**S1 Table. Details of the research included.**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type** | **Author** | **Year** | **Country** | **Design** | **Subjects** | | | **Intervention** | | | | **Outcome** | **Results** | | | | |
| **Sample**  **Size** | **Age** | **Time since stroke** | **Methods** | **minutes per session** | **times**  **per**  **week** | **duration** | **pre** | **post** | **within group** | **between group** | **Comment** |
| NIBS | Aşkın A et al. | 2017 | Turkey | RCT | IG: 20  CG:20 | IG: 58.80 (12.02)  CG: 56.75 (11.46) | IG: 24.35(15.39) months  CG: 28.35(15.34) months | IG: LF-rTMS(10 sessions) + CT (20 sessions)  CG: CT | LF-rTMS : 20  CT: n.d. | 5 | 4 | FMAUE  BBT | FMAUE  IG: 15.0 (0.0-58.0)  CG: 15.5 (0.0-58.0)    BBT  IG: 0.5 (0.0 - 39.0)  CG: 0.0(0.0 - 46.0) | FMAUE  IG: 15.5 (0.0-58.0)  CG: 18.5 (1.0-63.0)    BBT  IG: 1.0 (0.0-38.0)  CG: 1.0 (0.0-78.0) | + | + | FMAUE was significantly increased in both groups. LF-rTMS group was significantly improved FMA-UE score compared to control group. |
| Kuzu Ö et al | 2021 | Turkey | RCT | IG1: 7  IG2: 7  CG: 6 | IG1: 56.3 (11.5)  IG2: 61.3 (9.8)  CG: 65.0 (4.6) | IG1: 16.4 (2.5) months  IG2: 14.5 (1.6) months  CG: 14.5 (2) month | IG1: LF-rTMS + CT  IG2: cTBS + CT    CG: sham cTMS + CT | LF-rTMS: 10 sessions  cTBS: 10 sessions sham cTBS: 10 sessions  CT 30min | n.d. | n.d. | FMAUE | FMAUE  IG1: 14.7 (8.2)  IG2: 19.4 (14.2)  CG: 19.2 (11.1) | FMAUE   T1 (immediately effect)  IG1: 20.3 (9.1)  IG2: 22.7 (14.8)  CG: 20.3 (11.1)    T2 (4 week)  IG1: 22.4 (10.5)  IG2: 23.6 (14.4)  CG: 20.3 (11.1) | + | + | Both LF-rTMS and cTBS group were significantly improved compared with sham cTBS group follow up at after intervention and 4 weeks. |
| Kashoo FZ et al | 2022 | Saudi Arabia | RCT | IG: 32  CG: 32 | IG: 58.7 (5.7)  CG: 59.9 (5.6) | IG: 7.8 (1.3) months  CG: 7.4 (1.2) months | IG: tDCS + MI  CG: Sham-tDCS + MI | 30 | 5 | 2 | FMAUE | FMAUE  IG: 20.6 (2.6)  CG: 20.4 (3.7)   ARAT  IG: 17.6 (2.6)  CG: 17.4 (3.7) | FMAUE  IG: 28.3 (6.9)  CG: 22.8 (5.0)   ARAT  IG: 24.5 (6.9)  CG: 18.9 (5.1) | + | + | FMAUE and ARAT scores were significantly improved at pre to post in tDCS + motor imagery group. |
| Koh CL et al | 2017 | Taiwan | RCT | IG: 14  CG: 11 | IG: 55.3 (11.4)  CG: 56.9 (13.5) | IG: 15.8 (8.1) months  CG: 13.4 (9.4) months | IG: tDCS + Exercise  CG: Sham-tDCS + Exercise | 30 | 3 | 8 | FMAUE | FMAUE  IG: 20.4 (6.2)  CG: 27.2 (9.4)    ARAT  IG: 2.1 (2.1)  CG: 4.7 (9.1) | FMAUE  T1 (Immediately)  IG: 26.4 (7.7)  CG: 28.5 (11.2)  T2 (After 3 months)  IG: 25.1 (7.9)  CG: 26.2 (11.4)  T3 (After 6 months)   IG: 24.7 (7.7)  CG: 27.4 (11.1)    ARAT  T1 (Immediately)  IG: 2.6 (2.6)  CG: 4.7 (9.7)  T2 (After 3 months)  IG: 7.1 (5.1)  CG: 5.2 (12.5)  T3 (After 6 months)  IG: 2.8 (2.7)  CG: 4.0 (8.4) | - | - | No significant difference in both groups at pre to post. |
