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Measuring psychological flexibility and cognitive defusion in individuals with acquired brain injury

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ABSTRACT

Purpose: Acceptance and Commitment Therapy (ACT) is used increasingly for individuals with psychological distress following acquired brain injury (ABI) in different countries. However, questionnaires measuring ACT-processes are often not validated for this patient group and need cross-cultural validation. This study investigated the psychometric properties of the Acceptance and Action Questionnaire for Acquired Brain Injury (AAQ-ABI); measuring psychological flexibility related to thoughts and feelings about ABI and the Cognitive Fusion Questionnaire (CFQ-7; measuring cognitive defusion).

Materials and methods: Score distribution, reliability, and convergent validity of the AAQ-ABI and the CFQ-7 were examined in Dutch individuals with ABI.

Results: Seventy-three patients with ABI were included. The AAQ-ABI showed good reliability (Cronbach’s α = 0.87) and the CFQ-7 excellent reliability (Cronbach’s α = 0.97). Both did not show a floor or ceiling effect, nor a skewed distribution. There were strong to moderate correlations between the questionnaires and measures of psychological flexibility, mood, quality of life, and value-driven behavior (AAQ-ABI: r = −0.70–0.81; CFQ-7: r = −0.67–0.84). Inter-item total correlations indicate that the questions within each questionnaire measured the same construct (AAQ-ABI: r = 0.40–0.78; CFQ-7: r = 0.84–0.93).

Conclusions: The current study shows that the Dutch AAQ-ABI and CFQ-7 have acceptable to good psychometric properties when measuring psychological flexibility and cognitive defusion in patients with ABI.

Introduction

Acquired brain injury (ABI) is associated with an increased risk for the development of psychological distress (1,2). The psychological flexibility model provides an interesting perspective on how to deal with psychological distress related to medical conditions (3). This model forms the basis of Acceptance and Commitment Therapy (ACT), a third-generation Cognitive Behavioral Therapy. Psychological flexibility is the ability to adjust or persist in behaviors based on chosen values while staying in contact with the present moment, regardless of unpleasant thoughts, feelings, and bodily sensations (4). The treatment goal of ACT is the improvement of psychological flexibility. This is achieved through several interacting processes such as acceptance, cognitive defusion, mindfulness, and value based living.

Psychological flexibility is associated with wellbeing and is suggested to be a fundamental aspect of mental health. Previous studies have found relationships between psychological flexibility and physical and mental health, life satisfaction, quality of life, and rehabilitation adherence (5–7). Psychological inflexibility (which is characterized by the avoidance of thoughts and feelings, also called experience avoidance) is associated with psychopathology. This is especially apparent in individuals suffering from anxiety and depressive disorders (8–10), which are also common following an ABI (11).

Patients with ABI often experience negative thoughts (for instance: “life will never be the same again” or “I cannot do what I used to do”). These thoughts can be upsetting and therefore patients will try to avoid these thoughts. Cognitive defusion is the disentanglement and the process of creating a distance from thoughts (4) which can be helpful in the adaptation process following ABI, since people often experience thoughts that hold some truth (12). For instance, if the patient learns to let a reoccurring thought (such as “I cannot do what I used to do”) come and go (defusion) instead of focusing on or trying to avoid this thought (fusion), the impact of these thoughts on the patient’s behavior will decrease and there is more room for valued driven behavior. When applying and evaluating ACT, both psychological flexibility and cognitive defusion as core elements must be measured validly for treatment selection, monitoring of patients during rehabilitation and treatment, and the evaluation of interventions. Several questionnaires have been developed to measure psychological flexibility and cognitive defusion. The Acceptance and
Action Questionnaire (AAQ-II) is a widely used questionnaire measuring experiential avoidance and psychological inflexibility (13). Since ACT is used for various disorders, the AAQ-II has been adapted for different patient populations, including patients with chronic pain (14), diabetes (15), and substance abuse (16).

