Review

Non pharmacological treatments for psychological and behavioural disorders following traumatic brain injury (TBI). A systematic literature review and expert opinion leading to recommendations

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A B S T R A C T

Introduction: The non pharmacological approach is an important issue in the treatment of psychological and behavioural disorders in traumatic brain injury (TBI) patients. It remains nevertheless insufficiently known and defined. The objective of this work was to develop precise recommendations for caregivers and relatives.

Method: The elaboration of these guidelines followed the procedure validated by the French health authority for good practice recommendations, close to the Prisma statement, involving a systematic, critical review of the literature and the expert opinions of the French Society of Physical Medicine and Rehabilitation (SOFMER) group.

Results: 458 articles were identified, among which 98 were selected for their relevance to the theme of the research. None of the studies reached the highest level of evidence. Fifteen controlled studies reached a relatively high level of evidence (level 2); other studies were case series or expert opinions, and other articles again were reviews of the literature and theoretical points of view. The holistic approach structured into programmes, cognitive-behavioural therapy, and family and systemic therapy, despite the low levels of proof, are recommended in first intention at all stages in the evolution of TBI. Relational and adaptive approaches, rehabilitation and vocational approaches, and psychoanalytical therapies may be useful, provided that therapists are familiar with and trained in traumatic brain injury.

Conclusion: Despite the small number of publications and a low level of proof, a number of recommendations for the non-pharmacological approach to psychological and behavioural disorders in TBI is proposed by the consensus conference of experts. Scientific research in this domain is needed to confirm and complete these first recommendations.

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1. Introduction

The non-pharmacological approach to psycho-behavioural disturbances among brain-damaged individuals is a major issue for patients, families, and healthcare and social worker teams, who often experience difficulty coping with disturbances defined as “excesses”: irritability, impulsiveness, de-inhibition, anger, or disturbances that reflect “deficits”: lack of initiative, lack of energy, apathy, depression. The aim of this therapeutic approach is to improve psychological and behavioural disturbances, reduce pharmacological treatments that are damaging to brain function, avoid the exhaustion of families or care teams, restrict excessive hospitalisations in psychiatric care, not well suited to brain-damaged individuals, and combat social and professional exclusion. This type of approach requires considerable means, which are not always available once the person has left the rehabilitation unit [1], and it is often not well known, and is little documented [2] despite a certain number of articles centred on interpersonal approaches (Table 1), holistic approaches (Table 2), cognitive-behavioural approaches (Table 3), systemic approaches (Table 4) or psychodynamic approaches (Table 5).

Recently, there has been renewed interest for the instatement of new psychotherapies (Table 6) suited to behavioural disorders...
To date there has been only one review of the literature on the subject [4], and no official recommendations.

This article sums up the work conducted under the auspices of the Haute Autorité de la Santé (HAS the French health authority) and the Société Française de Médecine Physique et de Réadaptation (SOFMER) to produce good practice recommendations in the area of “behavioural disturbances in brain-damaged individuals”, also broaching the theme of “care provision techniques and non-pharmacological interventions”. After summing up the methods implemented, we will present the results of literature analysis, the recommendation concerning each of the approaches, and a general synthesis.

2. Methods

A bibliographic search was performed on Medline from 1999 to 2012 using the following keywords: “Brain Injuries” or “Cranio-encephal Trauma” or Brain injur” or Brain trauma or Head injur” or Head trauma" AND “Complementary Therapies” or “Behavior Therapy” or “Cognitive Therapy” or “Feedback” or “Holistic Nursing” or “Psychoanalysis” or “Psychotherapy” or “Family Therapy” or “psychological treatment” or “psychological therap” or “behaviour management” or “group psychotherapy” or “family intervention” or “music therapy”’. Title NOT “Critical Care” or “Child” or “Infant” or “Pediatrics” or “Adolescent” or “Critical care” or “child” or “infan” or “paediat” or “pediatr or adolescent”. Complementary searches were performed on the articles perused and on documents from earlier periods or not referenced. After the abstracts had been read the research that did not correspond to the exact theme of the review were removed. The final update was performed in July 2015 prior to publication of the work. Once perused, all the articles retained were classified according to level of proof (ranging from level 1 - randomised comparative trials with good power - to level 4 - retrospective studies, case studies), and according to a recommendation grade (ranging from grade A - established scientific proof - to grade C - low level of proof). They were then divided into two categories according to the techniques described: global approaches (interpersonal and adaptive, holistic, rehabilitational and occupational) and specific therapies (cognitive behavioural therapies, systemic family therapies, psychoanalytical therapies, others).

Recommendations were drafted by a group of experts following the HAS protocol: (http://www.has-sante.fr/portail/jcms/c_431294/recommandations-pour-la-pratique-clinique-rpc). This protocol uses several of the PRISMA criteria (criteria 1, 2, 3, 5, 6, 7, 13, 15).

3. Results: the international recommendations

Of the 458 articles identified, 98 were retained for their relevance to the research theme. Among these 93 articles were classified according to level, 15 were classified as level 2, 2 as level 3, and 56 as level 4; the remaining articles were 11 reviews of the literature and 9 theoretical articles. Grade recommendation B was allocated to 17 articles, and C to 44. No research was classified level 1 or grade A. It was not possible to reach any scientific grade A recommendation on account of the low levels of proof across the research overall. However 37 recommendations were drafted on the basis of expert opinion (EO), among which 33 (89%) obtained a consensus of over 90% of the experts involved.