| Llorens R et al | 2021 | Spain | RCT | IG: 16  CG: 16 | IG: 57.6 (6.9)  CG: 52.3 (10.9) | IG: 8.7 (2.3) months  CG: 9.3 (2.4) months | IG: tDCS + VR + CT  CG: CT | 60 | 5 | 3 | FMAUE  WMFT | FMAUE  IG: 9.50 (5.11)  CG: 9.87 (4.82)    WMFT  IG: 110.2 (13.9)  CG: 100.3 (16.8) | FMAUE  IG: 10.13 (4.60)  CG: 14.79 (7.37)    WMFT  IG: 103.1 (17.6)  CG: 98.8 (18.6) | + | + | FMAUE and WMFT scores were significantly improved at pre to post in tDCS with virtual reality + conventional physical therapy group compared to conventional physical therapy group. |
| Robotic assist training | Conroy SS et al | 2019 | USA | RCT | IG: 23  CG: 22 | IG: 56.4 (12.7)  CG: 55.7 (10.2) | IG: 39.3 months   CG: 33.5 months | IG: Robot training and physical therapy  CG: Robot training only | IG: 45min robot training + 15min Physical Therapy CG; 60 min robot training only | 3 | 12 | FMAUE | FMAUE  IG: 20.61 (1.86)  CG: 22.47 (2.03) | FMAUE   T1 (12 week)  IG: 25.34 (2.73)  CG: 25.42 (2.54)    T2 (24 week)  IG: 26.82 (2.96)  CG: 25.32 (2.76) | + | - | FMAUE was significantly increased in both groups. No significantly difference in between groups. |
| Page SJ et al | 2012 | USA | RCT | IG: 8  CG: 8 | IG: 59.0 (12.9)  CG: 58.5 (9.5) | IG: 44.7 (38.4) months  CG: 106.8 (114.6) months | IG: RAT  CG: TOT | 60 | 3 | 8 | FMAUE | FMAUE  IG: 22.88 (5.74)  CG: 21.63 (5.71) | FMAUE  IG: 22.86 (7.01)  CG: 21.0 (7.54) | - | - | No significant difference in both groups at pre to post. |
| Houseman SJ et al | 2009 | USA | RCT | IG: 14  CG: 14 | IG: 54.2 (11.9)  CG: 56.4 (12.8) | IG: 84.5 (96.3) months  CG: 112.4 (128.5) months | IG: RAT  CG: CT | 60 | 3 | 8 | FMAUE | FMAUE  IG: 21.7 (5.9)  CG: 18.1 (5.0) | FMAUE   T1 (After 24 sessions)  IG: 25.0 (8.3)  CG: 20.3 (7.6)   T2 (After 6 months)  IG: 25.3 (9.8)  CG: 19.6 (7.7) | + | - | FMAUE was significantly improved in both groups. No significantly difference in between groups. |
| Volpe BT et al | 2008 | USA | RCT | IG: 11  CG: 10 | IG: 62 (3)  CG: 60 (3) | IG: 35 (7) months  CG: 40 (11) months | IG: RAT  CG: CT | 60 | 3 | 6 | FMAUE | FMAUE  IG: 12.55 (1.5)  CG: 11.60 (1.0) | FMAUE   T1(Discharge)  IG: 15.73 (2.0)  CG: 15.10 (2.0)   T2(After 3 months)  IG: 15.82 (2.1)  CG: 14.80 (1.6) | + | - | Treatment with robotic training and an intensive movement-based protocol had comparable effects on improving motor outcome, as reflected in nonsignificant treatment interactions |
| Kim JA et al | 2023 | Korea | RCT | IG: 15  CG: 15 | IG: 65.53 (8.43)  CG: 64.53 (7.72) | IG: 214.20 (69.52) days  CG: 210.60 (80.78) days | IG: RAT  CG: ROM ex. | IG: 35  CG: 30 | 3-4 | 3 | FMAUE | FMAUE  IG: 19.00 (14.00 - 24.00)  CG: 23.00 (12.00 - 34.00) | FMAUE  IG: 21.00 (15.00 - 27.00)  CG: 23.00 (12.00 - 34.00) | + | - | FMAUE was significantly improved in both groups. No significantly difference in between groups. |
