# Interventions to enhance Coping after Traumatic Brain Injury: A Systematic Review.

Critical Review Article

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## Abstract

**Objective:** To identify effective psychosocial interventions to enhance coping in people who have experienced a traumatic brain injury (TBI), in order to inform clinical practice and articulate future research directions.

**Methods:** We searched five electronic databases (CINAHL, Medline, EMBASE, PsycINFO, and Cochrane Library). Titles and abstracts were independently screened by two of the authors and selected for inclusion. We retrieved the full text of all potentially relevant studies and assessed those for eligibility, reporting and methodological quality, and risk of bias.

**Results:** Eight included studies were very heterogeneous in terms of study design, type of intervention, the population studied and instruments used to evaluate coping. All studies were judged to have a moderately high risk of bias. Six studies used cognitive behavioral therapy (CBT) -based interventions. Two interventions (a peer-mentoring program and CBT combined with motivational interviewing) showed significant treatment effects on maladaptive coping. Two CBT-based group programs improved adaptive coping, but increases were either not sustained over time or no longer significant when compared to an active control.

**Conclusions:** There is insufficient evidence to support practice recommendations strongly. Targeting specific subgroups of people who have experienced TBI might allow the development of more effective coping interventions. Further a more unified concept of coping in TBI need to be articulated allowing larger scale evaluations.



**Key words:** brain injuries; cognitive behavior therapy; coping; rehabilitation; systematic review

## Introduction

Survivors of traumatic brain injury (TBI) can experience dramatic and long-lasting changes and challenges in physical, cognitive, social, relational, vocational and financial functioning. Thus, people who experience a TBI are faced with a difficult process of psychological adjustment (Finset and Andersson, 2000; Kolakowsky-Hayner et al., 2001; Lippert-Gruner et al., 2007).

The literature on coping is predominantly based on the work by Lazarus and Folkman (Lazarus R, 1984)(page 141), who define coping as "constantly changing cognitive and behavioral efforts to manage specific external and/ or internal demands that are appraised as taxing or exceeding the resources of the person". The term coping is used irrespective of the adaptive or maladaptive consequences of the process, and coping strategies are generally categorized as either emotion- or problem-focused.

Emotion-focused coping strategies, which are largely maladaptive, aim at adjusting the individual's reactions to stress, and include avoidance, wishful thinking, minimization, distancing, denial or alcohol and drug use. Problem-focused, or adaptive, coping strategies deal with problems by actively seeking solutions. Strategies include planning, problem-solving, generating and weighing alternatives, and looking for social support (Lazarus R, 1984; Lazarus, 1993).

People who have experienced TBI show greater reliance on emotion- than on problem-focused coping strategies (Bohnen et al., 1992; Tomberg et al., 2007; Tomberg et al., 2005; Wolters et al., 2010). Differences in coping strategies have consistently been shown to influence outcomes (Anson and Ponsford, 2006a; Curran et al., 2000; Dawson et al., 2006; Finset and Andersson, 2000; Tomberg et al., 2005), making coping an important target for treatment and rehabilitation of people who have experienced TBI.

It has been shown that psychological, in particular CBT-based, interventions are effective in the management of TBI-related emotional difficulties such as anger (Alderman, 2003), aggression (O'Leary, 2000), anxiety and depression (Ponsford et al., 2016).

It is however unclear whether interventions to enhance coping after TBI are effective and which should be adopted and advocated. This systematic review aimed to:

(a) identify the various psychosocial approaches to enhance coping in people who have experienced TBI in the literature

(b) appraise the effectiveness of these interventions, including the evaluation of variations in coping definition and measurement tools;

(c) draw conclusions for clinical practice, and suggest directions for further research.

## Methods

This systematic review was conducted in accordance with the PRISMA guidelines (Liberati et al., 2009) using selection criteria for participants, interventions, comparisons, outcomes and study design (PICOS).

### Inclusion and exclusion criteria (PICOS eligibility criteria)

Participants

We included studies of participants with traumatic brain injury or mixed groups of people sustaining traumatic and non-traumatic injuries (e.g. stroke, brain tumor). Injuries of any severity were permitted and participants needed to be at least 16 years old. We did not restrict the time post injury.

Interventions

Any type of psychosocial interventions of any length to enhance coping were eligible. This included individual or groups settings, all forms of psychological therapies, as well as social interventions and multidisciplinary rehabilitation programs.

Comparisons

We included controlled studies, cohort studies and trials. We allowed wait-list controlled design, comparison to a different form of intervention, such as social contact, self-help or activities, educational control, usual care, or patients serving as their own controls.

Outcomes

One outcome measure of the included studies needed to be a recognized coping scale as a primary or secondary outcome.

Study design

Studies were included if they were of a quantitative nature and investigated the effects of an intervention on coping behavior. We included review articles, book chapters and dissertations (if accessible), but excluded letters, editorial opinions and qualitative studies.

**Selection of Included Studies**

On 4th April 2016 we searched five electronic databases (CINAHL, Medline, EMBASE, PsycINFO, and Cochrane Library), using the search terms listed in table 1 (exemplified by PsycINFO). As we aimed to identify a broad range of interventions and study designs, no intervention search term was used. No language restrictions were applied, and search terms were modified as necessary to search each database. We included all studies published from the introduction of the respective database until 31st March 2016 and hand-searched reference lists of all included articles. Expert recommendations of additional references and a search in google scholar were used to identify studies potentially meeting criteria but not indexed in databases.