These population-specific measures are valuable since they measure experiential avoidance and psychological flexibility related to the problem area of interest. Consequently, they are thought to be more treatment-sensitive and measure psychological flexibility in a more content-valid manner compared to a generic measure (17). Sylvester (18) adapted the AAQ-II to measure both psychological inflexibility and avoidance of issues relating to ABI, namely the Acceptance and Action Questionnaire for Acquired Brain Injury (AAQ-ABI). The AAQ-ABI has only been validated within an Australian ABI population (19). Cross-cultural validation is needed, especially since ACT is used frequently for patients with psychological distress following ABI in other countries as well (12).

To measure cognitive defusion, Gillanders, Bolderston (20) developed the Cognitive Fusion Questionnaire (CFQ-7) which can be used for various patient populations. In patients with chronic pain (20), mental health problems, multiple sclerosis, and caregivers of people with dementia (21) it shows good psychometric properties. However, the psychometric properties have not yet been examined for patients with ABI.

Therefore, this study aimed to perform a cross-cultural validation of the Dutch AAQ-ABI and to validate the CFQ-7 for patients with ABI. The score distribution and reliability of the two questionnaires were examined. Convergent validity was established by comparing the questionnaires to measures of psychological flexibility, mood, quality of life, and value based living. We hypothesized that the correlations between the AAQ-ABI and CFQ-7 would correlate positively with the AAQ-II. We furthermore expected stronger correlations between the AAQ-II and AAQ-ABI (since they are both measures of psychological flexibility) than between the AAQ-II and the CFQ-7. Lastly, positive correlations were expected between measures of mood and negative correlations between measures of quality of life and value based living.

Methods

Participants

The inclusion criteria were: having sustained any type of acquired brain injury (such as a stroke, traumatic brain injury, or hypoxia), which is diagnostically confirmed by a neurologist; being 18 years or older; mastering the Dutch language sufficiently to fill in the questionnaires; and giving informed consent. The exclusion criteria were: the inability to complete the questionnaire because of cognitive impairment or communicative impairment based on the clinical judgment of a psychologist or inability to complete questionnaires in previous research.

Measures

Acceptance and Action Questionnaire after Brain Injury (AAQ-ABI). The AAQ-ABI measures psychological inflexibility regarding thoughts, feelings, and behaviors related to an ABI (19). The scale specifically focusses on identifying thoughts, feelings, and behaviors that may arise around functional disability occurring after an ABI. The AAQ-ABI relies on a 5-point Likert scale to reduce cognitive demand. Sylvester (18) initially developed a questionnaire consisting of 15 items. Whiting, Deane (19) evaluated the psychological properties of the AAQ-ABI and concluded that, based on a factor analysis, a shorter (one-factor) version with nine items has good reliability across time, satisfactory internal consistency (Cronbach’s α = .89), and associations with theoretically-relevant constructs. The scale includes items such as “I stop doing things when I feel scared about my brain injury” and “I need to get rid of my anxiety about my brain injury.” The score ranges from 0 to 36 with higher scores indicating greater psychological inflexibility. The questionnaire was translated into Dutch using a forward and backwards-translation method. It was first translated into Dutch by the first author (JR); afterward, it was translated back into English by a native English speaker who was blinded for the original version. Differences were discussed and a final version was agreed upon.

Cognitive Fusion Questionnaire (CFQ-7). The CFQ-7 (20) consists of seven items and measures cognitive fusion on a 7-point Likert scale. Scores range from 7 to 49. The higher the score, the more fused one is with one’s thoughts or identifies with one’s thoughts. The English version of the CFQ-7 demonstrated excellent internal consistency (Cronbach’s α = .90) and good test-retest reliability (20). The questionnaire was translated into Dutch by Batink and De Mey (22) and this version showed good psychometric properties. The English version had good psychometric properties in patients with chronic pain and multiple sclerosis (20,21).