| Conroy SS et al | 2011 | USA | RCT | IG1: 20  IG2: 21  CG: 21 | IG1: 57 (12)  IG2: 60 (13)  CG: 56(6.3) | IG1: 3 (2) years  IG2: 5 (8) years  CG: 4(6) years | IG1: RAT (Planar)  IG2: RAT (Planar + Vertical)  CG: CT | 60 | 3 | 6 | FMAUE  WMFT | FMAUE  IG1: 20.3 (14.7)  IG2: 16.5 (10.6)  CG: 18.2 (12.5)   WFMT (Time)  IG1: 71.5 (40.2)  IG2: 87.1 (35.7)  CG: 82.8 (33.3) | FMAUE  T1 (After 6 weeks)  IG1: 23.24 (15.47)  IG2: 18.2 (11.4)  CG: 19.39 (13.28)   T2 (After 12 weeks)  IG1: 23.6 (15.5)  IG2: 19.11 (11.41)  CG: 20.02 (13.28)   WFMT (Time)  T1  IG1: 71.5 (40.2)  IG2: 87.1 (35.7)  CG: 81.09 (35.36)  T2  IG1: 66.97 (42.32)  IG2: 83.73 (37.86)  CG: 80.03 (35.37) | + | - | FMAUE was significantly improved in Planar and Planar with Vertical groups after 6 weeks. No significantly difference in between groups. FMA-UE was significantly improved in all groups after 12 weeks.  The planar group significantly improved their WFMT score compared to the other group after 6 weeks. |
| BCI | Miao Y et al | 2020 | China | RCT | IG: 8  CG: 8 | IG: 30 - 70  CG: 25 - 72 | IG: 18.3 (10.9) months  CG: 11.1(5.0) months | IG: BCI  CG: TENS + TOT | BCI: 2 session/1time | 3 | 4 | FMAUE | FMAUE  IG: 19.5 (9.9)  CG: 20.6 (9.7) | FMAUE  IG: 23.0 (11.4)  CG: 21.5 (10.0) | + | - | FMAUE was significantly increased in both groups. No significantly difference in between groups. |
| Biasiucci A et al | 2018 | Switzerland | RCT | IG: 14  CG: 13 | IG: 41 - 76  CG: 36 - 76 | IG: 10- 176 months   CG: 11 - 121 months | IG: BCI + FES  CG: Sham-BCI | 60 | 2 | 5 | FMAUE | FMAUE  IG: 21.6 (10.8)  CG: 19.9 (11.2) | FMAUE  IG: 28.5 (10.8)  CG: 22.0 (12.2) | + | + | FMAUE was significantly improved in BCI group compared to sham-BCI group. |
| ES | Gabr U et al | 2005 | USA | RCT | IG: 8  CG: 4 | All: 59.75 | All: 52.75 months | IG: ES  CG: CT | 35 | 2 | 8 | FMAUE  ARAT | FMAUE  IG: 12.0  CG: 15.83   ARAT  IG: 1.428  CG: 0 | FMAUE  T1 (After 8 weeks)  IG: 18.875  CG: 16.83  T2 (After 16 weeks)  IG: 11.0  CG: 16.54   ARAT  T1  IG: 1.571  CG: 0  T2  IG: 0  CG: 0 |  |  | No statistical analysis. |
| Carda S et al | 2017 | Switzerland | Crossover design | IG: 5  CG: 6 | IG: 45.6 (14.5)  CG: 49.8 (13.3) | IG: 52 (50.5) months   CG: 41.5 (31.7) months | IG: ES + Exercise  CG: CT | 90 | 5 | 2 | FMAUE  WMFT | FMAUE  IG: 11 (5.4)  CG: 13.2 (4.9)   WMFT (Time)  IG: 99.8 (20.3)  CG: 86.2 (31.3)   WMFT (FAS)  IG: 12.6 (10.8)  CG: 14.8 (11.3) | FMAUE  IG: 23.2 (10.7)  CG: 17.5 (7.5)   WMFT (Time)  IG: 93.4 (18.5)  CG: 87.5 (30)   WMFT (FAS)  IG: 15.8 (13.5)  CG: 14.8 (11.3) | + | + | FMAUE was significantly improved in IG after 2 weeks.  WMFT was not significantly improved in both groups. |
| Akter R et al | 2023 | Bangladesh | RCT | IG: 12  CG: 13 | IG: 49.15 (12.76)  CG: 58.58 (9.42) | All: over 6 months | IG: FES + Exercise  CG: CT | 60 | 5 | 4 | FMAUE | FMAUE   IG: 21.15 (1.07)  CG: 21.33 (0.898) | FMAUE   IG: 47.38 (0.984)  CG: 33.50 (1.209) | + | + | FMAUE was significantly improved in FES group compared to control group after 4 weeks. |