All titles and abstracts (where relevant and available) of identified articles were independently screened by two of the authors (CM, SW) and selected for inclusion using the PICOS criteria above. We retrieved and read the full text of all potentially relevant studies and assessed them for full application of the PICOS eligibility criteria. Disagreements were resolved through discussion with the third author (FN).

Table 1: Search strategy (example for searching of PsycINFO)

| | |
|---|---|
| Subject terms | ( DE "traumatic brain injury" OR DE "head injuries" OR TI ( "brain injur*" OR "brain damage" OR "head trauma" OR "head injur*" OR "TBI" OR "craniocerebral trauma" OR "brain trauma" OR "brain contusion" OR "cortical contusion" OR "traumatic encephalopath*" ) OR AB ( "brain injur*" OR "brain damage" OR "head trauma" OR "head injur*" OR "TBI" OR "craniocerebral trauma" OR "brain trauma" OR "brain contusion" OR "cortical contusion" OR "traumatic encephalopath*" ) ) |
| | AND |
| Coping terms | ( DE "coping behavior" OR TI ("coping" OR "cope" OR "adaptation" OR "adaptive behaviour" OR "adaptive behavior" OR "adjustment") OR AB ("coping" OR "cope" OR "adaptation" OR "adaptive behaviour" OR "adaptive behavior" OR "adjustment") ) |

**Assessment for quality of reporting, methodological quality and risk of bias**

In a first step, studies meeting the PICOS eligibility criteria were assessed using the Checklist for assessing the quality of quantitative studies, developed by Kmet and colleagues (Kmet et al., 2004). The checklist is an empirically grounded quality assessment tool suitable for use with a variety of study designs, which provides an assessment of quality of reporting rather than rating the quality of a study in all aspects. From the assessment, a quality score was calculated, ranging from 0 to 1 with low scores meaning weak quality (weak quality: papers that provide inadequate information or poorly conducted studies). We included studies that were of at least moderate quality (Score $\geq 0.7$).

Kmet's criteria (Kmet et al., 2004) do not weigh the relative importance of certain design features versus others and thereby potentially underestimate the risk of bias. Therefore we additionally judged risk of bias based on the Classification of Evidence Matrices developed by the American Academy of Neurology (AAN, 2011). The strength of the evidence was evaluated using a four-tiered classification scheme: "In this scheme, studies graded Class I are judged to have a low risk of bias, studies graded Class II are judged to have a moderate risk of bias, studies graded Class III are judged to have a moderately high risk of bias, and studies graded Class IV are judged to have a very high risk of bias

(AAN, 2011)[page 8].” We did not assess the criterion of blinded outcome assessment as rigorously as mentioned in the original scheme, which does not classify patients’ own assessment of their outcome (e.g. completion of a ‘coping-questionnaire’) as masked or blinded. This was because coping is a very individual process and the self-perception of coping strategies can vary between individuals. Hence currently available coping measurements are based on patients’ own assessment. Studies were independently and blindly rated by two of the authors (CM, SW); disagreements resolved through discussion with the third author (FN). The classification scheme accounts only for systematic error and random error (low study power) was addressed separately.

**Data synthesis**

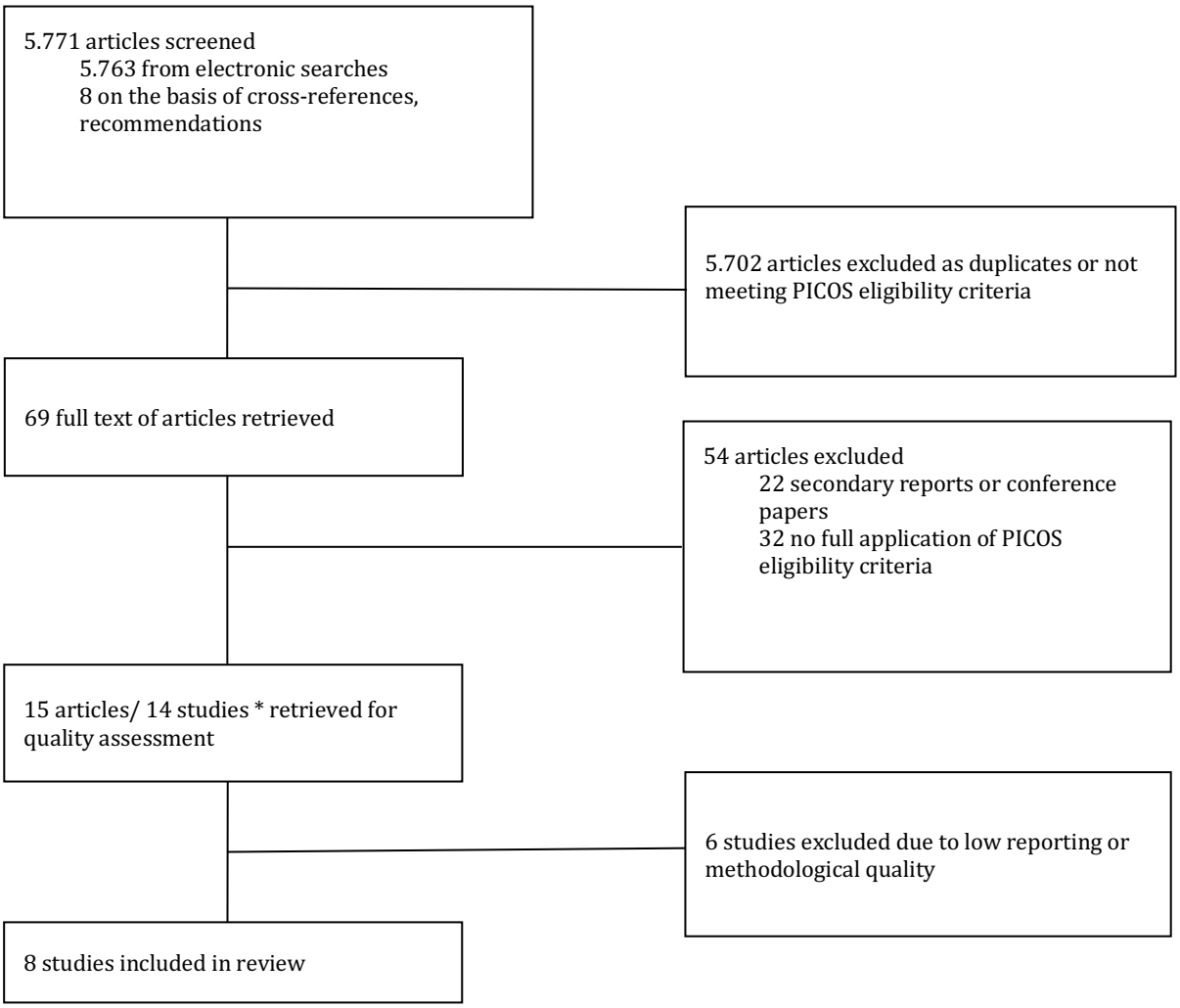
Due to the anticipated heterogeneity in terms of study design, definition of coping and measurement, and potential paucity of homogenous studies, a meta-analysis was not deemed appropriate. Thus, we critically considered the included studies in a best evidence synthesis, taking in to account potential risk of bias when making conclusions from the data.