Acceptance and Action Questionnaire II (AAQ-II). The AAQ-II (23) is a seven-item questionnaire measuring experiential avoidance and psychological inflexibility. The items measure the negative evaluation of feelings, forms of cognitive entanglement, and the influence of thoughts and feelings (13,24). The items are scored on a 7-point Likert scale and the total score ranges from 7 to 49 with a higher score indicating greater experiential avoidance and psychological inflexibility. The internal consistency of the AAQ-II is good (Cronbach’s α = .84) (13). The questionnaire was translated into Dutch by Jacobs, Kleen (25) and showed good psychometric properties. In an Australian ABI sample, the questionnaire showed excellent internal consistency (Cronbach’s α = .90) and good test-retest reliability (19).

Hospital Anxiety and Depressive Scale (HADS). The HADS was used to measure anxiety and depressive symptoms. The score ranges from 0 to 42 with higher scores indicating higher levels of depression or anxiety. The HADS was found to have good psychometric properties in patients with TBI and stroke (Cronbach’s α = 0.94) (26,27).

Depression Anxiety Stress Scales-21 (DASS-21). The DASS-21 was used to measure the levels of anxiety, depression, and stress of the participants. It consists of 21 items which are rated on a 4-point Likert-scale. The score ranges from 0 to 63 with higher scores indicating greater levels of depression, anxiety, or stress. The questionnaire has been validated and found to have good psychometric properties in a TBI sample (Cronbach’s α = 0.95) (28). The DASS-21 was included next to the HADS
because it includes a stress scale and includes items on devolution of life, self-deprecation, and hopelessness which the HADS lacks (29).

Short Form Survey (SF-12). Quality of life was measured with the Short Form Survey (SF-12). The SF-12 was used to measure the health status of the participants, but it can also be described as a broad assessment of quality of life (30). The SF-12 has two subscales: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). The total score of both scales ranges from 0 to 100, with a higher score indicating a better health status. The SF-12 demonstrates good psychometric properties in patients with stroke (Cronbach’s α PCS = 0.85 and MCS = 0.81) (31).

Valued Living Questionnaire (VLQ). The Valued Living Questionnaire (VLQ) is a two-part instrument that measures value based living (32). The participants rate the importance of ten value domains on a 10-point Likert scale. Subsequently, participants rate how consistently they have lived by their values within these domains. Scores from both parts are used to calculate a value based living component. The internal consistency of the valued living component is adequate (Cronbach’s α = 0.74) (32). The VLQ has been used in earlier research to measure valued living in patients with TBI (33).

Demographic questionnaire. Participants filled in details on demographic characteristics, including age, sex, educational level, marital status, employment status, type of brain injury, and time since brain injury.

Procedure

Individuals with ABI were recruited between October 2018 and May 2020 via databases of participants from previous studies investigating the consequences of an ABI (which matched the inclusion criteria of this study) for which medical ethics approval had been acquired. The participants had given written permission to be contacted for participation in future studies. If the participant agreed to participate and had given informed consent, they received a secure link to the questionnaires, which they could fill out at home. The participants filled in the questionnaires at one time point. A forced-choice response format was employed and thus there was no missing data. Additionally, part of the data was collected retrospectively. The data was drawn from an RCT examining the effect of ACT for patients with ABI for which the baseline measurement was used. The procedures for this study can be found elsewhere (34). Only these patients (N = 33) filled in the HADS, DASS-21, SF-12, and VLQ. The current study was approved by the medical ethics committee of Maastricht University Medical Center and Maastricht University (reference number 2018–0543).

Statistical analyses

The score distribution of the AAQ-ABI and CFQ-7 was reported in terms of mean, SD, median, range, skewness, and floor and ceiling effects. Skewness values lower than −1.0 or higher than 1.0 were considered strong. Those between 0.5 and 1.0 and −0.5 and −1.0 were regarded as moderate (35). Floor and ceiling effects were interpreted as present if at least 15% of the participants obtained the highest or lowest score (36). Furthermore, to test the homogeneity of the scales the item-total correlations were computed (the correlation between one item and the rest of the items). Each item was required to have a correlation coefficient higher than 0.3 (37). Furthermore, internal consistency was assessed in terms of Cronbach’s alpha (>0.9 = excellent; 0.9–0.8 = good; 0.8–0.7 = acceptable; 0.7–0.6 = questionable; 0.6–0.5 = poor) (37). Convergent validity was examined by calculating Spearman’s rank correlation coefficients between the AAQ-ABI, CFQ-7, AAQ-II, HADS, DASS-21, SF-12, and VLQ. Correlations were interpreted as strong if higher than 0.6, moderate if between 0.3 and 0.6, and weak if smaller than 0.3. Data were analyzed using SPSS version 26.0 (38).

