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Topic-specific Search Terms

Attention

exp attention/
attention.de.
attention disturbance.de.
attention$
concentrate$
concentration.de.
distract$
distractability.de.
distraction.de.

Brain Injury

abi
acquir$ adj2 brain injur$
exp acquired brain injury/
exp brain injuries/
exp brain injury/
post adj2 brain injur$
tbi
trauma$ adj2 brain injur$
exp traumatic brain injury/

Cognitive rehabilitation

Cognitive rehabilitation.de.
Cognitive$ adj2 rehab$
Cognitive$ adj2 remediat$
Cognitive$ adj2 train$
Compensatory adj2 rehab$
Compensatory adj2 remediat$
Compensatory adj2 train$
Cues.de.
Learning strategies.de.
memory$ adj2 rehab$
memory$ adj2 remediat$
memory$ adj2 train$
Memory training.de.
Neuropsych$ adj2 rehab$
Neuropsych$ adj2 remediat$
Neuropsych$ adj2 train$
Neuropsychological rehabilitation.de.
Restorative adj2 rehab$
Restorative adj2 remediat$
Restorative adj2 train$

Communication disorders

Apraxia$
exp apraxias/
Communication disorder$
exp communication disorders/
Dysprax$
Language disorder$

Table 9. Excluded Randomized Controlled Trials

Study	Primary Cognitive Deficit	Experimental Treatment	Reason for Exclusion
Dou et al. 2006(81)	Memory	Computer-assisted memory training	The authors indicated that patients had varying degrees of TBI severity, but did not indicate how many had moderate to severe TBI.
Man et al. 2006(82)	Executive functioning	Computer-assisted problem-solving training	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Man et al. 2006(83)	Executive functioning	Computer-assisted problem-solving training	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Hewitt et al. 2005(84)	Executive functioning	Intervention designed to help patients recall specific memories from their own personal experience with the goal of adding in problem solving	The instrument used to measure the outcome of interest was modified by the authors of the study, and not validated.
Soong et al. 2005(85)	Executive functioning	Computer-assisted problem-solving training	Study had less than 10 subjects per treatment arm and included patients with mixed etiology without reporting outcomes separately for moderate to severe TBI.
Tam et al. 2003(86)	Memory	Computer-assisted memory training	Study had less than 10 subjects per treatment arm.
Rath et al. 2003(87)	Executive functioning	Group treatment of problem-solving deficits	Study included patients who experienced mixed TBI severity (mild to severe) without reporting outcomes separately for those with moderate to severe TBI.
Kaschel et al. 2002(88)	Memory	Imagery training	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI

Study	Primary Cognitive Deficit	Experimental Treatment	Reason for Exclusion
Wilson et al. 2001(89)	Memory and executive functioning	Paging system	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Levine et al. 2000(90)	Executive functioning	Goal management training	Study included patients who experienced mixed TBI severity (mild to severe) without reporting outcomes separately for those with moderate to severe TBI.
Salazar et al. 2000(91)	Multiple deficits	Intensive inpatient cognitive behavioral program versus limited home intervention	Patients in the cognitive behavioral program received comprehensive treatment that included occupational therapy, speech language therapy, and psychotherapy in addition to group cognitive rehabilitation. This study does not provide evidence of CRTs effectiveness in isolation of other interventions.
Sohlberg et al. 2000(92)	Attention	Attention process training (ATP)	Study had less than 10 subjects per treatment arm and included patients with mixed etiology without reporting outcomes separately for moderate to severe TBI.
Watanabe et al. 1998(93)	Temporal orientation	Calenders in room	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Ownsworth and McFarland 1999(94)	Memory	Diary training	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Kasten et al. 1998(95)	Visual processing	Computer-assisted visual restitution training (VRT)	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI

Study	Primary Cognitive Deficit	Experimental Treatment	Reason for Exclusion
Schmitter and Fahy 1995(96)	Memory	Notebook training	Study included less than 10 patients per treatment arm.
Thomas-Stonell et al. 1994(97)	Cognitive-communication	TEACHware™	Study included less than 10 patients per treatment arm and mostly adolescents.
Twum and Parente 1994(98)	Memory	Imagery versus verbal labelling to improve memory	Outcome measures did not differ from the training measures.
Ruff et al. 1992(99)	Attention and memory	THINKable™	Study included less than 10 patients per treatment arm.
Gray and Robertson 1992(100)	Attention	Computer-assisted attention retraining	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Ryan and Ruff 1988(101)	Memory	Various tasks designed to improve memory	Study included patients with mild to moderate TBI. While the study reported outcomes separately based on severity, there were less than 10 subjects per treatment arm with moderate TBI in each group.
Lincoln et al. 1985(102)	Visual processing	Visual perceptual training	Study included patients with brain damage due to mixed etiology without reporting outcomes separately for patients with moderate to severe TBI
Helffenstein and Wechsler 1982(103)	Cognitive-communication	Interpersonal process recall (IPR)	Study included less than 10 patients per treatment arm.