The general recommendations are as follows:

- Non-pharmacological treatment for behavioural disturbances among brain-damaged patients and for distress in their families is recommended in first intention, whatever the stage in the condition. This treatment should be implemented by therapists who are acquainted with neuropsychological disorders related to traumatic brain injury (TBI), in collaboration with professional teams and the patient’s close circle (EO).
- The non-pharmacological treatment of behavioural disturbances includes different approaches: holistic (planned care itineraries, occupational activities, social activity, professional activity), cognitive-behavioural, systemic familial, and in some cases psychoanalytical. It also involves the adjustment of behaviours in the patient’s close circle and in the care and follow-up teams (EO).
- Different approaches can be combined depending on the predominance of certain symptoms or comorbidities, and if necessary backed up by specific treatments (post-traumatic distress syndrome, addictions etc.) (EO).

3.1. Global approaches

3.1.1. The interpersonal and adaptive approach

Even if this is not a structured approach corresponding to a targeted therapy, the expert group considered it important to start this article with the interpersonal (relational) and adaptive approach, one of the foundations of any care provision for psycho-behavioural disturbances among brain-damaged individuals. The relational approach consists, as far as possible, in adjusting the behaviours of the patient’s close circle and adapting the environment so as to avoid behavioural disturbances triggered by outside factors such as noise, hustle, annoyance, excessive demands etc. There is frequently a degree of misunderstanding of the needs of a brain-damaged individual in his or her immediate circle, social circle and above all professional circle, which is why C. Croisiaux [5] and the team in the La Braise centre in Anderlecht, Belgium, recognised for their European expertise in the medical and social care for behavioural disturbances, have drafted a document providing advice and recommendations, systematically incorporating the notion of the “non-visible” disability, i.e. cognitive and psycho-behavioural disturbances, into the relationship with the patient. The working group drew on this work to a considerable extent to propose 8 recommendations based on expert agreement (EO). Further to this, 3 recent research articles (Table 1), 2 classified

Table 1

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanks et al., 2012 [31]</td>
<td>Randomised study with control group, 92 subjects and 62 spouses</td>
<td>2</td>
<td>80% improvement in behavioural disturbances and social integration when family had accompaniment and therapeutic education.</td>
</tr>
<tr>
<td>Sim et al., 2013 [32]</td>
<td>Case study with control group, 29 patients with spouses</td>
<td>4</td>
<td>Training in conversation with spouses/partners of TBI patients improved productivity of discourse and quality of exchanges.</td>
</tr>
<tr>
<td>Wade et al., 2014 [33]</td>
<td>Randomised study 132 relatives of TBI patients</td>
<td>2</td>
<td>Teaching programme on TBI on website more efficient for behavioural adaptation of families than leaving relatives to seek their own information on the internet.</td>
</tr>
</tbody>
</table>
level 2, and 1 level 4, back up the interpersonal and adaptive approach more specifically.

**Recommendations**

- Avoid stressful situations and interference; allow for the cognitive difficulties (avoiding having to do two things at once, avoiding distractions, or tasks that take too long, etc.); allow for fatigue, and the person’s psychological state; avoid major changes and unexpected events – the person needs as much stability as possible. It should be borne in mind that things that may have been learned may not be fully acquired; a change or an upset can compromise the work achieved, and require new adjustments (EO).
- Remain structured, clear and precise, talk slowly suiting language to any understanding problems (short sentences, simple words, but avoid infantilising the person so that he/she does not feel devalued). Accompany the person step by step in different tasks, even those that may appear straightforward (EO).
- Maintain respect for the person and his or her need for autonomy: avoid thinking or acting too hastily in his or her place, provide scope for him/her to take life in hand (EO).
- Note down in writing any important information, using whatever form is best suited to the cognitive or sensory deficits of the patient – paper or electronic diary, notice board, memo stickers (EO).
- Go along with the tools and strategies set up, and encourage their use on a daily basis. Circulate the information among the different people involved – the brain-damaged individual, the person of trust, the family, the professionals, the helpers etc. – taking care to comply with confidentiality requirements (EO).
- Avoid feeling targeted by any irritation or aggressiveness. Set a distance, and resort to professionals or assistance services, avoid responding to aggressiveness by more aggressiveness in return (EO).
- For the patient, practice in controlling aggression consists in trying to detect the sensation of increasing tension and knowing how to cut off from other people in these situations. For the family, the training consists in trying to identify the run-up to bouts of aggressiveness, and to analyse and prevent triggering and aggravating factors; there also needs to be a reference person who can soothe the bouts of anger, adapt his or her behaviour and style of communication, and use verbal signals to tell the patient he or she is behaving aggressively. This person can also recall pleasant moments (EO).
- For the families, encourage encounters with other families of people who have sustained TBI, or with relevant associations, so as to share experiences (EO).

**Remark:** The holistic approach is thought to improve emotional disturbances, integration and social interactions.

**Recommendations**

- The holistic approach, although restricted by the material available means for its implementation, is in particular recommended for patients with social integration difficulties (EO).
- Efforts should be made at national level to assess feasibility and develop national holistic programmes (EO).
- Rehabilitation [12] and occupational therapies have an important place in the improvement of behavioural disturbances among brain-damaged individuals on account of their structuring, socialising and valorising role on individual level. There is no detailed study on this aspect determining the relative usefulness of one or other type of occupation (sporting, artistic, cultural, volunteer work etc.) nor on determining any particular approach to professional activity (return to previous employment, sheltered workshop, change of jobs etc.), but feedback from the holistic approach strongly suggest that activities of this type are beneficial. The activities should be coordinated by medical-social structures, if possible specialised in TBI. These activities also provide important back-up for psychotherapies, because they confront the patients with social and/or professional realities that explore identity, grieving for loss and other difficulties linked to their disability [9][EO].