## Results

### Identification and characteristics of included studies

The literature searches identified 5771 potentially relevant articles. We retrieved 69 full text articles, of which 14 studies met the PICOS eligibility criteria. One study was reported in two articles (Anson and Ponsford, 2006b; c). The studies were evaluated for reporting and methodological quality using Kmet's criteria (Kmet et al., 2004). Inter-rater agreement for all items between the two assessors was 81%. Six studies (Appleton et al., 2011; Arundine et al., 2012; Forman A, 2006; Hibbard et al., 2002; Hofer et al., 2010; Lundqvist et al., 2010) which were rated below moderate quality (Scores 0.32 – 0.69) were excluded. These were largely pilot studies of small sample sizes, without control groups or matching. One study did not apply a structured measure to assess coping (Hibbard et al., 2002), others did not describe the analysis in sufficient detail (Appleton et al., 2011; Forman A, 2006; Lundqvist et al., 2010). Eight studies, reported in nine journal articles, were rated as being of at least moderate quality (Scores 0.77-0.88), and were therefore included in the review (PRISMA flow diagram, figure 1).

Figure 1: Flow diagram of selection of studies (PRISMA diagram)




***** 15 articles representing 14 studies as one study was publicized in two separate articles

**Risk of bias and random error (study power)**

All eight included studies were judged to have a moderately high risk of bias (see table 2). Features increasing the risk of bias were: absence of relevant baseline characteristics (Hanks et al., 2012), not fully concealed allocation (Hsieh et al., 2012), patients serving as their own controls (Anson and Ponsford, 2006b; c; Wolters et al., 2010), matching of (non-randomized) groups (Bradbury et al., 2008; Tiersky et al., 2005), high levels of attrition which was not adequately accounted for (Backhaus et al.,

2010; Tiersky et al., 2005) and/or outcome measures which were not formally validated (Backhaus et al., 2016; Backhaus et al., 2010).

Six of the included studies had small sample sizes with 19 to 31 subjects with brain injury. All authors mentioned the small sample size as a limitation of their study, which restricted the statistical power. Only Backhaus et al. (2010) and Hsieh et al. (2012) performed an a priori power calculation, and both studies failed to involve the targeted sample size. Backhaus et al. (2016) recognized the lack of an a priori power calculation as a limitation and stated that their study was underpowered. Therefore, the potential contribution of chance to the results needs to be considered high. Further, most of the included papers did not present confidence intervals making it difficult to interpret the study's results regarding potentially random errors.