Appendix B. Coverage Policies

Table 10. Commercial Coverage Policies

Third Party Payer	Website	Coverage Policy	Date of Last Review	Policy/ Bulletin Number
Policies that cover CRT for TBI				
Aetna	http://www.aetna.com	Covered when: (1) the cognitive deficits are the result of impairment due to trauma, stroke, or encephalopathy; (2) the member has been seen and evaluated by a neuropsychiatrist or neuropsychologist; (3) neuropsychological testing has been performed and results will used to guide rehabilitation strategies; (4) and the member is expected to make sufficient cognitive improvement (not in coma or custodial state). CRT may be performed by an occupational or physical therapist, speech/language pathologist, neuropsychologist, or a physician.	05/02/06	0214

Third Party Payer	Website	Coverage Policy	Date of Last Review	Policy/ Bulletin Number
Wellmark BlueCross/BlueShield	http://www.wellmark.com	Covered when: (1) impairment due to stroke or TBI; (2) care plan documents specific diagnosis-related goals; (3) patient has reasonable expectation of achieving measurable improvements in a reasonable and predictable period of time.	12/2006	NR
Cigna	http://www.cigna.com	Covered when: (1) impairment due to acute brain insult, TBI, or CVA; (2) documented cognitive impairment with compromised functional status exists; (3) the patient can actively participate in treatment plan; (4) significant improvement is expected and can be demonstrated by documentation submitted weekly.	07/15/06	0124
WellChoice	http://www.wellchoicenj.com	Only covered in patients with significantly impaired cognitive function after TBI.	09/14/06	MED.00081

Third Party Payer	Website	Coverage Policy	Date of Last Review	Policy/ Bulletin Number
Policies that do not cover CRT for TBI/or do not have a specific policy				
BlueCross/BlueShield of Alabama	http://www.bcbsal.org	Does not have a specific coverage plan for CRT, and does not mention that it is covered under PT or OT.	NR	NR
BlueCross/BlueShield of Massachusetts	http://www.bcbsma.com	Only covers individuals with Medicare HMO or PPO plans in accordance with their local coverage decision. Otherwise, coverage is determined on an individual basis.	03/26/07	439
BlueCross/BlueShield of Minnesota	http://www.notes.bluecrossmn.com	Does not have a specific coverage plan for CRT, and does not mention that it is covered under PT or OT.	NR	NR
BlueCross/BlueShield of North Carolina	http://www.bcbsnc.com	CRT not covered because it is thought to be investigational	08/2006	0TH8040
BlueCross/BlueShield of Tennessee	http://bcbst.com	CRT not covered because it is thought to be investigational	03/08/07	NR
Harvard Health Plan	http://www.harvardpilgrim.org	Does not have a specific coverage plan for CRT, and does not mention that it is covered under PT or OT.	NR	NR
Health Partners	http://www.healthpartners.com	Does not have a specific coverage plan for CRT, and does not mention that it is covered under PT or OT.	NR	NR
Humana	http://apps.humana.com	Does not have a specific coverage plan for CRT, but does cover speech and communication complications resulting from head injury.	04/26/07	NR
Independence BlueCross/BlueShield	http://medpolicy.ibx.com	Does not have a specific coverage plan for CRT, but does cover speech and communication complications resulting from head injury.	NR	10.06.01a

Third Party Payer	Website	Coverage Policy	Date of Last Review	Policy/ Bulletin Number
Premera BlueCross/BlueShield	https://www.premera.com	Does not have a specific coverage plan for CRT, and does not mention that it is covered under PT or OT.	NR	NR
Regence BlueCross/BlueShield	http://www.regence.com	CRT not covered because it is thought to be investigational.	08/08/06	20
Tufts Health Plan	http://www.tufts-health.com	CRT is not considered appropriate for short-term rehabilitation and is, therefore, not covered under physical therapy services.	NR	NR

NR Not reported.
OT Occupational therapy.
PT Physical therapy.

Appendix C. Quality of Literature and Evidence Strength Rating

Determining the Quality of Individual Studies

To aid in assessing the quality of each of the studies included in this assessment, we used a quality scale that was developed by ECRI Institute. This instrument examines twenty-five different factors of study design that have the potential to reduce the validity of the conclusions that can be drawn from a trial.

Study Quality Evaluation Scale

Comparability of Groups at Baseline

1. Were patients randomly assigned to the study's groups?
2. Did the study employ stochastic randomization?
3. Were any methods other than randomization used to make the patients in the study's groups comparable?
4. Were patients assigned to groups based on factors other than patient or physician preference?
5. Were the characteristics of patients in the different study groups comparable at the time they were assigned to groups?
6. Did patients in the different study groups have similar levels of performance on all of the outcome variables at the time they were assigned to groups?
7. Was the comparison of interest prospectively planned?
8. Did ≥85% of the patients complete the study?
9. Was there a ≤15% difference in completion rates in the study's groups?
10. Were all of the study's groups concurrently treated?
11. Was compliance with treatment ≥85% in both of the study's groups?
12. Was there concealment of allocation?

Blinding

13. Were subjects blinded to the treatment they received?
14. Did the authors perform any tests after completing the study to ensure that the integrity of the blinding of patients was maintained throughout the study?
15. Was the treating physician blinded to the groups to which the patients were assigned?
16. Were those who assessed the patient's outcomes blinded to the group to which the patients were assigned?