3.1.2. Holistic approaches, rehabilitation and occupational therapy

The holistic approach, derived from holism in the 1920s, sees human functioning in complex, global manner within the framework of a recently described model in the medical and bio-psycho-social fields. Holistic psychotherapy is not derived from a technique already in existence, it was specially developed for TBI patients. The principle underpinning this method targets the need to gain awareness of the disability and to accept it, with a view to better social and professional rehabilitation. It sets out to obtain this in global, coordinated and progressive manner, in individual psychotherapy sessions, group psychotherapies, and cognitive rehabilitation. The patient advances stage by stage according to the following classic pattern: implication, awareness, malleability, control of compensation phenomena, acceptance, identity, social rehabilitation.

In the USA, these programmes are intensive, reaching as many as 20 hours a week over 4 to 6 months. Among proponents of this type of care for brain-damaged individuals, the most long-standing instance is Goldstein among TBI patients in the First World War, followed by Ben Yshai [6] and Prigatano [7] in the 1980s, and then in the 1990s by Teasdale and Christensen [8] in Europe and North [9] in France. Even if these care techniques may not be implemented in their entirety for reasons of cost, they are often integrated today into follow-up care programmes and specialised rehabilitation procedures for TBI patients [9–11]. More recent work has confirmed the positive impact of cognitive rehabilitation activities [12] and of the level of social integration [13] on psycho-behavioural disturbances. Eighteen articles were retrieved (Table 2) among which 4 reached level 2, and 9 reached level 4, along with 2 literature reviews with favourable conclusions.

**Remark:** Occupational and rehabilitation activities could contribute to improving psychological and behavioural disturbances among TBI patients.
Table 2: Articles on the holistic approach.

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prigatano et al., 1984 [34]</td>
<td>Randomised study with control group, 35 patients</td>
<td>2</td>
<td>Significant improvement in emotional disturbances and rates of return to work (75% vs 36%) compared to control group.</td>
</tr>
<tr>
<td>Teasdale and Christensen 1993 [35]</td>
<td>Prospective study without control group, 22 patients</td>
<td>4</td>
<td>Improvement in emotional, social and professional situation</td>
</tr>
<tr>
<td>Delmonico [36] 1998</td>
<td>Descriptive article</td>
<td>None</td>
<td>Group psychotherapy programme amongst TBI patients centred on behavioural disturbances, management of frustration and addictions, combining educational, cognitive and occupational approaches, within coordinated team.</td>
</tr>
<tr>
<td>Burg JS [37] 2000</td>
<td>Case-control study comparing 42 TBI cases in psychiatric sector with 25 non-TBI controls</td>
<td>4</td>
<td>TBI patients exhibited lesser improvement on Brief Symptom Inventory than non-TBI patients.</td>
</tr>
<tr>
<td>Soderback I [38] 2004</td>
<td>Prospective study with no control group, 46 patients</td>
<td>4</td>
<td>Institutional therapy programme centred on gardening, improving sensory-motor abilities, cognitive function, social integration and feelings of well-being.</td>
</tr>
<tr>
<td>Marin RS [39] 2005</td>
<td>Descriptive article</td>
<td>None</td>
<td>Presentation of bio-psycho-social approach to assess and improve motivation disturbances amongst TBI patients.</td>
</tr>
<tr>
<td>Judd D et Wilson SL [40] 2005</td>
<td>Retrospective study, 21 psychologists</td>
<td>None</td>
<td>Combined use of educational, psycho-social and cognitive treatments to instate a therapeutic alliance with TBI patients.</td>
</tr>
<tr>
<td>Schonberg M [41,42] 2006</td>
<td>Prospective study with no control group, 86 patients including 27 TBI and 49 AV</td>
<td>4</td>
<td>The level of the therapeutic alliance in a holistic 14-week programme was correlated with the reduction in depressive syndrome and the degree of implication in the programme.</td>
</tr>
<tr>
<td>Le Gall C, Mazaux JMM [11] 2007</td>
<td>Retrospective study, 75 patients</td>
<td>4</td>
<td>Programme for social and professional integration, holistic type (UEROS). At 5 years, patients exhibited significantly improved autonomy (+27%), professional activity (37%) and satisfaction with life.</td>
</tr>
<tr>
<td>Dahlberg CA [43] 2007</td>
<td>Randomised study with control group, 52 patients</td>
<td>2</td>
<td>12 group sessions 1h30/week, centred on social communication disorders, improvement in communication and satisfaction with life, results maintained at 6 months.</td>
</tr>
<tr>
<td>Martelli MF [44] 2008</td>
<td>Review of the literature</td>
<td>None</td>
<td>Holistic programme integrating classic psychotherapeutic approach entailing learning and adapting social skills.</td>
</tr>
<tr>
<td>Mc Donald S [45] 2008</td>
<td>Randomised multi-centre study with control group, 39 patients</td>
<td>2</td>
<td>Holistic programme centred on improvement of behavioural disturbances, comparing 3 groups of 13 patients over 12 weeks: holistic group, social activity group, waiting list group. Improvement in holistic group for social interaction, no improvement in social cognition nor in self-evaluation of behavioural disturbances. No improvement in the other two groups.</td>
</tr>
<tr>
<td>Cicerone KD [46] en 2008</td>
<td>Randomised study with control group, 68 patients</td>
<td>2</td>
<td>Comparison of two groups of 34 patients – holistic neuropsychological and rehabilitation group, with group and individual treatment 15h/week for 16 weeks, and neurological rehabilitation group. Improvement in cognitive performances in both groups. Significant improvement in holistic group for social integration and quality of life. Benefit maintained at 6 months.</td>
</tr>
<tr>
<td>Hofer H [47] 2010</td>
<td>Prospective study without control group, 11 patients</td>
<td>4</td>
<td>Psychotherapeutic and neuropsychological rehabilitation programme centred on adjustment strategies, with improvement in depression and adaptation of behaviours.</td>
</tr>
<tr>
<td>Nilson [9] 2011</td>
<td>Prospective study without control group, 10 patients</td>
<td>4</td>
<td>Holistic programme centred on self-assessment of disturbances, information, physical activity and behavioural adaptation</td>
</tr>
<tr>
<td>Driscoll DM [48] 2011</td>
<td>Review of the literature</td>
<td>None</td>
<td>Different psycho-social programmes, interest and limitations in the area of psychiatric pathology and brain injury.</td>
</tr>
<tr>
<td>Saout V [49] 2011</td>
<td>Clinical case</td>
<td>4</td>
<td>Description of an agitated, violent TBI patient in rehabilitation unit despite medication, benefit of psychiatric hospitalisations alternating with rehabilitation unit.</td>
</tr>
</tbody>
</table>
3.2. Specific approaches