Table 2: Types of interventions, study designs, and risk of bias

| Study | Class (AAN) | Intervention description | Study design | Control group | Treatment allocation | Completeness of follow-up | Masking throughout the study |
|---|---|---|---|---|---|---|---|
| Hsieh et al., 2012 | III | Motivational interviewing and cognitive behavioral therapy (MI + CBT) vs. non-directive counseling and cognitive behavioral therapy (NDC + CBT) vs. treatment as usual (TAU)<br>MI + CBT: Anxiety treatment program adapted for people with TBI; 3 weekly sessions of MI prior starting CBT (9 sessions)<br>NDC + CBT: 3 sessions of NDC prior starting CBT (9 sessions) | RCT; single center, parallel group trial with repeated measures (pre-post-9-weeks-follow-up test; MI + CBT vs. NDC + CBT vs. TAU) | Yes | Randomized in block of three | Minimal attrition | Self-assessment of outcome measure |
| Hanks et al., 2012 | III | Peer-mentoring program<br><br>Focus of mentoring: emotional well-being, post-TBI quality of life, community integration<br><br>Mentoring lasted for 1 year; weekly contacts for the first month, biweekly contacts for the next 2 to 3 months, monthly contacts for the remainder of the year | RCT; Comparison of outcome measures (mentoring group vs. control group)<br><br>Outcome of interest not assessed at baseline. | Yes | Random, concealed allocation | 79% completed follow-up, loss to follow-up equivalent between groups | Self-assessment of outcome measure |
| Tiersky et al., 2005 | III | Neuropsychologic rehabilitation program (cognitive behavioral therapy) and cognitive remedial training, sessions 3 days per week, for 11 weeks | RCT with wait-listed control design and repeated measures | Yes | Random, concealed allocation | 31% drop-out, differed in education level from completers | Self-assessment of outcome measure |
| Backhaus et al., 2016 | III | Brain Injury Coping Skills Group (BICS Group):<br>16 sessions, manualized, cognitive-behavioral treatment (e.g. psycho-education, stress management, problem-solving strategies, role-plays) | RCT with two arms:<br>BICS or support group<br><br>Control group: peer-directed support group, 16 sessions, facilitators only provide framework | Yes | Random, concealed allocation | Minimal attrition | Self-assessment of outcome measure |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Backhaus et al., 2010 | III | Brain Injury Coping Skills Group (BICS Group):<br>12 sessions, manualized, cognitive-behavioral treatment (e.g. psycho-education, support, coping skills training) | RCT with wait-list control group, repeated measures (pre-post-3-month-follow-up test) | Yes | Random, concealed allocation | High attrition in control group | Self-assessment of outcome measure |
| Bradbury et al., 2008 | III | Cognitive behavioral therapy (CBT) vs education group (control group):<br>11 CBT sessions or education sessions (45 to 75 min; in a face-to-face group or individually by telephone) within 9-week time frame | Trial with two groups and repeated measures (pre-post test; comparing the effects of CBT group to education control group for matched samples) | Yes | Matching | No attrition | Self-assessment of outcome measure |
| Anson & Ponsford, 2006b,c | III | Coping Skills Group (CSG):<br>Cognitive behavioral therapy (CBT) based intervention program,<br>2 sessions per week for 5 weeks | Trial with repeated measures (pre-post-follow-up test),<br>Follow-up one: 5 weeks post intervention,<br>Follow-up two: 6-24 months following intervention | No | Patients are their own controls | Low attrition | Self-assessment of outcome measure |
| Wolters et al., 2010 | III | Cognitive rehabilitation program; different combinations of modules, individual and/or group setting;<br>Frequency: in the beginning 1–3 hours per week, intensity gradually decreases over time, duration: 3–5 months | Trial with repeated measures (pre-post test) | No | Patients are their own controls (before-after design) | 78% questionnaire response rate | Self-assessment of outcome measure |

**Measurement of coping**

A variety of different scales were used to measure coping in the included studies (see table 3 for characteristics of coping scales). All coping measurement tools were self-report questionnaires. The scales evaluated situation-specific or dispositional coping (Gregorio et al., 2014) in 6-8 domains, using 20–66 items rated on 4- or 5-point Likert scales. Backhaus and colleagues developed the Brain Injury Coping Skills Questionnaire, focusing specifically on perceived self-efficacy regarding the injury (abbreviation for the questionnaire: PSE) (Backhaus et al., 2010). For a second study the PSE scale was modified to enable comparison of the intervention group with an active control (a peer-directed support group) and abbreviated BICSQ (Backhaus et al., 2016). Thus, this scale has not yet been validated, neither in general populations nor in people who have experienced TBI. The other instruments (CISS, CSA, CRI, UCL, WCQ-r) have been validated in the general population, but the majority of psychometric properties have either not been established in people who have experienced TBI or are largely rated as poor-to-moderate (see table 3 and Gregorio et al., 2014). The best evaluated property in the TBI populations is the ability of the instrument to measure change over time (i.e. responsiveness) the best established scale the Coping Inventory for Stressful Situations (CISS) (Brands et al., 2014; Endler and Parker, 1990; Folkman and Lazarus, 1988; Frydenberg and Lewis, 1997; Greene et al., 2015; Gregorio et al., 2014; Moos, 1993; Schreurs et al., 1993).

Table 3: Instruments to measure coping applied in included studies (adapted with permission from Gregorio et al., 2014 and expanded (Backhaus et al., 2016; Backhaus et al., 2010; Brands et al., 2014; Greene et al., 2015)

