Supplementary Material

# Supplementary Data

## Initial search Query

 (((((((((((("stroke") OR cerebral stroke[MeSH Terms]) OR "cerebrovascular stroke") OR cerebrovascular stroke[MeSH Terms]) OR cerebrovascular accident[MeSH Terms]) OR "apoplexy") OR apoplexy[MeSH Terms]) OR apoplexy, cerebrovascular[MeSH Terms]))))

AND

((((("upper limb") OR upper limb[MeSH Terms]) OR "upper extremity") OR upper extremity[MeSH Terms]))) AND ((Clinical Study[ptyp] OR Clinical Trial[ptyp] OR Observational Study[ptyp] OR Randomized Controlled Trial[ptyp]) AND ("2013/01/01"[PDat] : "2018/05/04"[PDat])

AND

 (English[lang] OR German[lang]))

## Follow-up search Query

(((((((((((("stroke") OR cerebral stroke[MeSH Terms]) OR "cerebrovascular stroke") OR cerebrovascular stroke[MeSH Terms]) OR cerebrovascular accident[MeSH Terms]) OR "apoplexy") OR apoplexy[MeSH Terms]) OR apoplexy, cerebrovascular[MeSH Terms]))))

AND

((((("upper limb") OR upper limb[MeSH Terms]) OR "upper extremity") OR upper extremity[MeSH Terms]))) AND ((Clinical Study[ptyp] OR Clinical Trial[ptyp] OR Observational Study[ptyp] OR Randomized Controlled Trial[ptyp]) AND ("2013/01/01"[PDat] : "2020/11/13"[PDat])

AND

(English[lang] OR German[lang]))

# Supplementary Figures and Tables

## Supplementary Figures



**Supplementary Figure 1.** Transformed data from individual data sources in percentage of recovery over the time course of one year after stroke. Individual assessments are color coded and the size depicts the underlying sample size. ARAT – Action research Arm Test, BBT – Box and Block test, F-M – Fugl Meyer Assessment (upper extremity), GRIP – Grip force, MI – Motricity Index, PEG – Peg test, RMA – Rivermead Motor Assessment, SIS – Stroke Impact Scale, WMFT – Wolf Motor Function Test.



**Supplementary Figure 2.** Risk of bias graph - methodological quality of included randomized trials rated with the Cochrane Risk of Bias Tool RoB2.

**Supplementary Figure 3.** Prediction of recovery across all assessments over the time course of one year cross-fading raw values. The light-green line resembles a healthy score, respective to 100% recovery

## Supplementary Tables

|  |  |  |  |
| --- | --- | --- | --- |
| contacted authors for additional information | extracted data from plots | recalculated means and sd from median and range | dropped reference due to missing information |
| Adie et al. 2017Feys et al. 1998Gialanella et al. 2015Ghaziani et al. 2018Harvey et al. 2018Kong et al. 2016Kwakkel et al. 1999Lang et al. 2013Lincoln et al. 1999Lohse et al. 2016Meyer et al. 2015Nadeau et al. 2014Persson et al. 2015Rodgers et al. 2003Rodgers et al. 2019Saposnik et al. 2016Shaw et al. 2010Stinear et al. 2017Winstein et al. 2016Wolf et al. 2006Zheng et al. 2015 | Feys et al. 1998 FMAWolf et al. 2006 WMFT | Kwakkel et al. 1999 ARAT | Feys et al. 1998 ARATKwakkel et al. 1999 FMASaposnik et al. 2016 WMFT, Grip, SIS |

