Willkommen
Techniken der Bewegungsvorstellung (BV) in der Schlaganfallrehabilitation

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Definition

Was sind Bewegungsvorstellungen (motor imagery)?

- Motor imagery (MI) may be defined as a dynamic state during which the representation of a given motor act is internally rehearsed within working memory without any overt motor output.

Decety & Grèzes, 1999
Was passiert während BV?
Objektive Messungen

• Blutfluss, Metabolismus (fMRI / PET / SPECT / NIRS)

Baseline vs. upper extremity movements

Corticale Bereiche

Bilateral laterale und mediale premotorische Areale, mediales Frontalgiebild mit einschließlich der supplementary motor area (SMA) und prSMA, prazentraler Gyri, primärer motorischer Areale, operkulares und insulärer Cortex.

Subkortikale Bereiche

Rechts der Basalganglien einschließlich der Putamen, Pallidum und Caudate Nucleus.

Parietale Bereiche

Nur linke Hemisphere, suprakallosaler und inferior parietaler Cortex.

Szameitat et al. 2007
1.1 FMSA

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental Mean</th>
<th>SD</th>
<th>Total</th>
<th>Control Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page, 2000</td>
<td>7.84</td>
<td>10.17</td>
<td>8</td>
<td>4.66</td>
<td>4.87</td>
<td>8</td>
<td>49.5%</td>
<td>3.18 [-4.63, 10.99]</td>
</tr>
<tr>
<td>Page, 2001</td>
<td>13.8</td>
<td>10.04</td>
<td>8</td>
<td>2.9</td>
<td>3.67</td>
<td>5</td>
<td>50.5%</td>
<td>10.90 [3.24, 18.56]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>16</td>
<td></td>
<td>13</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td>7.08 [-0.49, 14.64]</td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 14.21; Chi² = 1.91, df = 1 (P = 0.17); I² = 48%
Test for overall effect: Z = 1.83 (P = 0.07)

2.1 ARAT

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental Mean</th>
<th>SD</th>
<th>Total</th>
<th>Control Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page, 2001</td>
<td>16.4</td>
<td>15.14</td>
<td>8</td>
<td>0.7</td>
<td>2.02</td>
<td>5</td>
<td>36.4%</td>
<td>15.70 [5.06, 26.34]</td>
</tr>
<tr>
<td>Page, 2005</td>
<td>10.7</td>
<td>4.61</td>
<td>6</td>
<td>4.6</td>
<td>1.98</td>
<td>5</td>
<td>63.6%</td>
<td>6.10 [2.02, 10.18]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>14</td>
<td></td>
<td>10</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td>9.59 [0.54, 18.64]</td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 29.18; Chi² = 2.73, df = 1 (P = 0.10); I² = 63%
Test for overall effect: Z = 2.08 (P = 0.04)

## Verfügbare Reviews

<table>
<thead>
<tr>
<th>Year</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>Richardson A. Mental Practice: a Review and Discussion: I and II</td>
</tr>
<tr>
<td>1989</td>
<td>Surburg PR. Application of imagery techniques to special populations.</td>
</tr>
<tr>
<td>1995</td>
<td>Annett J. Motor imagery: Perception or action?</td>
</tr>
<tr>
<td>Year</td>
<td>Publication</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 2001 | **Fell** NT: Mental rehearsal as a complementary treatment in geriatric rehabilitation.  
**Hamel** O. "Imagerie mentale": A review of mental imagery in the French language on the world wide web.  
**Honeycutt** JM, Ford SG. Mental imagery and intrapersonal communication: A review of research on imagined interactions and current developments. |
| 2003 | **LeBoutillier** N, Marks DF. Mental imagery and creativity: A meta-analytic review study. |
### Verfügbare Reviews

<table>
<thead>
<tr>
<th>Year</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Taktek K. The effects of mental imagery on the acquisition of motor skills and performance: A literature review with theoretical implications</td>
</tr>
<tr>
<td></td>
<td>Sharma N, Pomeroy VM, Baron JC: Motor imagery - A backdoor to the motor system after stroke?</td>
</tr>
</tbody>
</table>
Warum benötigen wir einen weiteren SR?
Forschungsfrage SR

Welche Techniken der BV wurden in der verfügbaren Literatur verwendet und was sind die Elemente und Zeitparameter eines BV-Trainings für eine erfolgreiche BV-Intervention?
24 Datenbanken
Beispiele

<table>
<thead>
<tr>
<th>Medizin</th>
<th>Sport</th>
<th>Psychologie</th>
<th>Lehre / Pädagogik</th>
<th>Musik</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scopus</td>
<td>Sportdiscus</td>
<td>PsychINFO</td>
<td>Eric</td>
<td>RILM</td>
</tr>
<tr>
<td>WoS Cochrane</td>
<td>EMERALD</td>
<td></td>
<td>ASSIA</td>
<td>JSTOR</td>
</tr>
</tbody>
</table>
Literatursuche

Lehre / Pädagogik
Musik
Medizin
Psychologie
Sport
Literaturreview

Motor imagery
Guided imagery
Mental practice

Scopus, WoS, Cochrane, SPORTDiscus, EMERALD, PsycINFO, Eric, ASSIA, RILM, JSTOR, ...