| Instrument | Studies | Focus of coping | Items, domains | Scales | Interpretation (Psychometric properties in TBI) |
|---|---|---|---|---|---|
| Brain Injury Coping Skills Questionnaire (PSE) – Backhaus et al., 2010 | Backhaus et al., 2010– total score | Self-efficacy regarding injury | 20 items, 6 domains, effects of brain injury, caregiver role, factors affecting recovery, managing difficult situations, effective communication, positive self-appraisal<br><br>(higher total scores suggest better self-efficacy; range unknown) | 5-point scale | • Assesses person's self-efficacy regarding the injury<br>• Developed by authors of the study<br>• Responsive to treatment in this study<br>• Psychometric properties unknown |
| Brain Injury Coping Skills Questionnaire (BICSQ), revised version – Backhaus et al., 2016 | Backhaus et al., 2016 – T-score | Self-efficacy regarding the head injury and its sequelae | 35 items, 6 domains, effects of brain injury, caregiver role, factors affecting recovery, managing difficult situations, effective communication, realistic self-appraisal<br><br>(T-scores, higher scores suggest better self-efficacy) | 4-point scale | • Assesses person's self-efficacy regarding the injury<br>• Developed by authors of the study<br>• Responsiveness to treatment demonstrated in this and previous study<br>• Other psychometric properties unknown |
| Coping Inventory for Stressful Situations (CISS) – Endler & Parker, 1990 | Hanks et al., 2012 – all three scales | Stressful situations | 48 items, 3 scales (2 subscales): task-oriented, emotion-oriented, and avoidance-oriented (distraction, social diversion)<br><br>(range: 16 to 80 for each scale) | 5-point scale | • Sufficient internal consistency (Cronbach's alpha > 0.8)<br>• Sufficient factorial validity (multidimensional structure confirmed by factor analysis)<br>• Moderate convergent validity (moderate correlations between CISS and subscales of the Assimilative/ Accommodative Coping Questionnaire and subscales of the Hospital Anxiety and Depression Scale)<br>• Good reliability in moderate to severe TBI<br>• Responsiveness unknown |
| Coping Scale for Adults (CSA) – Frydenberg & Lewis, 1996 | Anson & Ponsford, 2006b,c – two subscales<br>Hsieh et al., 2012 – two subscales | Overall concerns and self- or administrator-nominated concern | 20 items, 4 scales: dealing with the problem/ adaptive coping, non-productive coping, optimism, sharing | 5-point scale | • Feasible for persons with more severe deficits<br>• Sufficient responsiveness to change (significant changes in coping demonstrated in follow-up study) |

| | | | | | |
|---|---|---|---|---|---|
| | (both: adaptive coping, non-productive coping) | | (range: 21 to 105 for each scale, with higher scores suggesting more frequent usage) | | • Adaptive coping and nonproductive coping subscales have moderate reliability<br>• Others psychometric properties unknown |
| Coping Responses Inventory (CRI) – Moos, 1993 | Tiersky et al., 2005 – two subscales (problem solving, emotional discharge) | Cognitive and behavioral responses to cope with a recent problem or stressful situation | 48 items, 8 scales: approach coping styles (logical analysis, positive reappraisal, seeking guidance and support, problem solving), avoidant coping styles (cognitive avoidance, acceptance or resignation, seeking alternative rewards, emotional discharge)<br><br>(range: 0 to 18 for each scale) | 4-point scale | • Psychometric properties unknown |
| Utrecht Coping List (UCL) – Schreurs et al., 1993 | Wolters et al., 2010 – two subscales (active problem-solving coping scale, passive reactions coping scale) | Problems in general | 47 items, 7 scales: active problem solving, and palliative reactions, avoidance, seeking social support, passive reactions, expression of emotions, and reassuring thoughts<br><br>(range: 7 to 28 for the active problem-solving coping scale and the passive reactions coping scale) | 4-point scale | • Feasible for persons with more severe deficits<br>• Sufficient responsiveness to change (significant changes in coping demonstrated in follow-up study)<br>• Others psychometric properties unknown |
| Ways of Coping Scale/Questionnaire, revised (WCQ-r) – Folkman & Lazarus, 1988 | Bradbury et al., 2008 – two subscales (planful problem focused, escape-avoidance) | Specific stressful event Items | 66 item, 8 dimensions: planful problem focused, self-controlling, seeking social support, positive reappraisal, confrontive coping, escape-avoidance, distancing, accepting responsibility<br><br>(range: 0 to 18 for the planful problem focused-scale, 0 to 24 for the escape-avoidance-scale) | 4-point scale | • Moderate internal consistency (Cronbach's alpha: 0.70-0.80)<br>• Sufficient responsiveness to change (significant changes in coping demonstrated in follow-up study and clinical trial)<br>• Insufficient factorial validity (structure not confirmed by factor or principal component analysis)<br>• Test-retest reliability and convergent validity are unknown |

**CBT-based interventions**

Six of the included studies used CBT-based interventions (see tables 2 and 4). Four studies (Anson and Ponsford, 2006b; c; Backhaus et al., 2016; Backhaus et al., 2010; Bradbury et al., 2008) used group therapy approaches, while two (Hsieh et al., 2012; Tiersky et al., 2005) offered individual therapy sessions. The individual therapy methods added either motivational interviewing (prior to starting CBT) (Hsieh et al., 2012) or cognitive remedial training (simultaneous with CBT) (Tiersky et al., 2005) to the CBT sessions.

The study, which applied individual motivational interviewing plus CBT (Hsieh et al., 2012), found a significant decrease in non-productive coping following the intervention compared to treatment as usual, but no effects on adaptive coping. Another study arm using non-directive counseling plus CBT was not superior to treatment as usual with regards to adaptive and non-adaptive coping. The authors did not compare motivational interviewing plus CBT with non-directive counseling plus CBT on coping measures, but reported that the addition of motivational interviewing was beneficial on anxiety, but not on depression scores.

In contrast, a CBT-based group intervention (Anson and Ponsford, 2006b; c) showed a significant treatment effect on adaptive coping at the end of the intervention, with no effect on maladaptive coping. However, this increase was not stable over time, and a significant decrease in adaptive coping was measured at 5 weeks' follow-up, followed by a significant increase at long-term follow-up (6-24 months post intervention). Backhaus and colleagues found that a coping skills group had positive effects maintained over time on perceived self-efficacy, when compared to wait-list controls (Backhaus et al., 2010), but not to an active control group (Backhaus et al., 2016).Two further studies did not detect significant treatment effects compared to a wait-list (Tiersky et al., 2005) or education matched control group (Bradbury et al., 2008).