**Supplementary Table 1.** Overview over studies of which the original articles did not provide sufficient information for the meta-regression or where data was extracted by other means and studies dropped from the final analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **N ischemic infarction**  | **N Dominant hand = right** | **N Affected arm = right** | **N Affected arm = dominant side** |
| Adie et al. 2017 (1) | 209 | 206 |  \*  |  \*  |
| Brunner et al. 2017 (2) | 95 | 108 | 53 |  \*  |
| Chen et al. 2016 (3) | 250 |  \*  | 88 |  \*  |
| Cramer et al. 2017(4) | 133 |  \*  |  \*  |  \*  |
| Feys et al. 1998 (5) | 95 |  \*  | 42 |  \*  |
| Ghaziani et al. 2018 (6) | 80 | 100 | 53 |  \*  |
| Gialanella & Santoro 2015 (7) | 167 |  \*  |  \*  |  \*  |
| Guo et al. 2019 (8) | 54 |  \*  |  \*  |  \*  |
| Harvey et al. 2018 (9)  | 157 |  \*  | 94 | 178 |
| Ietswaart et al. 2011 (10) |  \*  |  \*  | 52 |  \*  |
| Kong et al. 2016 (11) | 80 |  \*  | 40 |  \*  |
| Kwakkel et al. 1999 (12) |  \*  |  \*  |  \*  |  \*  |
| Kwakkel et al. 2016 (13) | 159 |  \*  | 54 | 54 |
| Lincoln et al. 1999 (14) |  \*  | 282 | 125 |  |
| Lohse et al. 2016 (15) |  \*  |  \*  |  \*  |  \*  |
| Meyer et al. 2016 (16) | 108 | 113 | 48 |  \*  |
| Morris et al. 2008 (17) | 9 | 54 | 52 | 92 |
| Nadeau et al. 2014 (18) | 163 |  \*  |  \*  |  \*  |
| Opheim et al. 2014 (19) | 100 |  \*  | 55 |  \*  |
| Rodgers et al. 2003 (20) | 112 | 111 | 54 |  \*  |
| Rodgers et al. 2019 (21) |  \*  |  \*  |  \*  |  \*  |
| Saposnik et al. 2016 (22) | 141 | 125 | 66 |  \*  |
| van Vliet et al. 2005 (23) |  \*  |  \*  | 61 |  \*  |
| Veerbeek et al. 2018 (24) | 202 |  \*  | 85 |  \*  |
| Wang et al. 2020 (25) | 0 |  \*  |  \*  |  \*  |
| Wilson et al. 2016 (26) | 98 |  \*  | 62 | 41 |
| Wolf et al. 2006 (27) | 195 |  \*  |  \*  | 110 |

**Supplementary Table 2.** Additional background information on type of infarction, hemispherical dominance and handedness of the study population. \*no information on this criteria was available.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study ID** |  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Adie et al. 2017 (1) |  |  |  | 0 |  | 11 |  |  |  |  |  | 15 |  |  |
| Brunner et al. 201 7(2) |  |  | 0 | 7 |  | 15 |  |  |  |  |  |  |  |  |
| Chen et al. 2016 (3) |  | 0 | 4 | 4 |  |  |  |  |  |  |  |  |  |  |
| Cramer et al. 2017 (4) |  | 0 |  |  | 39 |  |  |  |  |  |  |  |  |  |
| Feys et al. 1998 (5) |  |  | 0 | 0 | 0 |  |  | 4 |  |  |  |  |  | 10 |
| Ghaziani et al. 2018 (6) |  | 0 | 4 |  |  |  |  | 14 |  |  |  |  |  |  |
| Gialanella & Santoro 2015 (7) |  |  | 0 | 0 |  |  |  |  |  |  |  |  |  |  |
| Guo et al. 2018 (8) |  |  |  |  | 0 | 0 |  | 0 |  |  | 0 |  |  |  |
| Harvey et al. 2018 (9) \* |  |  |  |  | 86 | 82 | 51 | 50 | 40 | 29 | 25 | 40 | 0 | 11 |
| Ietswaart et al. 2011 (10) |  |  |  |  |  |  | 0 | 0 |  |  |  |  |  |  |
| Kong et al. 2016 (11) |  | 0 | 0 | 3 |  | 5 |  |  |  |  |  |  |  |  |
| Kwakkel et al. 1999 (12) |  | 0 |  | 0 | 0 |  | 0 | 0 |  |  |  |  |  |  |
| Kwakkel et al. 2016 (13) |  | 0 | 3 | 3 | 3 |  |  | 3 |  |  |  |  |  |  |
| Lincoln et al. 1999 (14) |  |  | 20 | 0 | 51 |  |  | 23 |  |  |  |  |  |  |
| Lohse et al. 2016 (15) \* |  | 96 | 43 | 0 | 35 | 35 | 49 | 62 | 78 | 79 | 86 | 87 | 86 | 85 |
| Meyer et al. 2016 (16) \* |  |  | 74 | 31 | 0 | 62 | 87 | 33 |  |  |  |  |  |  |
| Morris et al. 2008 (16) |  |  | 0 | 8 |  |  |  |  | 20 |  |  |  |  |  |
| Nadeau et al. 2014 (18) |  |  |  | 0 |  |  |  |  |  |  | 0 |  |  |  |
| Opheim et al. 2014 (19) |  | 0 |  |  |  |  |  |  |  |  |  |  |  | 33 |
| Rodgers et al. 2003 (20) |  | 0 |  | 15 |  |  |  | 41 |  |  |  |  |  |  |
| Rodgers et al. 2019 (21) |  |  |  |  |  |  | 0 |  |  |  |  |  |  |  |
| Saposnik et al. 2016 (22) |  |  | 0 | 14 | 30 |  |  |  |  |  |  |  |  |  |
| van Vliet et al. 2005 (23) |  | 39 | 0 |  | 14 |  |  | 12 |  |  |  |  |  |  |
| Veerbeek et al. 2018 (24) |  | 0 |  |  |  |  |  | 0 |  |  |  |  |  |  |
| Wang et al. 2020 (25) |  |  |  | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |
| Wilson et al. 2016 (26) |  |  |  |  | 0 |  | 13 | 17 |  | 25 |  |  |  | 30 |
| Wolf et al. 2006 (27) |  |  |  |  |  |  |  | 0 | 8 |  |  |  |  |  |

