Journal of
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MDPI

## **Supplementary Table S1.** Baseline characteristics of studies included.

| F. Author/Pub. Year | Country | Patient N. | Mean Age (Years) | Female % | Duration/ Intensity | Study Groups | comparator | Results Found | Outcome | Other information |
|---|---|---|---|---|---|---|---|---|---|---|
| **S.Sahin/2019** | Turkey | 60 | I:10.5 +-3.62 C: 10.06+- 3.24 | 38,3% | 45min.x2d.x8w | VR + (TOT) | TOT | VR improves motor skills and independence. | WeeFim Selfcare | Game:Air challenge,Boxing trainer,Wall breaker,Jet run,Super kick. |
| **G.Acar/2016** | Turkey | 30 | I:9,53+-3,04 C:9,73+-2,86 | 46,6% | 45min.x2dx6 w. | N.Wii + NDT | NDT | NDT improves hand function in hemi CP. | QUEST Grasp,JTHFT,ABILHAND-Kids,WeeFim | Games: tennis, baseball, and boxing. |
| **A.Alsaif/2015** | Saudi Arabia | 40 | 6-10 | Ni. | 20min.x7d.x12w. | N.Wii | No training | The Nintendo Wii significantly improved motor tests. | m-ABC-2 | [illegible] arm. movements, balancing, and jumping |
| **S. Atasavun/2016** | Turkey | 24 | I:9,13+-2,57 C:10,11+-2,62 | 58,3% | 30min.x2d.x12w. | N.Wii + Physio Th. | Physio Th. | Nintendo Wii improved occupational performance, daily activities, and balance. | PEDI | Games: basketball, tennis, boxing. |
| **E. Avcil/2020** | Turkey | 30 | I:10,93+-4,09 C:11,07+-3,24 | 43,4% | 24 session/8 w. | N.Wii + LMC | NDT | LMC games slightly improved manual dexterity in CP patients. | Grip Strength | Games: Fizyosoft®CatchAPet, Leapball. |
| **H. C. Chiu/2014** | Taiwan | 62 | I:9,4+-1,9 C:9,5+-1,9 | 54,8% | 40min.x3d.x6 w | N.Wii + Usual Th. | Usual Th. | Wii™ training showed no improvement in coordination, strength, or hand function. | JTHFT,Grip strength | Game: Wii Sports Resort. |
| **S. M. El-Shamy/2018** | Egypt | 40 | I:9,5+-1,2C:9,8+-1,4 | 35% | 40min.x3d.x12 w. | N.Wii + Usual Th. | Usual Th. | Wii training with usual care reduces spasticity and improves grip strength and hand function. | PMDS-2,Grip strength, PMDS-2 grasp | Games:tennis;boxing;bowling; basketball. |
| **J. Y. Choi/2021** | Korea | 78 | 5,66+-2,83 | 51,28% | 60min.x5d.x4 w. | VR+OT | OT | Virtual reality rehabilitation is effective for children with brain injury. | ULPRS | Game: RAPAEL Smart Kids. |
| **C. Kassee/2017** | Canada | 6 | 9,33 | 0% | 40min.x5d.x6w. | N.Wii | Resistance tr. | Wii training may be an effective home rehabilitation strategy. | Grip strength,ABILHAND-Kids, Melbourne Assesment II. | Games: Wii Nunchuck,Wii Sports Resort. |
| **T. N. Wang/2021** | Taiwan | 18 | I:8,55+-2,09C:8,56+-2,15 | 61% | 135min.x2d.x8w. | N.Wii + CIT | Const.-ind. Th. | CIT-Wii shows no significant difference in effects compared to conventional CIT. | ABILHAND-Kids | Games: e.g.,Sports Resort, Wii Sports, Mario Sports Mix, Cooking Mama: Cook Off, Let's Tap, and Happy Dance Collection. |
| **J. E. Sajan/2016** | India | 18 | I:12,4+-3,78C:12,4+-4,93 | 45% | 45min.x6dx3w. | N.Wii | CT | The intervention group showed significant improvement in upper limb function. | Quest,BBT | Games: boxing, tennis. |