Measurement/Instrument

17. Was the outcome measure of interest objective and was it objectively measured?
18. Were the same laboratory tests, clinical findings, psychological instruments, etc., used to measure the outcomes in all of the study's groups?
19. Was the instrument used to measure the outcome standard?
20. Were the follow-up times in all of the study's relevant groups approximately equal?

Treatment

21. Was the same treatment given to all patients enrolled in the experimental group?
22. Was the same treatment given to all patients enrolled in the control group?
23. Were all of the study's groups treated at the same center?

Investigator Bias

24. Was the funding for this study derived from a source that does not have a financial interest in its results?
25. Were the author's conclusions, as stated in the abstract or the article's discussion section, supported by the data presented in the article's results section?

Strength-of-Evidence System

To arrive at the strength-of-evidence categories, we applied the ECRI Institute Strength of Evidence system. This system involves 10 decision points. The methods we used to resolve these 10 decision points appear next.

Decision Point 1: Determining Quality of Individual Studies

To aid in assessing the quality of each of the studies included in this assessment, we used a quality scale developed by ECRI Institute for interventional trials. This instrument examines different factors of study design (attributes) that have the potential to reduce the validity of the conclusions that can be drawn from a trial (see above for the complete scale). For example, one attribute is whether patients were randomly assigned to treatment groups. In brief, the scale was designed so that a study attribute that, in theory, protects a study from bias receives a "Yes" response. If the study clearly does not contain that attribute it receives a "No" response. If poor reporting precludes assigning a "Yes" or "No" response for an attribute, then "NR" is recorded (NR = not reported).

To estimate the quality of an individual study, we computed a normalized score so that a perfect study received a score of 10, a study for which the answers to all items was "No" received a score of 0, and a study for which the answers to all questions was "NR" was 2.5. Quality scores were converted to categories as shown in Table 11 below. The definitions for what constitutes low, moderate, or high quality evidence were determined *a priori* by a committee of four methodologists. Since the quality was determined separately for each outcome, a study that scored as high quality for one outcome might score as moderate quality for another outcome.

Decision Point 2: Determining Quality of Evidence Base

After assigning quality scores to each individual outcome, we then classified the overall quality of the evidence base by taking the median quality score of the individual studies. We used the median because it is the appropriate measure of central tendency to represent the "typical" quality score, and is less sensitive to outliers than the mean. Depending on the overall quality scores for each outcome, we then followed the high, moderate, or low quality branch of the strength of evidence system.

The quality of the evidence base sets an upper limit on judgments of the strength and stability of the evidence. For example, the strength of evidence can be weak, moderate, or strong if the evidence base is of high quality, but the strength can never be strong if the evidence base is of moderate or low quality.

To determine whether the evidence base was High, Moderate, or Low quality, we used the thresholds listed in Table 11. The definitions for what constitutes low, moderate, or high quality evidence were determined *a priori* by a committee of four methodologists. Since the quality was determined separately for each outcome, a study that scored as high quality for one outcome might score as moderate quality for another outcome.

Table 11. Categorization of Quality

	Overall quality of evidence base		
	Low	**Moderate**	**High**
Median Overall quality score of the evidence base	5.0 to <6.7	6.8 to <8.5	8.5 or higher

Decision Point 3: Is There Sufficient Information to Perform a Quantitative Analysis?
The answer to Decision Point 3 depends upon the adequacy of reporting in available studies as well as the number of available studies. In order to conduct a quantitative analysis of a given outcome, the data for that outcome must be reported in at least three studies in a manner that allows the data to be pooled in a meta-analysis. If less than three studies are available, no quantitative analysis is usually possible regardless of reporting (the only exception to this rule is if the evidence base has two high-quality studies that are potentially informative when combined in a meta-analysis). Another situation that does not allow a quantitative analysis is when three or more studies are available, but fewer than 75% of them permit determination of the effect size and its dispersion, either by direct reporting from the trial or calculations based on reported information. If no quantitative analysis is possible, then one moves directly to Decision Point 8 to begin a qualitative analysis.

Decision Point 4: Are Data Quantitatively Consistent (Homogeneous)?
This decision point was used only if the answer to Decision Point 3 was Yes. Consistency refers to the extent to which the results of studies in an evidence base agree with each other.(104) The more consistent the evidence, the more precise a summary estimate of treatment effect derived from the evidence base. Quantitative consistency refers to consistency tested in a meta-analysis using the Higgins and Thompson's I^2 statistic.(60) We considered the evidence base to be quantitatively consistent when I^2 was $\leq$50%. If it was not homogeneous, we proceeded to Decision Points 6 and 7.

If the evidence base was quantitatively consistent (i.e., homogeneous), we combined the results in a random-effects meta-analysis (REMA). We then determined whether the summary effect size is informative or non-informative. The summary effect is considered informative if it meets any one of the following three criteria:

1) The summary effect is statistically significant.
2) If the minimum boundary of clinical significance is greater than 0, the 95% confidence intervals of the summary effect must exclude the possibility of a clinically significant effect. (In this report, clinical significance equals 0.2. So, the 95% confidence intervals surrounding the summary statistic should not overlap with -0.2 or +0.2 using Hedges' g).
3) If the summary effect is informative, we then test the stability of the findings in decision point 5.