**Supplementary Table 3.** Drop-out rate per time point and included study in percentage. When multiple assessments were measured per study, the drop-out rate was averaged over all measured assessments. Studies marked by an asterix (\*) provided individual patient data, thus the drop-out rate is relative to the largest sample size provided at any time-point and not representative for the provided data set.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **Total**  | 2416 | 4019 | 5019 | 2571 | 1321 | 1007 | 3294 | 634 | 296 | 736 | 566 | 272 | 496 |
| **Participants** | 1510 | 1814 | 3156 | 1652 | 887 | 759 | 2077 | 464 | 231 | 736 | 465 | 272 | 496 |
| **Study groups** | 46 | 70 | 78 | 57 | 30 | 27 | 68 | 12 | 7 | 9 | 8 | 4 | 10 |
| **Studies** | 11 | 13 | 16 | 13 | 8 | 8 | 15 | 4 | 3 | 4 | 3 | 2 | 5 |

**Supplementary Table 4.** Overview of available data per time point. ‘Total’ represent the summed number of collected measures from participants per study and per assessment. ‘Participants’ depicts the total number of participants per time point. ‘Study groups’ summarize the number of different study groups (f.i. treatment, control) per time point over all studies, and ‘Studies’ represents the number of studies of whom data points have been collected during the respective month after stroke.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **ARAT** | 13 | 16 | 23 | 10 | 10 | 12 | 17 | 4 | 2 | 2 | 4 | 2 | 2 |
| **BBT** | 4 | 6 | 4 | 4 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FMA** | 13 | 15 | 16 | 17 | 11 | 10 | 18 | 1 | 4 | 6 | 1 | 1 | 7 |
| **grip force** | 1 | 6 | 5 | 5 | 0 | 3 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Motricity** | 2 | 1 | 3 | 1 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| **peg test** | 0 | 7 | 5 | 2 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 |
| **Rivermead** | 2 | 4 | 5 | 5 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 |
| **SIS** | 7 | 9 | 11 | 6 | 5 | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 0 |
| **WMFT** | 4 | 6 | 6 | 7 | 1 | 1 | 7 | 3 | 1 | 1 | 1 | 1 | 1 |
| **sum** | 46 | 70 | 78 | 57 | 30 | 27 | 68 | 12 | 7 | 9 | 8 | 4 | 10 |