| **D. Tarakci/2016** | Turkey | 30 | I:10,46+-2,69C:10,53+-2,79 | 36,6% | 50min.x2d.x12w. | N.Wii + NDT | CT | Video games, combined with NDT, better improve static and performance-related balance. | WeeFim | Games: walking on rope,skiing,Tilt Table-Balance Board,Heading |
| **D. Tarakci/2019** | Turkey | 30 | I:10,93+-4,09C:11,06+-33,23 | 43,3% | 60min.x3d.x8w. | LMC | CT | LMCBT should be an effective alternative treatment for children with physical disabilities. | Grip strength, JTHFT,Duruoz Hand index | Fizyosoft Games: CatchAPet,Leapball. |
| **K. Ren/2016** | China | 35 | I:4,75+-0,83C:4,5+-1,16 | 42,8% | 40min.x5d.x12w. | VR + (OT) | CT+OT | VR training effectively improves fine motor function in the upper limbs. | PMDS-2,Grip strength, PMDS-2 grasp | - |
| **O.Fidan/2023** | Turkey | 52 | I:9,2+-2,08 CT:9,4+-2,25 | 40,38% | 45min.x2dx8 w. | VR | NDT | Kinect-based VR training helps improve balance, motor function, and upper extremity skills. | QUEST | Games:fruits Ninja,tennis game, soccer,bowling. |
| **A. K. Menekseoglu/2023** | Turkey | 36 | I:8,2+-1,8C:8,3+-1,4 | 47,2% | 60min.x2d.x6w. | VR + Exercise th. | Exercise th. | Virtual reality improved upper limb function, quality of life, and active joint range of motion in children with hemiplegic cerebral palsy. | QUEST, ABILHAND-Kids | Games: butterfly,bee,eagle game. |
| **A. Kanitkar/2023** | India | 63 | I:7,3+-2,1C:7,8+-1,9 | - | 45min.x3d.x16w. | PC games-based e. | CIMT + HABIT | This study shows a positive effect of GRP. | PMDS-2 | Games:arcade-style. |
| **R.Bedair/2016** | Egypt | 40 | I:7,05+-0,99C:7,25+-0,96 | 42,5% | 60min.x3d.x16w. | VR + Physical Th. | Physio Th. | Significant improvement in upper limb function in the study group post-treatment is linked to the active participation of children in a simulated environment. | ABILHAND-Kids, PMDS-2 | Games: tennis, bowling, golf, space pop, bubbles,boat driving. |
| **G. Saussez/2023** | Belgium | 38 | I:9+-3,1C:9,1+-2,9 | 50% | 90h/2w | REAtouch +HABIT-ILE | HABIT-ILE | The use of the REAtouch® device during HABIT-ILE demonstrated similar efficacy to the conventional evidence-based HABIT-ILE intervention. | ABILHAND-Kids, JTHFT | Regular Games: (e.g., board games, card, building activities, etc.) |
| **M. Daliri/2023** | Iran | 20 | I:6,4+-1,07C:6,1+-1,1 | 25% | 60min.x2d.x16w. | LMC | OT | Adding LMC to the rehabilitation program for CP patients may improve upper extremity motor function. | QUEST, Grip Strength | Games:cube grasping, flower petal,removal,Kyoto. |
| **J. Y. Choi/2023** | Italy | 35 | I:8,1+-3,2C:7,3+-2,6 | 48,6% | 30min.x5.dx6w. | VR + (OT) | OT | Home-based VR training had a limited impact on improving upper limb function. | ABILHAND-Kids, Melbourne Assesment II. | Game: RAPAEL Smart Kids. |
| **L.Zoccolio/2016** | Italy | 18 | 6,89+-1,91 | - | 90min.x2d.x8 weeks | Xbox kinect+ Usual Th. | CT | VGT was effective in improving upper limb motor function | QUEST, ABILHAND-Kids | Game:Xbox kinect adventure package. |