3.2.1. Behavioural and cognitive-behavioural therapies (BT, CBT)

The cognitive-behavioural approach is one of the main trends in contemporary clinical psychology, initially developed in English-speaking countries in the 1940s. The basic hypothesis is that the interpretation of subjective experience is biased by the influence of maladaptive thinking that can generate observable disturbances and symptoms. The patterns involved are mainly implicit, but what they produce (mental images, so-called “automatic” thoughts) is accessible to consciousness. They can then be identified, and if appropriate altered. The aim of therapy is thus to help the subject alter beliefs, thoughts and behaviours on two different levels:

- On the cognitive level:, by way of a process of “cognitive restructuring” in which the idea is to identify malfunctioning thoughts, identify cognitive distortions, test the validity of these findings, and develop more rational alternatives with the help of a therapeutic alliance. The methodology is strict, entailing systematic evaluations and the establishment of progressive objectives in the form of a contract, which are self- and hetero-evaluated (feedback).
- On behavioural level, we can quote for instance the gradual exposure to problem-situations, the establishment of behavioural experiments, the development of an “interior dialogue”, the use of therapeutic notes and diaries, the use of role play, training in problem-solving, or the use of relaxation techniques.

CBT was used in the 1980s and 1990s among TBI patients under the particular influence of R. Wood [14] and J. Ponsford [7] and it is today recommended and used in first intention in English-speaking countries. In the face of a combination of disturbances that are behavioural, emotional and cognitive, CBT appears well suited. There is for example the highly structured nature of the therapy (the attitude of the practitioner is empathetic, but he or she remains very active); the setting of precise, concrete objectives, and the focus on the “here and now”. Paradoxically, this widely used approach is not well developed in certain European countries, partly on account of psychotherapeutic orientations that have differed over time. There are 26 articles in this area, 3 reaching level 2, two others level 3, and three level 4, the other nine articles being literature reviews (Table 3).

Remark: CBTs are thought, in certain conditions, to contribute to improvement in psychological and behavioural disturbances among TBI patients.

3.2.2. Family and systemic psychotherapies

Family psychotherapies developed in the USA from the 1950s under the influence of Gregory Bateson and the Palo Alto school, which by combining communication theory (cybernetics) with ethnology gave rise to a new discipline: systemics (i.e. the study of relationships between systems). This discipline, applied to families (considering a family as a system), led on to Systemic Family Therapy. This approach, influenced by different successive currents, aroused considerable enthusiasm from the 1960s, with the opening of Family Therapy Centres in the USA. It consists in family interviews during which the family is analysed over several generations, enabling the detection of communication problems (verbal and non-verbal); secrets, failure to recognise distress, jealousies, alliances, conflicts. The aim is then to attempt to improve the situation by exchanges among family members and with the therapist. It was introduced in the 1970s and 1980s in Europe and in France, where the methods have been taught since the 1980s and used more particularly in situations of family violence and sexual abuse, behavioural disturbances in children and adolescents or marital problems.

The first articles on care provision for the families of brain-damaged individuals date from the 1980s. This type of care, initially focusing on support and information, gradually extended under the influence of different psychotherapeutic trends, in particular the systemic approach. More recently, certain authors [15,16] developed an approach to TBI subjects and their families, specifically focusing on the family and institutional interactions linked to the neurological sequelae, known as the neuro-systemic approach. The aim of this therapy is to facilitate a co-reconstruction, involving the therapist(s), the patient, the family and the care provision team [17].

There are 17 articles in this area, two reaching level 2 and ten level 4 (Table 4).