| Minami S et al | 2021 | Japan | Crossover design | IG: 5  CG: 4 | IG: 64.0 (13.4)  CG: 61.7 (10.4) | IG: 8.4 (4.5) years  CG: 9.3 (9.2) years | IG: ES + Exercise  CG: CT | 60 | 3 | 12 | FMAUE | FMAUE  IG: 20.4 (7.6)  CG: 28.8 (12.6) | FMAUE  IG: 30.0 (11.9)  CG: 28.6 (12.3) | + | + | FMAUE was significantly improved at pre to post in IG. |
| Page SJ et al | 2012 | USA | RCT | IG1: 9  IG2: 8  IG3: 8  CG: 7 | All: 57.6 (10.1) | All: 53.8 (69.4) months | IG1: TOT (30min) +ESN  IG2: TOT (60min) + ESN  IG3: TOT (120min) + ESN  CG: Home exercise program | IG1: 30  IG2: 60  IG3: 120  CG: 30 | 5 | 8 | FMAUE  ARAT  BBT | FMAUE:  IG1: 21.0 (3.3)  IG2: 26.6 (10.4)  IG3: 27.1 (7.5)  CG: 25.6 (9.9)    BBT  IG1: 0.7 (1.1)  IG2: 5.6 (9.0)  IG3: 9.8 (11.7)  CG: 7.9 (15.2)    ARAT  IG1: 6.4 (4.9)  IG2: 11.6 (14.4)  IG3: 18.6 (12.3)  CG: 10.9 (14.6) | FMAUE  IG1: 22.9 (3.4)  IG2: 27.9 (9.4)  IG3: 31.3 (9.2)  CG: 26.9 (12.0)    BBT  IG1: 1.6 (2.6)  IG2: 4.8 (7.6)  IG3: 12.5 (14.2)  CG: 7.7 (15.0)    ARAT  IG1: 8.3 (6.5)  IG2: 13.0 (14.9)  IG3: 22.3 (14.1)  CG: 12.3 (15.0) | + | - | FMAUE, BBT, and ARAT were significantly improved in 120min RTP + ESN group.  ARAT was significantly improved in 30, 60 min RTP + ESN group. No significantly difference in between groups. |
| VR | Fischer HC et al | 2007 | USA | RCT | IG1: 5  IG2: 5  CG: 5 | IG1: 32 - 64  IG2: 50 - 88  CG: 42 - 68 | IG1: 1.25 - 9 years  IG2: 2 - 12 years  CG: 2 - 38 | IG1: VR (Cable orthosis)  IG2: VR (Pneumatic orthosis  CG: Exercise | 60 | 3 | 6 | FMAUE  WMFT  BBT | FMAUE  IG1: 28 (17)  IG2: 19 (9)  CG: 25 (5)   WMFT (Time)  IG1: 76.4 (37)  IG2: 92.0 (36.4)  CG: 86.1 (32.2)   BBT  IG1: 3 (5.3)  IG2: 4 (7.1)  CG: 0 (0.4) | FMAUE  T1 (Post)  IG1: 32 (11)  IG2: 18 (10)  CG: 28 (7)  T2 (After one month)   IG1: 29 (15)  IG2: 20 (11)  CG: 28 (5)   WMFT (Time)  T1 (Post)  IG1: 74.7 (37.5)  IG2: 79.1 (34.2)  CG: 79.9 (38.8)  T2 (After one month)  IG1: 75.8 (34.7)  IG2: 76.1 (37.2)  CG: 73.9 (31.9)   BBT  T1 (Post)  IG1: 5 (7.1)  IG2: 3 (6.6)  CG: 2 (3.6)  T2 (After one month)  IG1: 4 (9.4)  IG2: 4 (8.3)  CG: 3 (1.9) | + | - | FMAUE, WMFT, and BBT were significantly improved in both groups. No significantly difference in between groups. |
| rESWT | Senarath ID et al. | 2023 | Sri Lanka | RCT | IG: 53  CG: 53 | IG: 63.32 (-)  CG: 64.42 (-) | n.d. | IG: rESWT + TOT  CG: TENS + TOT | 45 | rESWT: 1, task specific training: 3 | 4 | FMAUE  ARAT | FMAUE:  IG: 20.23(7.77)  CG: 17.00(6.98)  ARAT:  IG: 7.58(5.38)  CG: 6.53(5.79) | FMAUE:  T1 (immediately effect)  IG: 27.75 (8.68)  CG: 22.02 (7.40)   T2 (4 week)  IG: 41.30 (7.85)  CG: 33.04 (7.85)   ARAT:  T1  IG: 16.34 (7.74)  CG: 11.06 (5.65)   T2  IG: 31.21(6.40)  CG: 23.68 (2.67) | + | - | Both groups showed improvement in both FMAUE, ARAT, and MAS scores in before and after intervention and after 4 weeks.   The rESWT group improved in all outcomes at T1 and T2 compared to the TENS group. |