**Supplementary Table 5.** Data points per time point. Each study group is counted as an individual data point per assessment and time point. Month 0 corresponds to assessment measured within the first two weeks after stroke.

|  |  |  |  |
| --- | --- | --- | --- |
| Assessment | Time After Stroke | Recovery (%) | Original Scale |
| ARAT | 3 months (12 weeks) | 43.6 (27.8,68.3) | 24.9 (15.9,38.9) |
| 6 months (24 weeks) | 50.9 (32.5,79.6) | 29 (18.5,45.4) |
| 12 months (52 weeks) | 57.8 (36.1,92.6) | 32.9 (20.5,52.8) |
| BBT | 3 months (12 weeks) | 27.6 (17.1,44.3) | 20.4 (12.7,32.8) |
| 6 months (24 weeks) | 31.5 (19.5,50.8) | 23.3 (14.4,37.6) |
| 12 months (52 weeks) | 34 (19.3,60.1) | 25.2 (14.2,44.5) |
| F-M | 3 months (12 weeks) | 52.2 (33.4,81.7) | 34.5 (22,53.9) |
| 6 months (24 weeks) | 56.8 (36.3,88.8) | 37.5 (24,58.6) |
| 12 months (52 weeks) | 54.6 (34.3,86.9) | 36.1 (22.7,57.4) |
| GRIP | 3 months (12 weeks) | 19.4 (12,31.1) | 19.4 (12,31.1) |
| 6 months (24 weeks) | 25.5 (15.9,41.1) | 25.5 (15.9,41.1) |
| 12 months (52 weeks) | 38.6 (21.5,69.2) | 38.6 (21.5,69.2) |
| healthy | 3 months (12 weeks) | 112.8 (72.1,176.5) | 112.8 (72.1,176.5) |
| 6 months (24 weeks) | 113.1 (72.4,176.5) | 113.1 (72.4,176.5) |
| 12 months (52 weeks) | 90.1 (57.1,142.1) | 90.1 (57.1,142.1) |
| MI | 3 months (12 weeks) | 45 (27,75.1) | 45 (27,75.1) |
| 6 months (24 weeks) | 41.8 (25.1,69.6) | 41.8 (25.1,69.6) |
| 12 months (52 weeks) | 27.9 (14.5,53.7) | 27.9 (14.5,53.7) |
| PEG | 3 months (12 weeks) | 6.1 (3.7,10.1) | 0.1 (0.1,0.2) |
| 6 months (24 weeks) | 7.5 (4.6,12.2) | 0.2 (0.1,0.3) |
| 12 months (52 weeks) | 9.6 (5.3,17.5) | 0.2 (0.1,0.4) |
| RMA | 3 months (12 weeks) | 33.3 (20.6,54) | 5 (3.1,8.1) |
| 6 months (24 weeks) | 38 (23.5,61.4) | 5.7 (3.5,9.2) |
| 12 months (52 weeks) | 40.9 (23,72.7) | 6.1 (3.4,10.9) |
| SIS | 3 months (12 weeks) | 53.6 (33.9,84.8) | 13.4 (8.5,21.2) |
| 6 months (24 weeks) | 58 (36.5,92.2) | 14.5 (9.1,23.1) |
| 12 months (52 weeks) | 55.2 (32.2,94.4) | 13.8 (8.1,23.6) |
| WMFT | 3 months (12 weeks) | 61.9 (38.7,98.8) | 46.6 (74,2.7) |
| 6 months (24 weeks) | 67.5 (42.4,107.2) | 39.9 (69.6,-7.2) |
| 12 months (52 weeks) | 65.4 (38.5,111.2) | 42.3 (74.3,-12) |

**Supplementary Table 6.** Predicted recovery scores. The final model (LOCF) indicated a significant change in measured recovery after stroke over time when measured with the ARAT, BBT, F-M, GRIP, PEG, or when measuring RMA. The table presents predicted values within the standardized scale and in the original scale.

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