://osf.io/92jnt/

Compliance with Ethical Standards

Conflict of Interest. The authors declare that they have no conflicts of interest.

Informed Consent: Informed consent was obtained from all the individuals included in the study.

Ethics Statement. The institutional Ethical Committee of the University of Valencia (Spain) approved this study, with registration number: H1549821606365. All procedures were in accordance with the ethical standards of the Ethical Committee and with the 1964 Helsinki declaration and its later amendments.

Author Contributions

LD: designed and executed the study, assisted with the data analyses, and wrote the manuscript. AC: designed the study and collaborated with writing the paper. MM: analyzed the data and assisted with writing the paper, especially the part on the results. RL: collaborated with recruiting the participants and writing the study. MN: collaborated with recruiting the participants. RB: collaborated with writing the study. All the authors approved the final version of the manuscript for submission.

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Table 1.

Demographic and clinical characteristics of the sample (N = 38)

	N (%)	*M*	*SD*	Range
Sex				
Men	23 (60.50%)	-	-	-
Women	15 (39.50%)			
Age (years)	-	48.18	13.41	18-71
Education level (years)	-	13.45	4.49	5-21
Country of birth				
Spain	35 (92.10%)	-	-	-
South American country	3 (7.90%)			
Marital status				
Single	8 (21.10%)			
In a relationship	2 (5.30%)	-	-	-
Married	20 (52.60%)			
Divorced/Separated	7 (18.40%)			
Widowed	1 (2.60%)			
Occupation (at injury time)				
Employed	31 (81.58%)	-	-	-
Student	4 (10.53%)			
Retired	3 (7.89%)			
Etiology				
Ischemic stroke	16 (42.10%)			
Hemorrhagic stroke	9 (23.70%)	-	-	-
Traumatic brain injury	7 (18.40%)			
Tumor	3 (7.90%)			
Other kind of brain injury	3 (7.90%)			
Time since injury (months)	-	15.95	11.15	3-48
Lateralization of injury				
Right hemisphere	9 (23.70%)	-	-	-
Left hemisphere	11 (28.90%)			
Both hemispheres	18 (47.40%)			

Table 2.

Sorting blocks of the Self-Esteem Implicit Association Test

		Correct key press	
Block	Trials	"E" key	"I" key
1. Target Practice	20	Self	Other
2. Attribute Congruent Practice	20	Positive	Negative
3. Congruent PRACTICE	20	Self/positive	Other/Negative
4. Congruent TEST	40	Self/positive	Other/Negative
5. Attribute Incongruent Practice	20	Negative	Positive
6. Incongruent PRACTICE	20	Self/Negative	Other/Positive
7. Incongruent TEST	40	Self/Negative	Other/Positive

To counterbalance the order of presentation of "self/positive – other/negative" and self/negative other/positive" associations, half the participants received an SE-IAT in the following order: Block 1, Block 5, Block 6, Block 7, Block 2, Block 3, Block 4, and the other half in the "natural" order: Block 1, Block 2, Block 3, Block 4, Block 5, Block 6, Block 7. "Congruent" trials are related to high implicit self-esteem, and "incongruent" trials are related to low implicit self-esteem.

Table 3.

Correlations matrix of self-esteem (explicit, implicit, size and direction of explicit-implicit discrepancy), self-compassion, emotional distress, and cognitive measures

	1	2	3	4	5	6	7
1. Explicit self-esteem	-						
2. Implicit self-esteem	.20	-					
3. Size of the explicit-implicit self-esteem discrepancy[a]	-.21	.12	-				
4. Direction of the explicit-implicit self-esteem discrepancy[b]	-.48**	.51**	-.05	-			
5. Self-compassion	.58***	.29	-.10	-.17	-		
6. Anxiety	-.56**	-.47**	.04	.08	-.62**	-	
7. Depression	-.58**	-.25	.32	.21	-.57**	.68**	-
M	31.37	0.72	1.07	-	3.21	6.95	5.10
SD	5.10	0.36	0.91	-	0.77	5.84	4.20

*$p < .05$; **$p < .01$; ***$p < .001$. [a] Higher scores on the size of the discrepancy indicate larger discrepancies between explicit and implicit self-esteem; [b] Higher scores on the direction of the discrepancy are associated with higher scores on implicit self-esteem than on explicit self-esteem, whereas lower scores are associated with higher scores on explicit self-esteem than on implicit self-esteem (0 = fragile self-esteem; 1 = damaged self-esteem).

Table 4.

Hierarchical multiple regression analyses to explain anxiety and depression scores

Dependent variables	Independent variables[a]	*R*	*Adjusted* R^2	R^2 Change	B	SE	*β*	*t*
Anxiety	*Model 1*							
	Constant				24.35	4.41		5.52***
	Explicit self-esteem	.56	.29	.31***	-0.56	0.14	-.56	-4.00***
	Model 2							
	Constant				25.75	4.04		6.37***
	Explicit self-esteem				-0.48	0.13	-.48	-3.71**
	Implicit self-esteem	.67	.41	.14**	-5.29	1.82	-.38	-2.91**
	Model 3							
	Constant				26.65	3.80		7.02***
	Explicit self-esteem				-0.28	0.14	-.28	-1.95
	Implicit self-esteem				-4.35	1.74	-.31	-2.50*
	Self-compassion	.73	.49	.09*	-2.41	0.98	-.36	-2.46*
Depression	*Model 1*							
	Constant				20.82	3.55		5.87***
	Explicit self-esteem	.58	.32	.34***	-0.48	0.11	-0.58	-4.28***
	Model 2							
	Constant				21.71	3.40		6.40***
	Explicit self-esteem				-0.31	0.13	-0.38	-2.42*
	Self-compassion	.65	.38	.08*	-1.88	0.86	-0.35	-2.19*

*$p < .05$; **$p < .01$; ***$p < .001$. R = Multiple Correlation Coefficient; R^2 = Coefficient of determination; R^2 Change = Coefficient of determination change; B = unstandardized beta values; SE = Standard error; *β* = standardized beta values. [a] The rest of the proposed independent variables are not included in the table because they were not significant predictor variables in any of the regression analysis models. In the case of Model 3 to explain anxiety, the beta values were not significant for the size (*β* = -0.27, *t*

= -0.22, p = .830) and direction (β = 0.11, t = 0.57, p = .571) of the explicit-implicit self-esteem discrepancy. In the case of Model 2 to explain depression, the beta values were not significant for implicit self-esteem (β = -0.08, t = -0.57, p = .574), and the size (β = 0.21, t = 1.63, p = .113) and direction (β = -0.04, t = -0.24, p = .809) of the explicit-implicit self-esteem discrepancy.