Results

Participants’ characteristics

A total of 73 participants filled in the questionnaires. Participants’ characteristics are shown in Table 1.

Score distribution and reliability

Table 2 shows the score distributions of the AAQ-ABI and the CFQ-7. The mean score of the AAQ-ABI was 11.18 (SD = 8.40). 2.7% of the participants obtained the lowest score and no participants obtained the highest score. The skewness value was 0.28 and the Cronbach’s α was 0.87.

The mean score of the CFQ-7 was 22.73 (SD = 12.24). On the CFQ-7, 13.7% of the participants obtained the lowest score while no participants obtained the highest score. The skewness value was 0.18 and the Cronbach’s α was 0.97.

Table 1. Demographic characteristics.

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, n women (%)</td>
<td>34 (46.6)</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>56.5 (11.47)</td>
</tr>
<tr>
<td>Marital Status, n (%)</td>
<td>Unmarried 5 (6.8)</td>
</tr>
<tr>
<td></td>
<td>Married 48 (65.8)</td>
</tr>
<tr>
<td></td>
<td>Living together with partner 12 (16.4)</td>
</tr>
<tr>
<td></td>
<td>Divorced 5 (6.8)</td>
</tr>
<tr>
<td></td>
<td>Widowed 3 (4.1)</td>
</tr>
<tr>
<td>Education, n (%)</td>
<td>Low (primary education and lower vocational education) 12 (16.4)</td>
</tr>
<tr>
<td></td>
<td>Medium (general secondary education and secondary vocational education) 24 (32.9)</td>
</tr>
<tr>
<td></td>
<td>High (pre-university education, higher professional education, and university education) 37 (50.7)</td>
</tr>
<tr>
<td>Employment, n (%)</td>
<td>Employed 26 (35.6)</td>
</tr>
<tr>
<td></td>
<td>Incapacitated for work 24 (32.9)</td>
</tr>
<tr>
<td></td>
<td>Unemployed 4 (5.5)</td>
</tr>
<tr>
<td></td>
<td>Retired 11 (15.1)</td>
</tr>
<tr>
<td></td>
<td>Other 8 (10.9)</td>
</tr>
<tr>
<td>ABI-related variables</td>
<td>Mean (SD) or n(%)</td>
</tr>
<tr>
<td>Time (years) since ABI, mean (SD)</td>
<td>3.68 (5.39)</td>
</tr>
<tr>
<td>Type of ABI, n (%)</td>
<td>Ischemic stroke 34 (46.6)</td>
</tr>
<tr>
<td></td>
<td>Hemorrhagic stroke 8 (10.9)</td>
</tr>
<tr>
<td></td>
<td>Traumatic brain injury 31 (42.5)</td>
</tr>
</tbody>
</table>

ABI, acquired brain injury
Table 2. Score distribution and reliability.

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
<th>Range</th>
<th>% lowest score</th>
<th>% highest score</th>
<th>Skewness</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAQ-ABI</td>
<td>11.18</td>
<td>8.40</td>
<td>8</td>
<td>0–31</td>
<td>2.7%</td>
<td>0%</td>
<td>0.28</td>
<td>0.87</td>
</tr>
<tr>
<td>CFQ-7</td>
<td>22.73</td>
<td>12.24</td>
<td>24</td>
<td>7–45</td>
<td>13.7%</td>
<td>0%</td>
<td>0.18</td>
<td>0.97</td>
</tr>
</tbody>
</table>

AAQ-ABI, Acceptance and Action Questionnaire after Acquired Brain Injury; CFQ-7, Cognitive Fusion Questionnaire.