Comment: Family and systemic therapies, despite the fact that the studies available present a poor level of proof, could have a beneficial effect for patients and families.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood R et Burgess</td>
<td>Retrospective study, 30 patients</td>
<td>4</td>
<td>Improvement in aggressiveness for patients receiving positive reinforcement techniques – verbal or material rewards, and “time out” procedures, reduction in need for time-out from 8 to 2 per 5 weeks at 6 months.</td>
</tr>
<tr>
<td>Zencius A [50] 1990</td>
<td>Case study</td>
<td>4</td>
<td>Description of 3 cases of sexual de-inhibition improved via combined bio-feedback and behavioural adjustment.</td>
</tr>
<tr>
<td>Pickett E [51] 1991</td>
<td>Case study</td>
<td>None</td>
<td>Interest of mental imagery in psychotherapy to help patients adapt better to their deficits and adopt new behaviours.</td>
</tr>
<tr>
<td>Uomoto JM [52] 1992</td>
<td>Case study</td>
<td>None</td>
<td>Presentation of positive reinforcement and time-out techniques in the case of an aggressive patient and his family.</td>
</tr>
<tr>
<td>Ponsford J [57] 1995 Manchester [53] 1997</td>
<td>Case studies</td>
<td>4</td>
<td>Description of time-out and positive reinforcement, consisting, in case of aggressive reaction, of looking away, leaving the room without comment, and resuming action as if nothing had happened, alongside reward strategies and positive biofeedback if reaction is suited.</td>
</tr>
<tr>
<td>Alderman N [54] 1999</td>
<td>Case study</td>
<td>None</td>
<td>Presentation of aggressiveness scale: OAS-MNR (Overt Aggression Scale Modified for Neuro Rehabilitation) to assess the origins of aggressiveness and provide the patient with feedback.</td>
</tr>
<tr>
<td>Yody B [50] 2000</td>
<td>Case study</td>
<td>None</td>
<td>Description of a case of de-inhibition and aggressiveness in institution requiring precise assessment of the disturbances and specific training for the team.</td>
</tr>
<tr>
<td>Demark [55] 2002</td>
<td>Review of the literature</td>
<td>None</td>
<td>Looks at difficulties for application of behavioural methods to aggressive behaviours among TBI patients, requiring adaptation.</td>
</tr>
<tr>
<td>Bedard M [56] 2003</td>
<td>Case-control study, 13 patients</td>
<td>3</td>
<td>Evaluation of MBCT (Mindfulness-Based Cognitive Therapy) centred on meditation, breathing, mental imagery and acceptance. Comparison of 10 mild to moderate TBI who followed a 12-week group therapy, with 3 controls, significant improvement in quality of life, depression and stress.</td>
</tr>
<tr>
<td>Anson K et Ponsford J [57] 2006</td>
<td>Case-control study, 30 patients</td>
<td>3</td>
<td>Comparison group of 30 patients following CBT programme, 12 sessions twice weekly/5 weeks, based on coping skills for emotional disturbances (Coping skills group) and a control group (waiting list). Improvement in understanding of emotional disturbances and strategies, no improvement in depression, anxiety, self-esteem or psycho-social functioning.</td>
</tr>
<tr>
<td>Carnevale GJ [58] 2006</td>
<td>Randomised prospective study, 3 patients</td>
<td>2</td>
<td>Comparison of 3 groups of TBI patients, one following a NBSP programme (Natural Setting Behaviour Management), one following an educational programme, and the third being a control group. The treated group was significantly improved at 3 months after the end of the programme, reduction in behavioural disturbances, but no reduction in stress or carer burden.</td>
</tr>
<tr>
<td>Mateer CA [34] 2006</td>
<td>Case study</td>
<td>4</td>
<td>The authors underline the need to combine cognitive drilling with CBT to improve cognitive and emotional disturbances restricting return to work.</td>
</tr>
<tr>
<td>Manchester D [59] 2007</td>
<td>Case study</td>
<td>4</td>
<td>Presentation of CBT group programme (EQUIP), for 3 aggressive TBI patients, 4 30-minute group sessions/week for 6 weeks, centred on acquiring appropriate social conduct, mood improvement and correction of aggressive behaviours. 2 patients had improved at the end of the programme, and 3 months later the 3 patients were less aggressive.</td>
</tr>
<tr>
<td>Soo C et Tate R [2] 2007</td>
<td>Review of the literature</td>
<td>4</td>
<td>Three studies on small samples, of which two on mild to moderate TBI, observed an improvement in anxiety in CBT treated groups compared to control groups. Numbers of patients and heterogeneity prevented meta-analysis. The authors recommended further research.</td>
</tr>
<tr>
<td>Arco L [60] 2008</td>
<td>Case study</td>
<td>4</td>
<td>For a serious TBI patient, describes improvement in compulsive disorders by CBT at home, results maintained at 6 months.</td>
</tr>
<tr>
<td>Bradbury CL [61] 2008</td>
<td>Prospective randomised study, 20 patients</td>
<td>2</td>
<td>Compared 20 serious TBI patients at home presenting anxiety or depressive disorders, one group following 10 sessions of CBT, the other an educational programme. The CBT group improved for anxious-depressive symptoms, but not for social skills nor adaptation to disability. No improvement with the educational programme.</td>
</tr>
<tr>
<td>Fann JR [62] 2009</td>
<td>Review of the literature</td>
<td>None</td>
<td>Of 27 studies on the treatment of post-TBI depression, no specific study of psychotherapeutic care. The authors conclude to the sparseness of the literature, and recommend CBT in first intention, and further research.</td>
</tr>
<tr>
<td>Walker AJ [63] 2010</td>
<td>Retrospective study, 52 patients</td>
<td>4</td>
<td>Analysis of serious TBI patients presenting bouts of anger treated with group CBT once weekly for 12 weeks. In all 9 groups were followed from 1998 to 2006. Improvement in feelings and expression of anger after the sessions, and maintenance of effects in the long term for 31.</td>
</tr>
<tr>
<td>Topolovec-Vranic J [64] 2010</td>
<td>Case series, 21 patients</td>
<td>4</td>
<td>CBT website (MoodGym), 1 session/week for 6 weeks, evaluated for 21 mild to moderate TBI depressive patients at home. Programme completed by 64%, 43% re-contacted by phone at 1 year. Attenuation of depression. Level of participation restricted by severity of memory and attention deficits.</td>
</tr>
<tr>
<td>Lundquist A [65] 2010</td>
<td>Case series, 21 patients</td>
<td>4</td>
<td>Among 21 TBI patients who followed group CBT an improvement was noted in awareness of the disturbances, behavioural strategies, life satisfaction, professional situation and self-confidence.</td>
</tr>
<tr>
<td>Doering B [66] 2011</td>
<td>Review of the literature</td>
<td>None</td>
<td>Review of the efficacy of CBT combined with cognitive drilling for behavioural disturbances among TBI patients, underlining, despite the probable interest of the technique, the methodological weaknesses of the studies and the need for further research.</td>
</tr>
<tr>
<td>Kangas M [67] 2011</td>
<td>Review of the literature</td>
<td>None</td>
<td>Suggests the interest among different CBTS of acceptance and commitment therapies and the scientific evaluation of their efficacy for mild to moderate TBI patients. Reviews the interest of feedback to improve awareness of the disability among brain-damaged patients. Of 12 studies, only 3 presented satisfactory methodologies, amounting to 62 patients in all. The result are only moderately conclusive for awareness of functional improvement.</td>
</tr>
</tbody>
</table>
3.2.3. Psychoanalytical psychotherapies