Decision Point 5: Are Findings Stable (Quantitatively Robust)?

Robustness was addressed by determining the stability of the summary estimate. A stable summary estimate indicates that the accumulated body of evidence is large enough to have accurately measured the "true" effect size. The stability of the summary estimates was tested using the following methods:

Test 1. Width of confidence intervals. If the 95% confidence interval around the meta-analytic effect size allow for an effect size that is greater than the summary effect size plus the minimal clinically significant effect size then the estimate is automatically considered not robust. Example: clinical significance in this report is defined as 0.2. The summary effect size is 0.4 (0.1 to 0.7). Clinical significance plus effect size is 0.6, which is exceeded by the confidence intervals; therefore the estimate is not robust. If the estimate passes this robustness test, proceed with the next test.

Test 2. Removal of one study. The summary estimate should not depend heavily on the inclusion of any particular study in the evidence base. To test this, we calculated the summary effect size plus/minus clinical significance. These two lines will represent the range of acceptable deviation from the summary effect size in the sensitivity analysis. Remove one study at a time (and only one study removed; for each new analysis, replace the previously removed study and remove a different study) from the meta-analysis and re-calculate the summary effect size without it. If the new effect size exceeds the bounds defined above, the estimate is not robust.

Test 3. Cumulative meta-analysis. Calculate the summary effect size plus/minus clinical significance. These two lines will represent the range of acceptable deviation from the summary effect size in the cumulative meta-analysis. Add studies into the meta-analysis sequentially in order of publication date, starting with the earliest study. If the new effect size exceeds the bounds defined above, the estimate is not robust. If any of the steps of the cumulative meta-analysis shows heterogeneity (I^2 greater than or equal to 50%), the estimate is not robust.

Decision Point 6: Exploration of Heterogeneity

If we observed heterogeneity, we next attempted (if there were five or more studies) to explain the heterogeneity using meta-regression. If there were fewer than five studies in this situation, we did not arrive at a quantitative estimate. A priori, we planned to use the following factors as predictor variables:

- CRT setting (inpatient/outpatient)

- Duration of CRT (measured in weeks)
- Time to intervention of CRT (measured in months)
- Intensity of CRT (measured in hours)

For meta-regression, we planned to perform random-effects meta-regression in Stata using the permutation test p-value, as described by Higgins and Thompson.(105) We decided that a meta-regression could be considered to have explained the heterogeneity if the covariate was statistically significant by the permutation test, and if the p-value for the remaining heterogeneity was greater than 0.1.

Decision Point 7: Is Meta-regression Model Stable?
The purpose of Decision Point 7 is to test the stability of any quantitative findings that may emanate from meta-regression analysis. We used the same robustness test as in Decision Point #5.

Decision Point 8: Are Qualitative Findings Robust?

The robustness of the qualitative findings is tested as described for Decision Point 5. We considered findings to be overturned only when the sensitivity test alters the conclusion (for example, a statistically significant finding becomes non-significant).

Decision Point 9: Are Data Qualitatively Consistent?
This Decision Point is used only when the evidence base for an outcome consists of two studies. For our purposes, the two studies were considered qualitatively consistent if they met either of the following two situations: 1) both studies showed a statistically significant effect in the same direction; or 2) neither study showed a statistically significant effect.

Decision Point 10: Is Magnitude of the Treatment Effect Large?

When considering the strength of evidence supporting a qualitative conclusion based on only one or two studies, magnitude of effect becomes very important. If a single study finds a very large effect with a narrow confidence interval, then new evidence is unlikely to overturn the qualitative conclusion. To resolve this decision point, we consulted the 95% confidence interval around the effect size for the study (with two studies, we consulted the interval around the random effects summary statistic). If this interval was fully above +0.5 (or if it was fully below -0.5), AND the point estimate itself was 0.8 or greater, we considered the effect to be large. Otherwise, we considered it to be not large. For example, an estimate of 0.85 with an interval from +0.6 to +1.1 would be considered a large effect, whereas an estimate of 0.85 with an interval from +0.4 to +1.3 would not be considered a large effect. Another effect that would be considered large is an estimate of -0.85 with an interval from -1.1 to -0.6 (large in the negative direction). The use of 0.5 and 0.8 is based on Cohen,(62) who stated that an effect size of 0.5 was "moderate" and an effect size of 0.8 was "large". Thus, the decision rule required that the point estimate be large and also that it be statistically significantly larger than "moderate". The use of 0.5 and 0.8 applies to standardized mean difference or Hedges'g as the measure of effect size. For log odds ratio, Cohen's magnitude of effect size translates to the following: small = 0.4, moderate = 0.9, and large = 1.5. These correspond to approximate odds ratios of 1.5, 2.5, and 4.5, respectively.

Special Instructions: Meta-analysis of Two High Quality Trials

We perform a random-effects meta-analysis of two high-quality trials, as long as the studies do not have statistically significant effect sizes in opposite directions (qualitative inconsistency). The only other requirement is that both studies must have enough information to allow calculation of accurate effect sizes (no imputation is allowed when only two studies are available).

Other parts of the algorithm

Some parts of the algorithm are not formally called "Decision Points", and yet some decisions must be made in order to apply them. These are described next.