Mental rehearsal
Mental movement
Visual imagery

Start
Einfache Duplikatsuche
Einfügen / Extrahieren
Übereinstimmungprüfung
Handselektion

Techniken der Bewegungsvorstellung in der Schlaganfallrehabilitation
Potential relevant articles
n=21739 (5741)
Education 8990 (90), Medicine 9785 (1387), Music 880 (15), Psychology 4586 (3973), Sports 4748 (301)

Excluded articles by electronic duplicate search while importing into Endnote n=5469 (62)

Articles retained for further evaluation n=18271 (5679)

Re-sorting with EndNote search options (e.g. all music related articles put into the Music library) n=16271 (5679)

Manual duplicate deleting with the help of edit distance calculation in Matlab (4 refining steps) results in n=14011 (5109)

Excluded articles (duplication) n=2260 (573)

Manual deleting based on general terms n=13828 (5109)

Excluded articles n=363
- MP during TMS
- MP as psychotherapy

Manual selection based on pre-defined criteria (title/abstract + full text search) resulting in n=85 (36)
Education 0 (2), Medicine 90 (22), Music 4 (0), Psychology 46 (8), Sports 5 (4)

Excluded articles (n=1343)
- Not meet inclusion criteria n=1343, (5073)
- Not obtainable n=51

Re-sorting of articles included in the review n=85 (36)
Education 4 (2), Medicine 17 (17), Music 4 (0), Psychology 66 (12), Sports 4 (9)

Articles found in selected articles by hand search of the reference lists n=2 (4)

Articles included in the review n=89 (38)
Education 5 (3), Medicine 17 (17), Music 5 (0), Psychology 66 (12), Sports 4 (9)

Excluded SR by hand search of the reference lists n=6

Final article selection to include in the review n=95 (38)
Education 6 (3), Medicine 20 (17), Music 5 (0), Psychology 66 (12), Sports 4 (9)

Final article selection of both selection processes to include in the review n=133
Education 9, Medicine 37, Music 5, Psychology 82, Sports 10
Schlüsselwörter?

Total publications: 133

1. Mental practice (47%)
2. Motor imagery (16%)
3. Mental imagery (10%)
4. Mental training (8%)
5. Mental rehearsal (5%)
6. Visual imagery (3%)
7. Guided imagery (2%)
8. Other combinations (10%)
Table 2 Overview of extracted MITS<sup>a</sup> elements