Psychoanalytical psychotherapies are an adaptation of the typical cure defined by Freud in the 1920s, which appeared too limiting in a certain number of situations. From the 1930s, Ferenczi, and then Winnicott and Balint in the 1960s and 1970s, suggested adaptations of the typical cure, making it more accessible: face-to-face interviews, semi-structured interviews, flexibility in frequency and duration, scope for institutional practice etc., while at the same time preserving the Freudian underpinnings. The Freudian approach assumes the presence of an unconscious psychic life, the seat of non-resolved childhood conflicts that can show up in different symptoms. The psychotherapy consists in establishing a therapeutic relationship with the patient, known as an inter-subjective relationship or a psychotherapeutic encounter, within which phenomena of transference and counter-transference occur between patient and therapist, enabling the unconscious to be reached by words, and the resolution of intra-psychic conflicts. Since the 1980s, psychoanalytical psychotherapies have been used among brain-damaged patients, subject to major adjustments on account of the context-related factors and the neurological sequelae [4,17–20]. This type of therapy makes it possible to go deeper into particularly complex problems of identity, lack of awareness of disabilities (anognosia), grieving for loss and psychic reconstruction following the trauma.

There are ten articles in this area (Table 5) all level 4, and no controlled study has been published.

**Comment:** the level of scientific proof is inadequate to recommend this technique. However, given the wealth of theoretical support, the interest of working on identity, and the demand from certain patients for more far-reaching therapy, the experts considered that it could be offered in certain circumstances.

### Recommendation

- Despite certain limitations linked to the lack of scientific evaluation, psychoanalytical psychotherapy can be offered to patients by therapists who are familiar with the sequelae of TBI, in particular the cognitive disturbances, complementing and articulating with global care provision (EO).

3.2.4. Other therapies

This heading groups care techniques derived from different trends, applied recently to brain-damaged patients, which could be of use in case of certain thymic symptoms such as anxiety disorders, depression, or post-traumatic distress syndrome for instance. Breathing is used in relaxation and yoga [21,22], body movements in Tai Chi [23–25], hearing in music therapy [26,27], bodily sensations in hypnosis, thought in mindfulness [28], and ideation in positive psychology [23,29].

There are 12 articles in these areas, two level 3 concerning music therapy and Tai Chi, and 4 level 4 (Table 6).

**Comment:** These approaches appear interesting in practice, but still require evaluation before full recommendation. No article considers hypnosis, although the approach is said to be effective for anxiety disorders, and none explores Eye Movement Desensitization and Reprocessing therapy (EMDR), which is nevertheless widely used in case of post-traumatic stress. Further research is required before any recommendations can be made.

### 4. Discussion

Although levels of proof are inadequate, this is to our knowledge the first research, based on a review of the literature and consensus conference, to provide an up-to-date overview and a complete set of recommendations concerning the non-pharmacological treatment of psychological and behavioural disturbances among TBI patients. The recommendations are necessarily open to criticism, and leave room for improvement, since among the studies reviewed none reached level 1. In addition, this research came up against the problem of the small number of articles published, and the fact that they were, overall, low-powered. This could be a result of the methodological complexity and the low incidence of serious TBIs in the general population, the small number of facilities dealing with this type of pathology, and the insufficient means available in this area. Nevertheless, there has been an increase over the last five years in the numbers of articles on the subject, along with an improvement in their methodological quality.

The recommendations are first of all based on the international literature, but they also called upon the field experience acquired over more than 20 years by the experts in the working group, who all belong to the first or second generation of care providers genuinely trained in the care for TBI, and dealing daily with the psychological and behavioural disturbances of these patients. This diversity reflects a variety of experiences and the poor level of proof in the methods implemented. The confrontation of experiences from different countries could in the future contribute to developing the recommendations.

Concerning the recommendations, the working group chose to distinguish two types of approach, which are both different and complementary. On the one hand there is the global approach: adaptive, rehabilitational, occupational and in some instances part of a holistic programme; on the other, specific care, including
behavioural, systemic and family therapies, psychoanalytical therapy, or other types again in some instances. Although the global approach is still inadequately mapped out and documented, the group of experts recommends medico-social-coordination, which means funding specific teams to organise the living environment and suitable accompaniments. The group of experts consider that the professionals involved should be well acquainted with brain trauma, with the cognitive and psycho-behavioural disorders related to the brain lesion, and with the best ways to communicate with patients. This implies the need for care professionals to be trained, and for adequate information to those close to the patient – families, friends, professional colleagues etc.. In this respect, it could be useful to develop systematic educative intervention for the patient and his/her family, as already proposed in certain programmes [30].