Sufficient Data for Meta-Regression?

We required a minimum of 5 studies before attempting meta-regression.

Mega-Trial?

We defined a mega-trial as any trial that reported data on 1,000 or more patients.

Meta-Analysis Possible?

For continuous outcomes, meta-analysis is possible when the pertinent studies either report effect sizes and standard errors, or there is sufficient reported information for both effect sizes and standard errors to be calculated. For dichotomous outcomes, meta-analysis is possible when the pertinent studies report the total number of patients in each group as well as the number of events in each group.

Abbreviations

FEMA – Fixed Effects Meta-Analysis
MR –Meta-regression
REMA – Random Effects Meta-Analysis

Figure 3. General Section of Strength-of-Evidence System

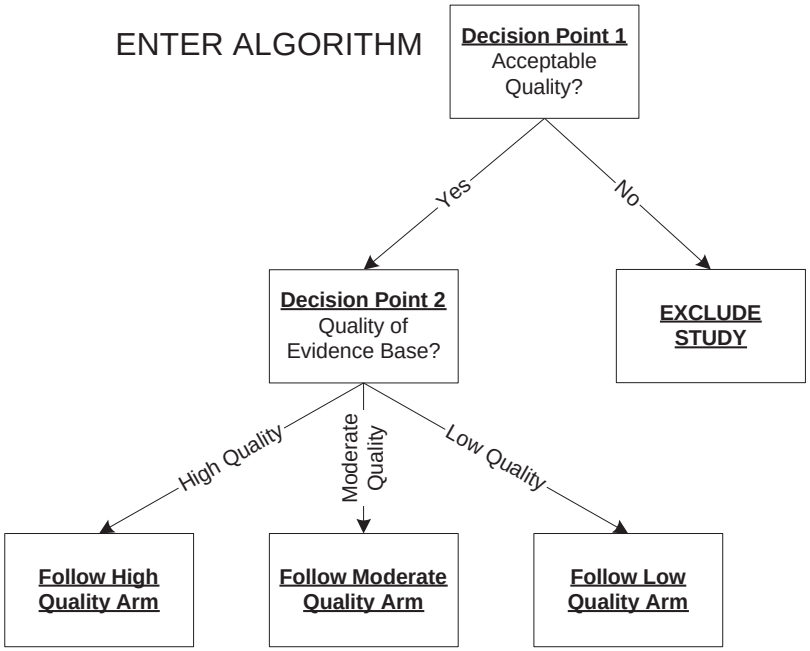


Figure 4. Highest Quality Pathway of Strength-of-Evidence System

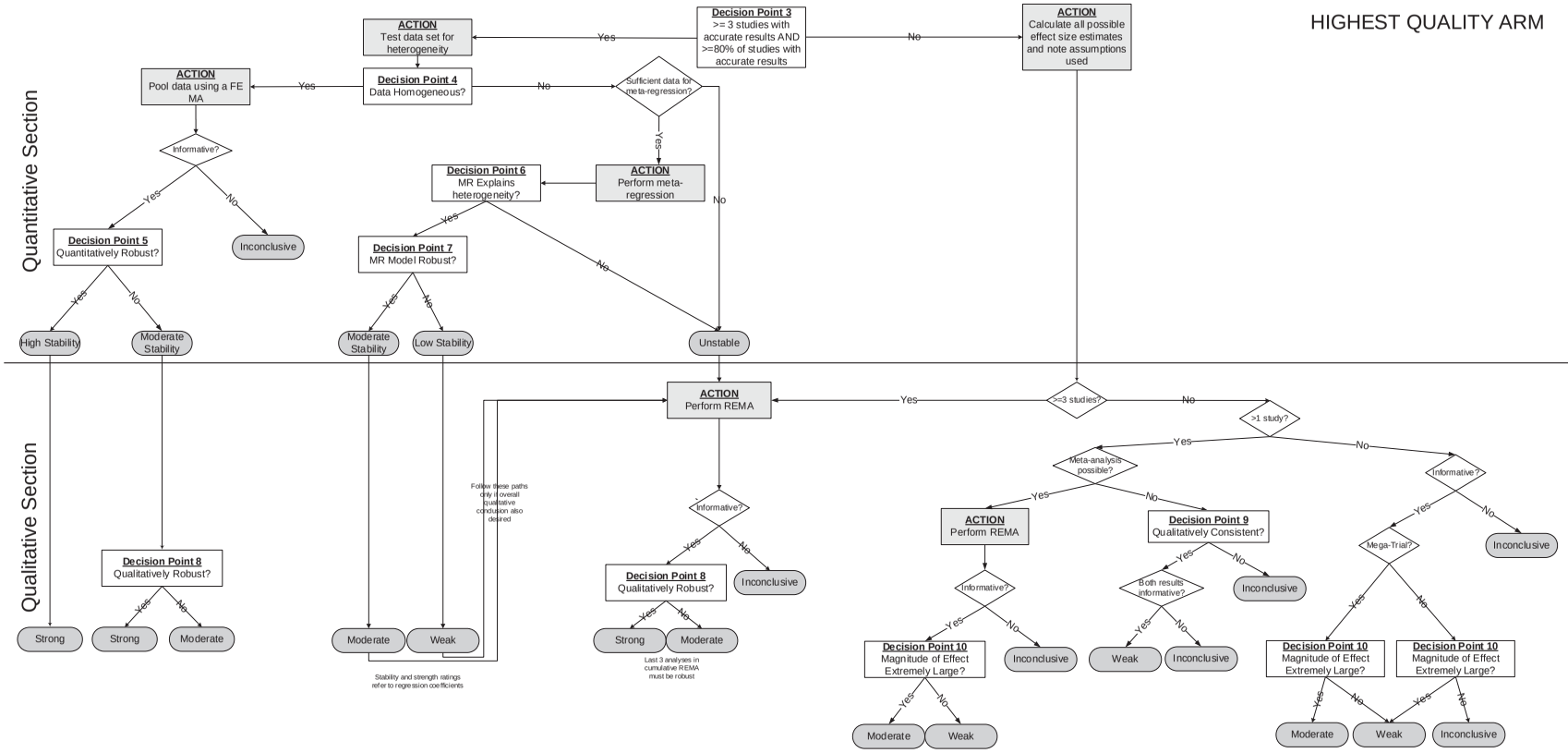


Figure 5. Moderate Quality Pathway of Strength-of-Evidence System

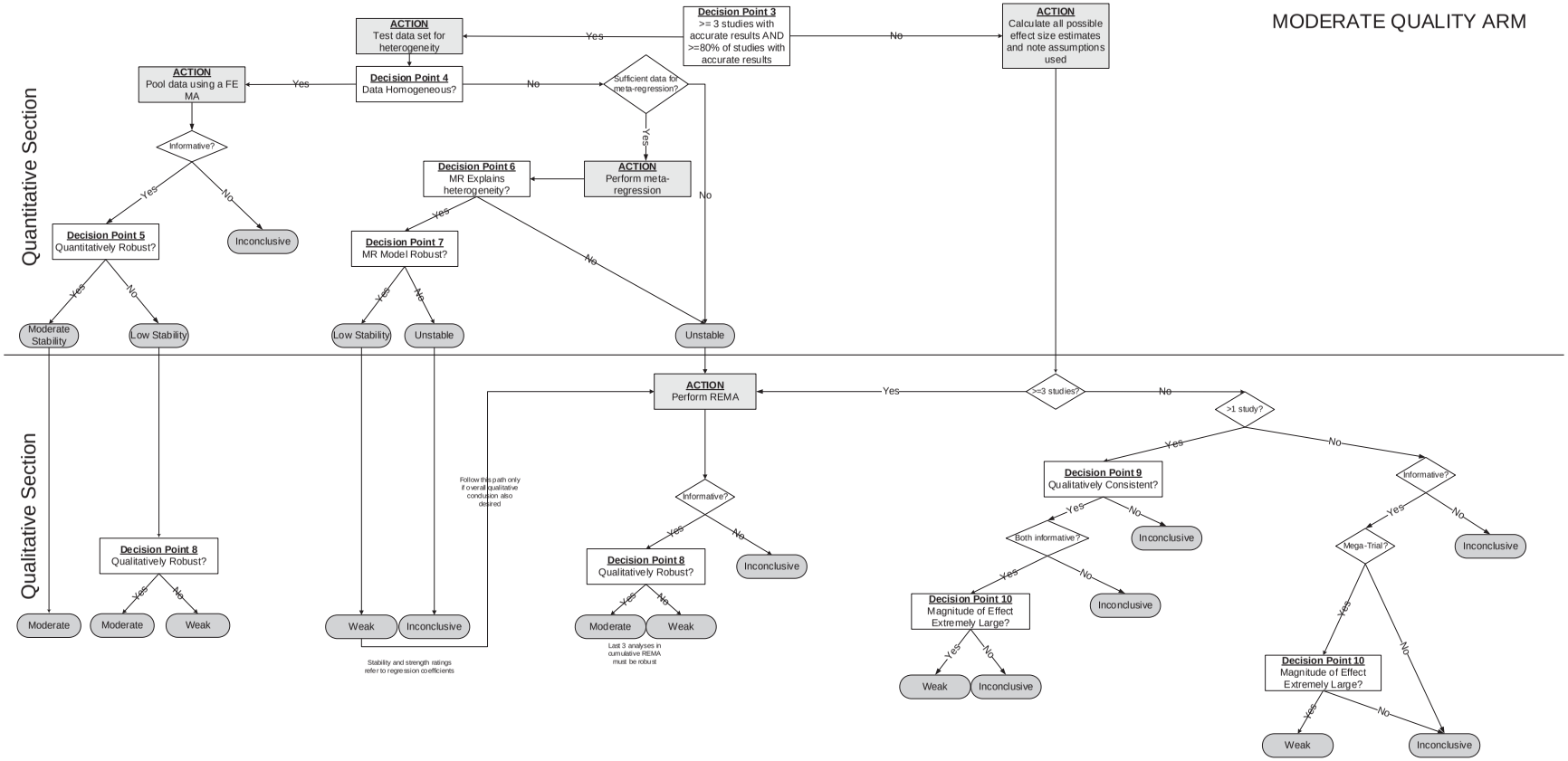
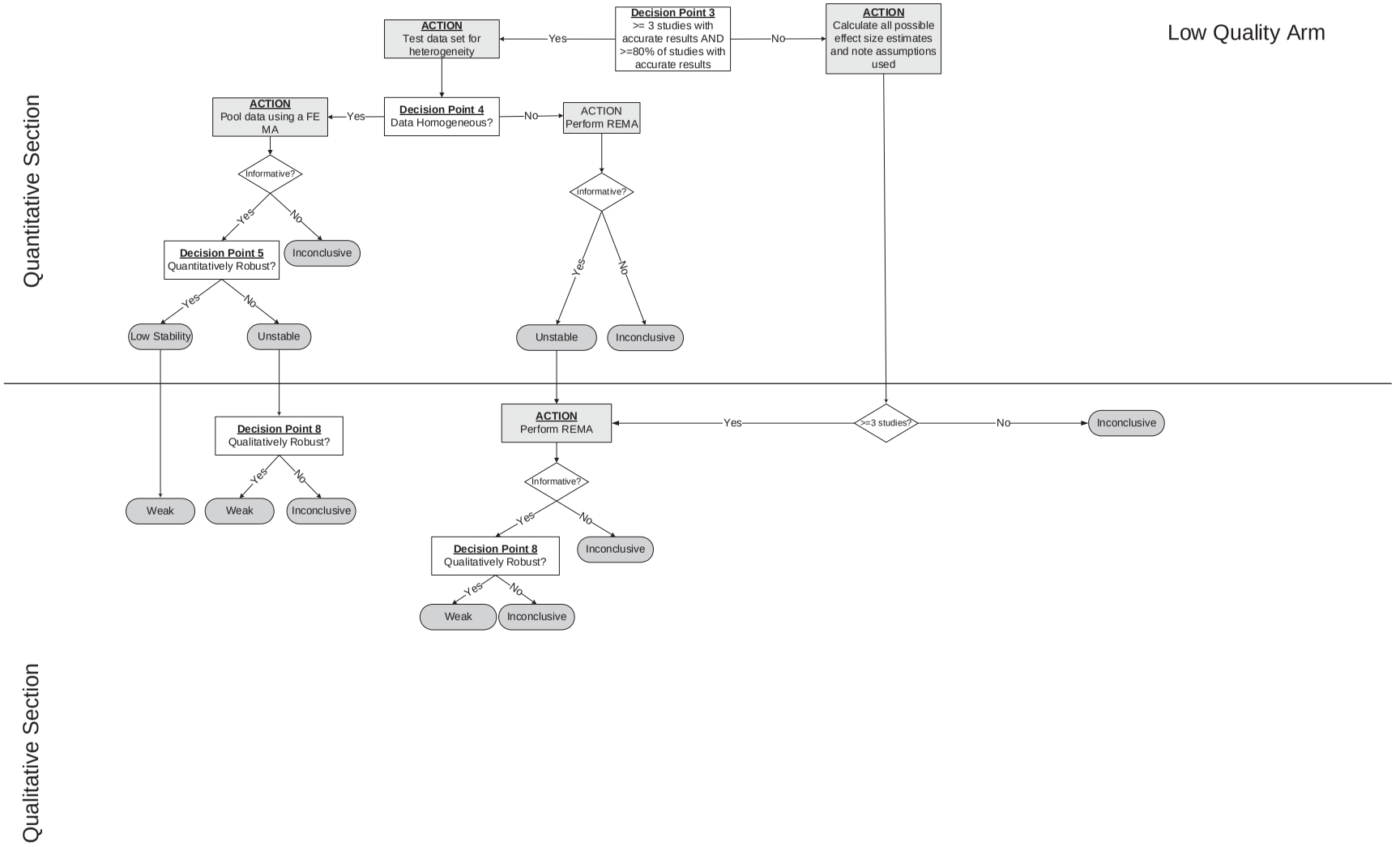