<table>
<thead>
<tr>
<th>Number</th>
<th>MITS element</th>
<th>MITS element description and categories</th>
<th>PETTLEP category</th>
<th>Dominant category found in successful MI&lt;sup&gt;b&lt;/sup&gt; interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Position</td>
<td>Describes the position of the individual during MI practice as task-specific or not task-specific.</td>
<td>Physical</td>
<td>Task-specific</td>
</tr>
<tr>
<td>2</td>
<td>Location</td>
<td>Describes the location of MITS as task-specific or not task-specific.</td>
<td>Environment</td>
<td>Task-specific</td>
</tr>
<tr>
<td>3</td>
<td>Focus</td>
<td>Each task consists of different parts. Focus of the intervention classifies the main focus of task-related activities that had to be imagined: motor, cognitive or strength.</td>
<td>Task</td>
<td>Motor-focused activities</td>
</tr>
<tr>
<td>4</td>
<td>Order</td>
<td>Describes temporal order of MI and PP trials. MI trials could have been performed before, between, after or simultaneously with PP.</td>
<td>Timing</td>
<td>MI after PP</td>
</tr>
<tr>
<td>5</td>
<td>Integration</td>
<td>Describes whether MI practice has been added to PP or embedded into PP.</td>
<td>Added</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MI instructions medium</td>
<td>MI instructions can be provided differently through one or more media types. Media type was scored as acoustic, written or visual. More than one media type could be assigned.</td>
<td>Learning</td>
<td>Acoustic</td>
</tr>
<tr>
<td>7</td>
<td>Instruction mode</td>
<td>In addition to the instruction medium, the mode was classified as live or pre-recorded (for example, using tape or video).</td>
<td>Live</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Supervision</td>
<td>MITS could have been supervised or not supervised by an instructor present during the session.</td>
<td>Supervised</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Directedness</td>
<td>MITS could have been directed or non-directed when stepwise guidance was present or not.</td>
<td>Non-directed</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Instruction type</td>
<td>The description of MI instructions varied. Instructions could cover detailed descriptions for each part of the task that had to be imagined, simple keywords, or coarse (broad) overall MI instructions.</td>
<td>Detailed</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Instruction individualisation</td>
<td>MI instructions could have been individualised to the participant’s problems with the task that had to be imagined (tailored), or could have been the same for each participant (standardised).</td>
<td>Standardised</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Familiarisation</td>
<td>Describe whether study participants had received an MI familiarisation session before the MI intervention began.</td>
<td>No familiarisation</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Change</td>
<td>Indicated whether modification of content, duration or dosage of the MI training occurred, to facilitate the learning process during the MI intervention period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>MI session</td>
<td>MITS could have been classified as group sessions with more than one person participating in a MITS or as individual sessions with one participant only.</td>
<td>Emotion</td>
<td>Individual</td>
</tr>
<tr>
<td>15</td>
<td>Eyes</td>
<td>During the MI, the participant’s eyes could have been closed or open. In some interventions, participants started with one condition and changed to the other after one or several MITS.</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Perspective</td>
<td>During the MI, participants could have imagined the task from an internal or external perspective. In some interventions, participants started with one condition and changed to the other after one or several MITS.</td>
<td>Perspective</td>
<td>Internal</td>
</tr>
<tr>
<td>17</td>
<td>Mode</td>
<td>During the MI, participants could have used a kinaesthetic or visual mode. In some MI interventions, participants started with one condition and changed to the other during one or after several MITS.</td>
<td>Kinaesthetic</td>
<td></td>
</tr>
</tbody>
</table>
Interventionsparameter (129 Positive)

Interventionsparameter (129 Positive)
Interventionsparameter (129 Positive)
Interventionsparameter Medizin
Interventionsparameter Medizin

Techniken der Bewegungsvorstellung in der Schlaganfallrehabilitation
Zeitparameter

Zeitparameter

Positive 129

Medizin 37
Weitere Vergleichsanalysen

- Bezüglich anschliessendes oder integriertes BV-Training
- Bezüglich verschiedener BV-Trainingsfoki
- Bezüglich verschiedener Trainingstypen (individuell, Gruppe)
- Bezüglich verschiedener Altersgruppen (Studenten)
- Bezüglich beider Geschlechter
- Bezüglich Veränderungen in Inhalt, Dauer, Dosierung des BV-Trainings
Zusammenfassung Parameter

• Intervention
  – Sitzungsart, Integration, Reihenfolge, Supervision, Führung, Lokalisation, Position, Medium, Instruktionstyp, individuelle Instruktion, Instruktionsmodus, Augen, Perspektive, Modus, Fokus

• Temporal / Zeitparameter
  – BV-Trials, BVTS-Dauer, Anzahl BVTS, BV-Interventionsdauer
Relevanz für die Praxis

• Überblick über BV-Elemente in 5 verschiedenen Disziplinen
  ⇒ gleiche und verschiedene BV-Trainingsansätze

• Definition and Standardisierung von 17 BV-Trainingselemente und 7 Zeitparameter
  ⇒ Erarbeiten einer logischen Struktur für BV-einsatz in der Therapie und Design von BV-Interventionen

• 8 durchgeführte Analysen und Vergleiche bezüglich relevanter BV-Designelemente
  ⇒ Erleichterung der Auswahl für patientenspezifischen BV-Interventionen

Techniken der Bewegungsvorstellung in der Schlaganfallrehabilitation
Systematischer Literaturreview
(2007 – 2011)

Schuster et al. BMC Medicine 2011, 9:75
http://www.biomedcentral.com/1741-7015/9/75

Best practice for motor imagery: a systematic literature review on motor imagery training elements in five different disciplines

Corina Schuster¹,², Roger Hilfiker³, Oliver Amft⁴,⁵*, Anne Scheidhauer¹, Brian Andrews⁶,⁷, Jenny Butler², Udo Kischka¹,⁸ and Thierry Ettlin¹,⁹
Take home message

Motor imagery

- it's more than just to close your eyes!
Vielen Dank für Ihre Aufmerksamkeit!

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c.schuster@reha-rhf.ch
Besten Dank.

www.reha-rhf.ch
Referenzen


• Schuster C, Glässel A, Ettlin T, Butler J. Motor imagery experiences and use: asking patients after stroke where, when, what, why, and how they use imagery - a qualitative investigation. Stroke Research and Treatment 2012;accepted for publication.