Concerning recommendations on specific care techniques, the poor methodological quality of the existing studies does not enable any formal conclusions to be drawn, but this literature review has nevertheless identified diverse, potentially valuable resources that need to be explored in greater depth. CBT therapies are the most frequently studied, and also those for which study methodologies were the best designed, but the working group underlines the considerable limitations linked to levels of severity of the cognitive disturbances and [...]. Systemic and family therapies are less well documented than CBTs, and there is a certain lack of homogeneity. Nevertheless, the existing literature and field experiences suggest the usefulness of professionalising interpersonal relationships and communication between families, caregivers and patients, which could lead on to developing genuine therapies. For psychoanalytical therapies, there is the problem of the absence of any study assessed as levels 2 or 3, and the existing publications are based on case studies. The experts however considered that they might be of use for certain patients needing to develop introspection, provided that they are conducted by therapists with knowledge of traumatic

### Table 4

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Söderström S [71,72] 1988, 1992</td>
<td>Case study</td>
<td>4</td>
<td>Family psychotherapy intervention model for management of bouts of violence using the object-relations approach and transactional analysis, for a single case study of two cases of aggressive patients not much improved by CBT, where family members had training in the management of bouts of anger. Interest of combining individual and family approaches.</td>
</tr>
<tr>
<td>Uomoto JM [52] 1992</td>
<td>Case study</td>
<td>4</td>
<td>Prospectively studied 50 families of TBI patients receiving an educational intervention, with improvement at 1 year in carer burden, harmony and tension for family and spouse, but two years on, a return to the previous situation, suggesting the need for longer family accompaniment.</td>
</tr>
<tr>
<td>Perlesz [73] 1998</td>
<td>Series of cases, 50 families</td>
<td>4</td>
<td>Describes a family support programme involving accompaniment on 3 levels: information on TBI, family follow-up, marital counselling. This programme, running 7 years, seems interesting but requires controlled evaluation.</td>
</tr>
<tr>
<td>Tyerman [74] 2001</td>
<td>Case series</td>
<td>4</td>
<td>Describes a family support programme involving accompaniment on 3 levels: information on TBI, family follow-up, marital counselling. This programme, running 7 years, seems interesting but requires controlled evaluation.</td>
</tr>
<tr>
<td>Laroi F [75] 2003</td>
<td>Case study</td>
<td>4</td>
<td>Presents case studies on the usefulness of systemic family psychotherapy compared to a merely informative or educational approach. Need for collaboration among TBI professionals and family psychotherapists trained in the sequelae of TBI.</td>
</tr>
<tr>
<td>Destaillets [15,16] 2004, 2011</td>
<td>Theoretical article</td>
<td>None</td>
<td>The author details the family, neuro-systemic approach deployed in Bordeaux CHU since 1993, based on the notion of the relational crisis affecting family, patient and caregivers, and leading to breakdown in communication and conflict. Interviews aim to improve family communication, and knowledge and recognition of the distress of those concerned, in the setting of the overall family history.</td>
</tr>
<tr>
<td>Lefevre [76] 2007</td>
<td>Case study</td>
<td>4</td>
<td>Assesses the Multiple Family Group Treatment, implementing a psycho-educational approach: 27 patients and 28 spouses took part in these groups over 12 to 18 months, with improvement in anxiety and depression for patients, and in fatigue among spouses.</td>
</tr>
<tr>
<td>Rodgers ML [77] 2007</td>
<td>Case series</td>
<td>4</td>
<td>Among 67 spouses, compares 33 with 12 problem-solving interventions over 1 year and 34 with the same number of interventions of an informative nature. Improvement in depression and somatic complaints in the first group, but no improvement in carer burden or well-being.</td>
</tr>
<tr>
<td>Rivera [78] 2008</td>
<td>Case-control study, 67 families</td>
<td>2</td>
<td>The authors recommend extending this approach to the group follow-up, and including it in holistic care plans.</td>
</tr>
<tr>
<td>Klonoff PS [79] 2008</td>
<td>Case study</td>
<td>4</td>
<td>The authors recommend extending this approach to the group follow-up, and including it in holistic care plans.</td>
</tr>
<tr>
<td>Kreutzer JS [80,81] 2009, 2010</td>
<td>Case series, 76 families</td>
<td>4</td>
<td>Assesses the effect of a programme of 5 2-hour sessions over 10 weeks for families, using the BFI (Brain Injury Family Intervention), based on comprehension of the situation, stress management, and problem-solving. The results at 3 months for 76 family members and 76 patients showed good levels of participation in the programme, good satisfaction, but a lack of results on family and individual stress and on satisfaction with life among family members.</td>
</tr>
<tr>
<td>Koleck M et al [82] 2011</td>
<td>Randomised study, 17 families</td>
<td>2</td>
<td>Presents an evaluation of the family neuro-systemic approach, comparing 10 families having had 4 session 1 month apart and 7 control families. Feeling of anger (STAXI) and family cohesion (FACES3) were significantly improved in the treated group, as were anxiety and depression.</td>
</tr>
<tr>
<td>Wiart L [83,84] 2012</td>
<td>Retrospective study, 47 patients</td>
<td>4</td>
<td>Cohort study of 47 TBI patients having had 11 interviews on average using an individual neuro-systemic approach (sessions centred on family and interpersonal difficulties). The authors observed a significant global improvement for 73%, in particular for depressive and anxious symptoms, while lack of energy, impulsiveness and addictive disorders were little improved.</td>
</tr>
</tbody>
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Table 5
Articles on psychoanalytical psychotherapies.