| Task oriented training | Waller　SMC | 2014 | USA | RCT | IG: 14  CG: 13 | IG: 56  CG: 57 | IG: 5.3 years  CG: 3.1 years | IG: Bilateral TOT  CG Unilateral TOT | 60 | 3 | 6 | FMAUE  WFMT  BBT | FMAUE  IG: 18.7 (9.1)  CG: 23.0 (12.1)    WMFT  IG: 89.9 (9.1)  CG: 78.2 (24.0)   BBT  IG: 2.3 (3.3)  CG: 3.3 (5.7) | FMAUE  T1 (After 12 week)  IG: 24.4 (11.5)  CG: 26.1 (17.4)  T2 (After 18 weeks)  IG: 20.5 (12.9)  CG: 26.8 (16.7)    WMFT  T1 (After 12 week)  IG: 76.0 (18.8)  CG: 76.2 (30.6)  T2 (After 18 weeks)  IG: 77.5  CG: 73.3   BBT  T1 (After 12 week)  IG: 4.1 (6.6)  CG: 5.3 (9.5)  T2 (After 18 weeks)  IG: 2.3 (5.1)  CG: 4.8 (8.5) | + | - | FMAUE, WFMT, and BBT were significantly improved after 12 weeks in both groups. WMFT was significantly improved in COMBO group after 12 weeks compared to SAEBO group. WMFT and BBT were significantly improved after 18 weeks in COMBO group compared to SAEBO group. |
| Mirror Therapy | Colomer C et al | 2016 | Spain | RCT | IG: 17  CG: 17 | IG: 53.8 (5.5)  CG: 53.3 (10.5) | IG: 584.2 (478.7) days  CG: 520.0 (262.5) days | IG: MT  CG: passive ROM ex. | 45 | 3 | 8 | FMAUE  WMFT | FMAUE  IG: 8.5 (1.2)  CG: 9.0 (1.1)   WMFT (Time)  IG: 1615.2 (67.2)  CG: 1492.7 (65.1)   WMFT (FAS)  IG: 10.9 (1.7)  CG: 9.0 (1.1) | FMAUE  IG: 8.6 (1.1)  CG: 9.5 (1.1)   WMFT (Time)  IG: 1539.8 (72.8)  CG: 1405.8 (70.8)   WMFT (FAS)  IG: 10.1 (1.8)  CG: 12.6 (1.8) | - | - | WMFT was significantly difference in both groups at pre to post. No significantly difference in between groups.  FMAUE was not significantly difference in both groups at pre to post. |
| Biofeedback | Cordo P et al | 2013 | Portland | RCT | IG1: 23  IG2: 23 | IG1: 57 (10)  IG2: 54 (12) | IG1: 12.7 (10.8) months  IG2: 6.0 (7.4) months | IG1: Torque Biofeedback  IG2: The Electromyographic (EMG) Biofeedback | 30 | 3-4 | 10-12 | FMAUE | FMAUE  IG1: 23.1 (8.8)  IG2: 19.4 (6.2) | FMAUE  IG1: 27.0 (10.3)  IG2: 23.7 (6.2) | + | - | FMAUE was significantly improved in both groups. No significantly difference in between groups. |
| Other | Zondervan DK et al | 2015 | USA | RCT | IG: 8  CG: 8 | IG: 61 (17)  CG: 54 (14) | IG: 39 (46) months   CG: 19 (9) months | IG: The resonating arm exerciser  CG: CT | 180 | 3 | 3 | FMAUE | FMAUE  IG: 19 (9)  CG: 24 (8) | FMAUE  IG: 21.88 (13.68)  CG: 25.31 (10.59) | + | - | FMAUE was significantly improved in both groups.  MAS was not significantly improved in both groups. |

ARAT: Action Research Arm Test, BBT: Box and Block Test, BCI: Brain-Computer Interface, CG: Control Group, CT: Conventional Therapy, cTBS: Continuous Theta Burst Stimulation, ES: Electrical Stimulation, FES: Functional Electrical Stimulation, FMAUE: Fugl-Meyer Assessment Upper Extremity, IG: Intervention Group, MAS: Motor Assessment Scale, MI: Motor Imagery, MT: Mirror Therapy, n.d.: no date, RAT: Robotic Assisted Therapy, rESWT: radial Extracorporeal Shock Wave Therapy, RCT: Randomized Controlled Trial, ROM: Range of Motion, rTMS: Repetitive Transcranial Magnetic Stimulation, tDCS: Transcranial Direct Current Stimulation, TENS: Transcutaneous Electrical Nerve Stimulation, TOT: Task Oriented Training, VR: Virtual Reality, WMFT: Wolf Motor Function Test