Table 4: Design Characteristics and outcomes of CBT-based interventions

| Author Year | Cohort size | Comparison group | Participants | | | | | Inclusion of caregivers | Effect on adaptive coping | Effect on maladaptive coping |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Age (y; mean ± SD) | Sex (% female) | Time since injury (Mean (y) ± SD or % < 1y) | % non-TBI participants | Injury severity | | | |
| Hsieh et al., 2012 (Hsieh et al., 2012) | **27** | MI + CBT vs. NDC + CBT vs. TAU | 38.0 ± 13.2 | 22% | 37% | none | moderate to very severe | No | CSA – subscale: dealing with the problem / adaptive coping (mean ± SD):<br>Intervention Baseline Post-CBT<br>MI + CBT: 49.7±16.9 59.1±16.1<br>NDC + CBT: 66.6±12.8 67.3±13.2<br>TAU: 58.9±12.4 55.9±13.5<br>No significant differences | CSA – subscale: non-productive coping (mean ± SD):<br>Intervention Baseline Post-CBT<br>MI + CBT: 62.0±16.2 50.6±10.3<br>NDC + CBT: 71.4±19.4 68.0±20.8<br>TAU: 62.6±18.1 53.6±23.0<br>Significant decrease post intervention in the MI + CBT-group compared to treatment as usual (β = -1.082, p = 0.001) |
| Tiersky et al., 2005 | **20** | Wait-list control | 46.85 ± 10.51 | 55% | 6.25 ± 6.02 | none | mild to moderate | No | CRI – subscale: problem solving (mean ± SD):<br>Intervention Baseline Post-Intervention<br>Treatment group: 10.8±3.2 13.1±2.7<br>Comparison group: 13.3±2.9 12.6±2.2 | CRI – subscale: emotional discharge (mean ± SD):<br>Intervention Baseline Post-Intervention<br>Treatment group: 7.6±3.0 6.5±2.9<br>Comparison group: 8.4±2.7 7.7±4.4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | No significant differences between groups or over time | No significant differences between groups or over time |
| Backhaus et al., 2016 | **19** | Peer-directed support group | **Treatment group:** 51.67 ± 10.27 | **Treatment group:** 0% | **Treatment group:** 44% | **Treatment group:** 56% | Not reported | Yes | BICSQ (mean ± SD):<br>Intervention: Treatment group: Baseline 69.3±10.9, Post-Intervention 80.2±8.8<br>Comparison group: Baseline 69.4±10.9, Post-Intervention 79.2±7.9<br>Significant improvement over time for both groups (F=8.644, P<0.001, partial $\eta^2$= 0.351).<br>No group x time interaction (F=0.341, P=0.796, partial $\eta^2$= 0.021). | Not assessed |
| | | | **Comparison group:** 49.90 ± 12.32 | **Comparison group:** 40% | **Comparison group:** 30% | **Comparison group:** 50% | | | | |
| Backhaus et al., 2010 | **20** | Wait-list control | **Treatment group:** 43.00 ± 13.14 | **Treatment group:** 30% | **Treatment group:** 80% | **Treatment group:** 50% | Not reported | Yes | ANCOVA of post-treatment scores with pre-treatment scores of perceived self-efficacy measure as covariate: significant difference between groups (F=14.16; p = 0.01) with large effect size (partial $\eta^2$= 0.277).<br>(exact PSE scores not reported; means and SDs are shown in a graph) | Not assessed |
| | | | **Comparison group:** 39.00 ± 17.19 | **Comparison group:** 60% | **Comparison group:** 90% | **Comparison group:** 60% | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Anson & Ponsford, 2006b,c | **31** | Participants as their own controls | 38.3 ± 12.41 | 16% | 45% | none | moderate to severe | No | Significant time by group interaction effect for adaptive coping ($F_{3,87}$=4.53, p < 0.01):<br><br>Significantly higher scores post-intervention,<br>Significant decrease to follow-up one,<br>Significant increase to follow-up two; effects not stable over time<br><br>(exact CSA – subscale: dealing with the problem/ adaptive coping - scores not reported; means are shown in a graph) | No main effect of time for non-productive coping<br><br>(exact CSA – subscale: non-productive coping scores not reported) |
| Bradbury et al., 2008 | **20** | Education-matched control | **Treatment group:** 39.80 ± 10.44<br><br>**Comparison group:** 42.50 ± 13.01 | **Treatment group:** 50%<br><br>**Comparison group:** 50% | **Treatment group:** 7.00 ± 6.15<br><br>**Comparison group:** 11.40 ± 9.42 | **Treatment group:** 30%<br><br>**Comparison group:** 70% | Not reported | No | Significant improvements (pre-treatment to post-treatment) in implementation of problem-focused adaptive coping in both groups<br><br>Repeated-measures ANOVA:<br>Main effect of time in WCQ-r – subscale: planful problem-focused ($F_{1,18}$=7.81, p < 0.05)<br><br>(exact scores not reported) | Repeated-measures ANOVA: no significant change in WCQ-r – subscale: escape-avoidance<br><br>(exact scores not reported) |

y = years; SD = standard deviation; MI = motivational interviewing; TAU = treatment as usual; CSA = Coping Scale for Adults; CRI = Coping Responses Inventory; BICSQ = Brain Injury Coping Skills Questionnaire, revised version; PSE = Brain Injury Coping Skills Questionnaire; WCQ-r = Ways of Coping Scale/Questionnaire, revised

**Other interventions**

A randomized controlled trial assessed the effect of a peer-mentoring program (Hanks et al., 2012) (see tables 2 and 5). After 20 hours of formal training, the mentors provided social and emotional support, help to gain access to community resources, and discussed topics related to TBI or caregiving. This study showed significantly lower scores of emotion- and avoidance-oriented coping in the mentored group of patients with TBI compared to the control group. There was however no statistically significant difference in the use of adaptive coping strategies and this study did not evaluate changes in scores over time.