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geva N et Stern [85] 1985</td>
<td>Case study</td>
<td>4</td>
<td>Describes practice in the analysis of dreams among TBI patients, thought to enable abstraction difficulties to be addressed, and access to the unconscious despite cognitive deficits.</td>
</tr>
<tr>
<td>Lewis L Rosenberg [86] 1990</td>
<td>Case study</td>
<td>4</td>
<td>Presents psychoanalytic practice with brain-damaged patients and adaptation of the classic cure to take account of neurological and cognitive disorders, their psychological impact, factors independent from the brain injury and the social context. Interviews offered for patients and families to improve comprehension and empathy.</td>
</tr>
<tr>
<td>Miller L [87] 1991</td>
<td>Case study</td>
<td>4</td>
<td>In practice with TBI patients, includes educational and cognitive elements, but avoiding free-association techniques on account of cognitive difficulties. Warnings against mistaken psychoanalytical interpretations of psychical or behavioural manifestations of neurological origin (absence, lateness, Freudian slips etc) which should not be taken for manifestations of repression or resistance.</td>
</tr>
<tr>
<td>Grosswasser Z et Stern [89] 1998</td>
<td>Case study</td>
<td>4</td>
<td>Describes a psycho-dynamic model centred on 3 post-traumatic stages during which the psychotherapist, in collaboration with the care team, can intervene: disorganised personality, aggressiveness and denial, reconstruction of identity.</td>
</tr>
<tr>
<td>De La Torre J [90] 2002</td>
<td>Case study</td>
<td>4</td>
<td>Describes how certain TBI patients test how far the therapist can put up with what they have become, and can avoid reducing their identity to that of the patient. Among 15 patients with serious TBI, explores phenomena of non-awareness of cognitive disturbances using the Neurological Behavioural Scale (NBS) and the Patient Competency Rating Scale (PCRS). In 9 cases the authors observed non-awareness secondary to previous cognitive disorders or personality disorders.</td>
</tr>
<tr>
<td>Oppenheim-Gluckman H, Fayol P [18] 2003</td>
<td>Case series</td>
<td>4</td>
<td>Details the psychopathology resulting from psychic and neurological trauma, and describes the numerous obstacles to the instatement of psychoanalytical psychotherapy, which requires adjustments to take account of cognitive disturbances, the environment, and social factors.</td>
</tr>
<tr>
<td>Gagnon JR [91] 2005</td>
<td>Case study</td>
<td>4</td>
<td>Case from psychoanalytical psychotherapy combining sequences of classic analysis with sequences of support.</td>
</tr>
</tbody>
</table>

Table 6
Articles on other therapies.

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study</th>
<th>Level of proof</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysaght R [21] 1990</td>
<td>Case study</td>
<td>4</td>
<td>Studies the effect of relaxation on 4 TBI patients, autogenic training exercises, breathing, mental imagery. The authors noted an improvement in anxiety and emotional disturbances.</td>
</tr>
<tr>
<td>Magee W [93] 2002</td>
<td>Case study</td>
<td>4</td>
<td>Pilot study on an anxious-depressive TBI patient receiving music therapy, partial improvement on a few items in a scale. Assesses the effect of Tai Chi on 18 TBI patients compared to 9 patients on waiting list. The treated patients had improved at the end of the programme, and 3 weeks later, for their depression, anxiety and anger scores, while fatigue and quality of life were not statistically improved.</td>
</tr>
<tr>
<td>Gemmell C [25] 2006</td>
<td>Case-control study</td>
<td>3</td>
<td>Studied the effect of Tai Chi 1 hour/week for 8 weeks on 20 TBI patients, compared to a control group with no physical activity. The authors noted an improvement in mood and self-esteem, but no significant improvement in motor coordination.</td>
</tr>
<tr>
<td>Blake H [24] 2009</td>
<td>Case-control study</td>
<td>3</td>
<td>A pilot study assessing the immediate effect on a few TBI patients of 4-30 min sessions of music therapy, compared to rest session of the same duration. In the controls the authors found an improvement only in emotional adjustment and anger, and among treated patients the same improvements and in addition improvement in attention, executive functions, anxiety and sadness.</td>
</tr>
<tr>
<td>Thaut MH [94] 2009</td>
<td>Case study</td>
<td>4</td>
<td>A study of 13 TBI patients with 1 hour/week music therapy for 20 weeks. The authors noted an improvement in mood (anxiety and depression) after the first few sessions, increasing after the 10th and the 20th weeks. They conclude to a probable positive effect of music therapy, and the interest of including it in care plans for TBI patients.</td>
</tr>
<tr>
<td>Guetin S, [26] 2009</td>
<td>Case series</td>
<td>4</td>
<td>20 TBI patients followed a meditation programme 1 hour/week for 8 weeks - reduction in depression, pain and fatigue, but not anxiety. Patients followed a programme of 3 yoga sessions/week for 3 months - improvement in controlled breathing and feelings of physical and mental well-being. The author presents a 4-step existential programme: identifying expectations before TBI, determining what TBI has changes in these expectations, reconciling with the loss of these expectations, developing a future that is realistic and reasonable. Across 39 cases, the author notes correlation between elements of positive psychology - strength of character, resilience, positive mood – and the success of the rehabilitation. They suggest the development of programmes centred on positive psychology for brain-damaged individuals.</td>
</tr>
<tr>
<td>Bédard M [56] 2012</td>
<td>Case series, 20 patients</td>
<td>4</td>
<td>The author proposes to evaluate the role of Neurological Music Therapy (NMT), usually used to improve sensory-motor functioning, language and cognition, in the emotional disturbances of TBI patients. Following two periods of 12 weeks in positive psychotherapy (in groups), the patients scored better on mood.</td>
</tr>
<tr>
<td>Silverthorne [22] 2012</td>
<td>Case-control study</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>Ruf R [95] 2013</td>
<td>Theoretical article</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Bertich [29] 2014</td>
<td>Case study</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>Hegde [27] 2014</td>
<td>Theoretical article</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Andrewes [23] 2014</td>
<td>Case-control study</td>
<td>4</td>
<td>None</td>
</tr>
</tbody>
</table>
5. Conclusion

Despite the poor levels of scientific proof observed, the French experts, under the auspices of SOFMER, recommend non-pharmacological care for psycho-behavioral disturbances among brain-damaged individuals in first intention, whatever the stage in evolution of the condition. This type of treatment involves a global approach to the patient, specific therapies that should be implemented in collaboration and coordination with care professionals well acquainted with brain lesions, and, alongside, systematic provision for the family and the patient’s close circle. Complementary studies need to be conducted to assess the different approaches and the new therapies more precisely, and to refine the present recommendations.

Disclosure of interest

The authors declare that they have no competing interest.

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efficacy

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