Table 3. The corrected item-total correlations of the Acceptance and Action Questionnaire after Brain Injury.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I hate how my brain injury makes me feel about myself</td>
<td>0.69</td>
</tr>
<tr>
<td>2</td>
<td>I need to get rid of my anxiety about my brain injury</td>
<td>0.86</td>
</tr>
<tr>
<td>4</td>
<td>My brain injury defines me as a person</td>
<td>0.67</td>
</tr>
<tr>
<td>5</td>
<td>I am moving forward with my life</td>
<td>0.64</td>
</tr>
<tr>
<td>6</td>
<td>I would give up important things in my life if I could make the brain injury go away</td>
<td>0.59</td>
</tr>
<tr>
<td>7</td>
<td>My worries and fears about my brain injury are true</td>
<td>0.60</td>
</tr>
<tr>
<td>8</td>
<td>Other people make it hard for me to accept myself</td>
<td>0.78</td>
</tr>
<tr>
<td>9</td>
<td>Most people are doing better than me</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Table 4. The corrected item-total correlations of the Cognitive Fusion Questionnaire.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My thoughts cause me distress or emotional pain</td>
<td>0.91</td>
</tr>
<tr>
<td>2</td>
<td>I get so caught up in my thoughts that I am unable to do the things that I most want to do</td>
<td>0.84</td>
</tr>
<tr>
<td>3</td>
<td>I over-analyze situations to the point where it’s unhelpful to me</td>
<td>0.88</td>
</tr>
<tr>
<td>4</td>
<td>I struggle with my thoughts</td>
<td>0.93</td>
</tr>
<tr>
<td>5</td>
<td>I get upset with myself for having certain thoughts</td>
<td>0.87</td>
</tr>
<tr>
<td>6</td>
<td>I tend to get very entangled in my thoughts</td>
<td>0.87</td>
</tr>
<tr>
<td>7</td>
<td>It’s such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful</td>
<td>0.87</td>
</tr>
</tbody>
</table>

Item-total correlations

All item-total correlations were above 0.3 for the AAQ-ABI ($r = 0.40–0.78$) and CFQ-7 ($r = 0.84–0.93$) as can be seen in Tables 3 and 4.

Convergent validity

Table 5 shows the correlations between the AAQ-ABI, CFQ-7 and the AAQ-II, HADS, DASS-21, SF-12, and VLQ. The AAQ-ABI and the CFQ-7 correlated strongly with each other and with the AAQ-II. Correlations between the AAQ-ABI and the HADS were moderate and between the AAQ-ABI and the DASS-21 strong, while the CFQ-7 correlated strongly with the HADS and moderately with the DASS-21. Both measures had weak correlations with the PCS and stronger correlations with the MCS. Lastly, the AAQ-ABI showed strong correlations with the VLQ and the CFQ-7 showed moderate correlations.

Discussion

The aims of this study were to perform a cross-cultural validation of the AAQ-ABI and to validate the CFQ-7 in a Dutch ABI population. The internal consistency of the AAQ-ABI was good (Cronbach’s $\alpha = 0.87$) and of the CFQ-7 excellent (Cronbach’s $\alpha = 0.97$). Neither of the questionnaires showed floor or ceiling effects and skewness levels were acceptable. The strong positive correlation between both the AAQ-ABI and the CFQ-7 and the AAQ-II indicated a good convergent validity. The AAQ-ABI showed a stronger correlation with the AAQ-II than with the CFQ-7. This was expected since the AAQ-II and AAQ-ABI both measure constructs related to psychological flexibility. Whiting, Deane (19) found similar correlations between the English versions of the AAQ-II and the AAQ-ABI. However, in the current study, the AAQ-II correlated stronger with the CFQ-7 than with the AAQ-ABI, which was not expected. A possible explanation for this finding could be that the constructs measured by the AAQ-II and the CFQ-7 are closely related (20). Where the CFQ-7 measures psychological flexibility regarding cognition, the AAQ-II does this in a broader way regarding emotions and thoughts. Therefore, the AAQ-II contains items that may estimate levels of cognitive fusion (such as; I worry about not being able to control my worries and feelings). In addition, both questionnaires had positive correlations with measures of mood and negative correlations with measures of value-driven behavior, which was expected. Both questionnaires correlated significantly with quality of life, but only when related to mental health and less when related to physical health. The AAQ-ABI had a weak association with physical health-related quality of life. Lower associations between measures of psychological functioning and physical functioning are not uncommon (39). There was no association between the CFQ-7 and physical health-related quality of life. It could be that cognitive defusion is simply not as related to physical health-related quality of life as the other components of
psychological flexibility or has a more indirect effect that the measures used did not capture. Finally, all separate items of the AAQ-ABI and CFQ-7 correlated adequately with the total score of the respective questionnaire, indicating that the items within each questionnaire measure the same construct.