Figure 6. Lowest Quality Pathway of Strength-of-Evidence System



Appendix D. Quality Assessment Scores

Table 12. Quality Assessment of Included Studies by Outcome of Interest

Studies	**Q1.** Were pts randomly assigned to study groups?	**Q2.** Did the study employ stochastic randomization?	**Q3.** Were methods other than randomization used to make groups comparable?	**Q4.** Were pts assigned to groups based on factors other than pt or phy preference?	**Q5.** Were characteristics of pts in different groups comparable at assignment?	**Q6.** Did pts in different study groups have similar scores on all outcome measures at assignment?	**Q7.** Was comparison of interest prospectively planned?	**Q8.** Did ≥85% of the pts complete study?	**Q9.** Was there a ≤15% difference in completion rates in the study groups?	**Q10.** Were all of the study's groups concurrently treated?	**Q11.** Was compliance with treatment ≥85% in both groups?	**Q12.** Was there concealment of allocation?	**Q13.** Were subjects blinded?	**Q14.** Were tests performed to ensure blinding?	**Q15.** Was the treating phy blinded?	**Q16.** Were outcome assessors blinded?	**Q17.** Was the outcome objective and objectively measured?	**Q18.** Were the same instruments used to measure outcomes?	**Q19.** Was the instrument used to measure the outcome standard?	**Q20.** Were follow-up times of study groups equal?	**Q21.** Was the same tx given to exp group?	**Q22.** Was the same tx given to C group?	**Q23.** Were all study grps treated at the same center?	**Q24.** Was funding free of financial interest?	**Q25.** Were conclusions supported by data?	**Overall Quality Score**
Cognitive Outcomes (memory, attention, executive function, communication, visuospatial) As measured by Neuropsychological Tests																										
Fasotti et al. 2000(54)	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.2
Novack et al. 1996(55)	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	NR	No	NR	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.2
Milders et al. 1995(2)	Yes	NR	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	NR	NR	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	NR	Yes	6.4
Berg et al. 1991(1)	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	NR	Yes	6.8
Neistadt 1991(56)	Yes	NR	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	NR	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	6.6
Niemann et al. 1990(57)	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	NR	No	NR	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.1
Ruff et al. 1989(4)	Yes	NR	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NR	NR	Yes	NR	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	6.9