Wolters and colleagues (Wolters et al., 2010) evaluated a cognitive rehabilitation program facilitated by a multi-disciplinary team (neuropsychologists; cognitive, occupational and speech therapists). The individualized program used group sessions to provide emotional support and facilitate emotional adjustment, together with one-to-one sessions to teach self-management techniques, which included specific compensation strategies and problem-solving skills. This program showed no treatment effect on coping styles; rather a significant increase in use of passive coping and decreased use of active coping strategies after the intervention.

Table 5: Design and outcomes of non-CBT interventions

| Author Year | Cohort size | Comparison group | Participants | | | | | Inclusion of care-givers | Effect on adaptive coping | Effect on maladaptive coping |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Age (y; mean ± SD) | Sex (% female) | Time since injury (Mean (y) ± SD) | % non-TBI participants | Injury severity | | | |
| Hanks et al., 2012 | **96** | 4 arms: mentored vs non-mentored (patients/caregivers) | **Mentoring group:** 38.43 ± 17.60<br><br>**Comparison group:** 40.90 ± 17.33 | **Mentoring group:** 11%<br><br>**Comparison group:** 10% | Not stated | none | Mild to severe | Yes | CISS – subscale: task-oriented (mean ± SD):<br><br>Mentoring group: 53.1±10.7<br>Comparison group: 56.5±10.1<br>No significant difference ($t_{85}$=1.58; p=0.12; d=0.32) | CISS – subscale: emotion oriented (mean ± SD):<br><br>Mentoring group: 40.0±10.0<br>Comparison group: 44.4±11.0<br>Significantly lower scores in mentoring group ($t_{85}$=2.04, p = 0.04; d=0.42)<br><br>CISS – subscale: avoidance oriented (mean ± SD):<br><br>Mentoring group: 38.3±11.0<br>Comparison group: 43.2±10.7<br>Significantly lower scores in mentoring group ($t_{85}$=2.19, p = 0.03; d=0.45) |
| Wolters et al., 2010 | **110** | Changes over time | 42.3 ± 14.0 | 44% | 2.8 ± 4.6 | 73% | Not reported | Yes | UCL – subscale: active problem-solving (mean ± SD):<br><br>Baseline: 17.9±3.8<br>Follow-up: 16.8±4.1<br>Significant decrease ($t_{109}$ = 2.87, p < .01) | UCL – subscale: passive reactions (mean ±SD):<br><br>Baseline: 12.4±3.2;<br>Follow-up: 13.1±4.0<br>Significant increase ($t_{109}$ = – 2.20, p < .05) |

y = years; SD = standard deviation; CISS = Coping Inventory for Stressful Situations; UCL = Utrecht Coping List

## Discussion

The purpose of this systematic review was to examine the efficacy of psychological interventions on the use of coping strategies in people who have experienced TBI. All eight included studies were at moderately high risk of bias.

A peer-mentoring program (Hanks et al., 2012) and motivational interviewing plus CBT (Hsieh et al., 2012) led to a significant decrease in the use of maladaptive, emotion-focused coping strategies in people who have experienced TBI. Conceding that all studies were underpowered and with unclear risk of random error and limited generalizability to the general population, this provides 'possible' evidence that maladaptive coping can be reduced using such an individualized intervention.

Two group therapies (Anson and Ponsford, 2006b; c; Backhaus et al., 2010) showed improved adaptive coping immediately after the intervention. However, this effect was either not sustained over time (Anson and Ponsford, 2006b; c) or no longer significant when compared to an active control, i.e. a peer-directed support group (Backhaus et al., 2016).

To appraise why most psychological interventions, and in particular group therapies, fail to improve coping strategies, especially adaptive coping, we must consider modifiable and static factors influencing coping post TBI. Cognitive behavioural approaches are flexible as they apply a variety of functional components. While this allows the therapist to adjust the intervention according to psychological and cognitive functioning, injury-related difficulties with executive control of behaviour or thinking may impede their efficacy in brain injured populations (Mateer and Sira, 2006; Wolters et al., 2010). Indeed, better executive performance has been linked to greater use of constructive problem-solving strategies, while executive dysfunction is associated with reliance on avoidant coping strategies (Krpan et al., 2007; Krpan et al., 2011a). Krpan and colleagues (Krpan et al., 2007) hypothesized that people who have experienced TBI must recruit executive processes actively in order

to engage in problem-solving behaviors, while healthy individuals are able to use coping strategies more automatically. This might explain the lack of sustained benefits on adaptive coping in the majority of CBT-based interventions, as "individuals may have reverted to stereotypical patterns of behavior and coping" (page 175) (Anson and Ponsford, 2006b).