The results suggest that the AAQ-ABI and the CFQ-7 measure psychological flexibility and cognitive defusion in patients with ABI. The questionnaires can therefore further help to improve the care for patients with ABI related anxiety and depressive complaints. Clinicians can use these scales to monitor their patients with ABI during an ACT intervention, to evaluate the treatment, and to give the patient insight into the treatment process. Furthermore, the questionnaires can be used in studies to further investigate the effectiveness of ACT for patients with an ABI. This is important since psychological distress is common following ABI and more research into the effectiveness of different treatment options is needed (11,40).

Limitations and future research

The discriminant validity of the questionnaires was not investigated in this study, which should be further examined in future research, especially given the growing concern regarding the discriminant validity of the AAQ-II (41). Several studies have found that it measures psychological distress or neuroticism rather than psychological flexibility (42,43), which is a matter of concern and has to be taken into account when using the AAQ-II. The AAQ-ABI is based on the AAQ-II and therefore there might be doubts regarding the discriminant validity of the AAQ-ABI as well. Therefore, more research into the discriminant validity of the AAQ-ABI is needed.

Population-specific versions of the AAQ-II, such as the AAQ-ABI, are thought to be more treatment sensitive (17). However, their responsiveness to measuring change in treatment contexts has not well been examined yet. For these reasons, it is recommended to use an AAQ specific questionnaire in addition to the AAQ-II as the treatment sensitivity of the AAQ-II has been better studied (17,44). Furthermore, this will aid the comparability between trials. Regarding the treatment sensitivity of the AAQ-ABI, the English version of the questionnaire was used in a pilot RCT investigating the effectiveness of ACT for people with severe traumatic brain injury (45). No significant change was measured on the AAQ-ABI, however, no significant difference was also found on the AAQ-II. This could be due to the small sample size of the study (N = 19). More research is needed to investigate the treatment sensitivity of the AAQ-ABI.

The test-retest reliability of both scales was not examined in this study. However, the test-retest reliability of the English AAQ-ABI was good in an Australian ABI sample (19). Furthermore, the test-retest reliability of the CFQ-7 was good in student and community samples (20,46). However, the test-retest reliability should still be examined in Dutch individuals with ABI.

The largest part of the data was collected online, which has several advantages. Patients are easy to reach and it takes them a minimal amount of time to participate in the study. However, the questionnaires are not filled in in a controlled environment. Furthermore, the sample may have limited representativeness since these are all participants who have access to and know how to use a computer.

Conclusion

The current study shows that the Dutch AAQ-ABI and CFQ-7 have acceptable to good psychometric properties when measuring psychological flexibility and cognitive defusion in Dutch patients with ABI. The AAQ-ABI and CFQ-7 can help clinicians to monitor their patients with ABI during an ACT intervention and can help evaluate the treatment. Furthermore, the questionnaires can be used in studies further investigating the effectiveness of ACT for patients with ABI. When using the AAQ-ABI in intervention studies it is recommended to use it in combination with the AAQ-II, since the treatment sensitivity of the AAQ-II is better studied.

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Disclosure Statement

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