Studies	**Q1.** Were pts randomly assigned to study groups?	**Q2.** Did the study employ stochastic randomization?	**Q3.** Were methods other than randomization used to make groups comparable?	**Q4.** Were pts assigned to groups based on factors other than pt or phy preference?	**Q5.** Were characteristics of pts in different groups comparable at assignment?	**Q6.** Did pts in different study groups have similar scores on all outcome measures at assignment?	**Q7.** Was comparison of interest prospectively planned?	**Q8.** Did ≥85% of the pts complete study?	**Q9.** Was there a ≤15% difference in completion rates in the study groups?	**Q10.** Were all of the study's groups concurrently treated?	**Q11.** Was compliance with treatment ≥85% in both groups?	**Q12.** Was there concealment of allocation?	**Q13.** Were subjects blinded?	**Q14.** Were tests performed to ensure blinding?	**Q15.** Was the treating phy blinded?	**Q16.** Were outcome assessors blinded?	**Q17.** Was the outcome objective and objectively measured?	**Q18.** Were the same instruments used to measure outcomes?	**Q19.** Was the instrument used to measure the outcome standard?	**Q20.** Were follow-up times of study groups equal?	**Q21.** Was the same tx given to exp group?	**Q22.** Was the same tx given to C group?	**Q23.** Were all study grps treated at the same center?	**Q24.** Was funding free of financial interest?	**Q25.** Were conclusions supported by data?	**Overall Quality Score**
Functional Independence																										
Novack et al. 1996(55)	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	NR	No	NR	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.2
Cheng and Man 2006(22)	Yes	No	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	NR	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.0
Psychosocial/																										
Ruff and Niemann 1990(3)	Yes	NR	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NR	NR	Yes	NR	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	6.9
Self-Awareness																										
Cheng and Man 2006(22)	Yes	No	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	7.0

Appendix E. Patient and Treatment Characteristic Tables

Table 13. Patient Eligibility Criteria for Included Studies

Study	Inclusion criteria	Exclusion criteria
Cheng and Man 2006(22)	Patients had to be stable and mentally alert as evidenced by normal range in language sub-test of the Neurobehavioral Cognitive Status Examination (NCSE), and demonstrate impaired self-awareness.	NR
Fasotti et al. 2000(54)	Patients had to 1) sustain a severe to very severe closed head injury at least 3 months prior to randomization; 2) show evidence of slow speed of information processing (demonstrated by PASAT, ACT, and RT); score equal to or greater than 75 on the WAIS; 3) be between the ages of 18 and 50 years; 4) have no severe intellectual, aphasic, agnosic, or personality disorders; 5) implicitly state interest in participating in study.	NR
Novack et al. 1996(55)	Patients had to have the ability to communicate in some fashion.	NR
Milders et al. 1995(2) & Berg et al. 1991(1)*	Patients had to 1) sustain a closed-head injury more than 9 months prior to randomization; 2) have subjective memory complaints in everyday life; 3) have no severe intellectual, aphasic, apraxic, agnosic, or personality disturbances; 5) have no previous neurological or psychiatric admissions; and 6) be between the age of 18 and 60 years.	NR
Neistadt 1991(56)	Patients had to 1) be aged 18 to 55 years; 2) have a condition diagnosed diffuse brain injury secondary to traumatic head injury; 3) be at least 6-months postinjury; 4) receiving treatment in long-term rehabilitation program; 5) have functional use of both arms; 6) have at least an eighth grade education; 7) be functional communicators; 8) show no signs of unilateral neglect on line bisection test; 9) have a pretest scaled score of 10 or lower on the WAIS-R Block Design subtest; and demonstrate room for improvement in their constructional and meal preparation skills	NR
Niemann et al. 1990(57)	Patients had to 1) be between 16 and 60 years; 2) have TBI in the moderate to severe range with a minimum coma duration of 1 hour; 3) have sustained head injury 12 to 72 months prior to randomization; 4) demonstrate no evidence of severe disorientation and confusion (GOAT Score of at least 75); 5) have sufficient cognitive functioning (DRS score of at least 100); 6) have no severe aphasia; 7) have sufficient vision to read text on computer screen; 8) have at least one functional hand; 9) have no substance abuse or premorbid psychiatric disorders.	NR