Another more dynamic factor mediating coping style and response to coping interventions is self-awareness and its relation to the timing of interventions. People who have experienced TBI tend to become more realistic over time, realizing that they may not regain their pre-injury level of functioning (Kendall E, 1996). This is mirrored in an increased use of maladaptive coping strategies as time passes (Spitz et al., 2012; Wolters et al., 2010). This process might be hastened by attending a group intervention providing peer feedback, or even through individual therapy. Poor self-awareness has on the other hand been linked both to poor rehabilitation and psychosocial outcomes and to greater reliance on avoidant coping strategies. This has been attributed to a lack of understanding of the need for continuing treatment (Bajo and Fleminger, 2002; Flashman and McAllister, 2002).

There seems to be a fine line between increasing self-awareness to a level that encourages engagement in therapy, but not to the extent of causing resignation and thereby maladaptive coping. Future interventions might therefore need to manage the increased self-awareness arising from attending therapy (e.g. specifically targeting perceptions of disability). Psychological therapies might be most effective if provided later in the post-injury period, when a certain degree of self-awareness has developed (Anson and Ponsford, 2006a). In the studies included here, the time since injury varied from a few months to many years. Interventions conducted relatively soon after the injury, as in the study by Wolters and colleagues (Wolters et al., 2010), were not successful.

Although not a direct focus of this review, some of the included studies suggest that the involvement of caregivers might stabilize gains. The peer-mentoring program (Hanks et al., 2012) (which was

associated with better non-adaptive coping in mentored TBI patients) and the Brain Injury Coping Skills Group (Backhaus et al., 2016; Backhaus et al., 2010) (which increased perceived self-efficacy), provided caregivers with long-term support and skills. This effect might partly be mediated by the caregivers' capacity to structure and modify the patients' environment, thereby making them feel healthier and able to cope with demanding situations in an adaptive, problem-focused manner (Wolters et al., 2010).

Several static factors that might influence coping in people who have experienced TBI have been investigated in the literature. Herrmann and colleagues (2000) found that coping style does not seem to be associated with gender, type of brain pathology (no difference between TBI, brain tumors, cerebrovascular accidents or Parkinsonism), the severity of neurological symptoms or the impairment of activities of daily living. Neither lesion location (Finset and Andersson, 2000) nor age at injury (Anson and Ponsford, 2006a) seem to affect coping. In fact, patients with TBI did not differ from patients with orthopedic injuries in self-reported coping strategies (Curran et al., 2000). Spitz and colleagues (Spitz et al., 2012) consequently speculated that individuals involved in any form of trauma (typically young males) might share premorbid personality traits, greater reliance on non-adaptive coping being one. This is supported by the finding that pre-injury personality disturbances are associated with poor treatment outcomes after TBI (Prigatano et al., 1984). Besides pre-injury personality, other factors shown to influence coping style include age, illness duration, social factors, and premorbid intellectual functioning (Anson and Ponsford, 2006a; Herrmann et al., 2000; Kendall E, 1996; Spitz et al., 2012; Wolters et al., 2010) suggesting substantial heterogeneity amongst those who have experienced TBI. Consequently, individual therapies tailored to the specific abilities and needs of a person who experienced TBI or group interventions for more clearly defined populations might be more effective in influencing coping.

**Strengths and limitations**

This systematic review is to our knowledge the first to provide a comprehensive overview of

interventions for the enhancement of coping in patients with traumatic brain injury. We minimized the risk of missing relevant articles by using a very broad search strategy and scanning secondary reference lists. Nevertheless, there may have been publication bias, particularly regarding studies with negative findings. Rigorous assessment ensured that only studies of at least moderate reporting and methodological quality were included.

The limited number of studies and the diversity of coping interventions and measures ruled out the possibility of a meta-analysis, and our results must be interpreted with caution.

Most studies had very low numbers of participants, were underpowered, and study samples were heterogeneous in relation to type of injury, injury severity and timing of the trauma. Half of the included eight studies examined mixed groups of traumatic and non-traumatic brain injury survivors. However, coping style has been shown not to differ between these two groups (Herrmann et al., 2000). Nevertheless, this makes it difficult to make inferences to general TBI populations or to specific subgroups.

Further coping itself remains a vague and complex construct and the psychometric properties of instruments measuring coping have not been adequately investigated in TBI populations. As the questionnaires use self-report blinding of outcome assessment is impossible and the consequences of the brain injury (limited self-awareness, cognitive problems or communication difficulties) may impair the validity of questionnaire results (Gregorio et al., 2014). This could be remedied by using observed stress tests (e.g. the Baycrest Psychosocial Stress Test developed by Krpan et al. (Krpan et al., 2011b)), but these are very resource intensive.

**Clinical implications and future research directions**

From the studies reviewed, there is insufficient high-quality evidence to support practice recommendations relating to psychological interventions for enhancing coping strategies in the aftermath of TBI. There is possible evidence that individualized intervention might be effective in reducing maladaptive coping. Many factors influencing coping styles, as TBI-sequelae (e.g. executive dysfunction), premorbid personality and intellectual functioning, are not amenable to change. This suggests that specific subgroups of people who have experienced TBI, for instance those who have retained the ability to learn new problem-solving skills or those who are at risk of developing maladaptive coping mechanisms (as e.g. alcohol misuse), might be more likely to benefit from tailored coping interventions than unselected samples of TBI survivors.

For future research, a more unified concept of coping in TBI needs to be articulated. This will allow the development and validation of measurement scales most suited to brain-injured populations and the conduction of more robust, larger scale studies.

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**Declaration of interest**

The authors declare no conflicts of interest.

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