[1] I.[2] C.[3]min.[4]d.[5]w.[6]VR[7]TOT[8]N.Wii[9]NDT[10]Physio th.[11]LMC[12]Usual Th.[13]OT[14]CIT[15]exercise th.[16]PC games-based e.[17] Physical Th.[18]HABIT-ILE[19]Resistance tr.[20]Const-ind Th.[21]CT[22]CIMT[23]HABIT[24]WeeFim[25]QUEST[26]JTHFT[27]m-ABC-2[28]PEDI[29]PMDS-2[30]ULPRS[31]BBT

[1] Intervention

[2] Control group

[3] Minute

[4] Day

[5] week

[6] Virtual reality

[7] Traditional occupational therapy

[8] Ninetendo Wii

[9] Neurodevelopmental treatment

[10] Physio therapy

[11] Leap motion controller

[12] Usual therapy

[13] Occupational therapy

[14] constraint-induced therapy

[15] exercise therapy

[16] Computer game-based therapy

[17] Physical therapy

[18] Hand Arm Bimanual Intensive Training Including Lower Extremity

[19] Resistance training

[20] Constraint induced therapy

[21] Conventional therapy

[22] Constraint induced movement therapy

[23] Hand Arm Bimanual Intensive Training

[24] Functional Independence Measure for Children

[25] Quest quality of upper extremity skills test

[26] Jebsen Taylor Hand Function Test

[27] Movement Assessment Battery for Children-2

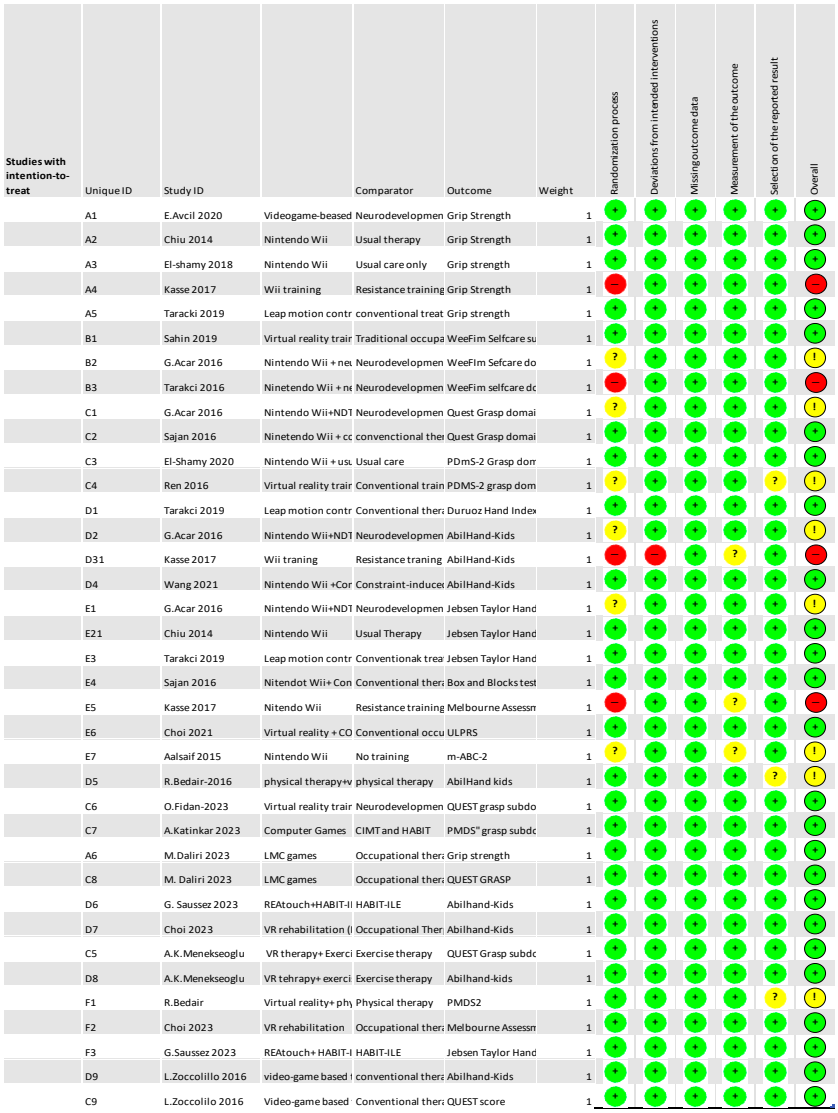
[28] Pediatric Evaluation of Disability Inventory

[29] Peabody Developmental Motor Scales-2

[30] Upper Limb Physician's Rating Scale

[31] Box and Block Test

**Supplementary Table S2.** Results of the risk of bias assessment using the Cochrane Risk of Bias tool, version 2.



| Studies with intention-to-treat | Unique ID | Study ID | | Comparator | Outcome | Weight | Randomization process | Deviations from intended interventions | Missing outcome data | Measurement of the outcome | Selection of the reported result | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | E.Avcil 2020 | Videogame-beased | Neurodevelopmen | Grip Strength | 1 | + | + | + | + | + | + |
| | A2 | Chiu 2014 | Nintendo Wii | Usual therapy | Grip Strength | 1 | + | + | + | + | + | + |
| | A3 | El-shamy 2018 | Nintendo Wii | Usual care only | Grip strength | 1 | + | + | + | + | + | + |
| | A4 | Kasse 2017 | Wii training | Resistance training | Grip Strength | 1 | − | + | + | + | + | − |
| | A5 | Taracki 2019 | Leap motion contr | conventional treat | Grip strength | 1 | + | + | + | + | + | + |
| | B1 | Sahin 2019 | Virtual reality trair | Traditional occupa | WeeFim Selfcare su | 1 | + | + | + | + | + | + |
| | B2 | G.Acar 2016 | Nintendo Wii + ne | Neurodevelopmen | WeeFim Sefcare do | 1 | ? | + | + | + | + | ! |
| | B3 | Tarakci 2016 | Ninetendo Wii + ne | Neurodevelopmen | WeeFim selfcare dc | 1 | − | + | + | + | + | − |
| | C1 | G.Acar 2016 | Nintendo Wii+NDT | Neurodevelopmen | Quest Grasp domai | 1 | ? | + | + | + | + | ! |
| | C2 | Sajan 2016 | Ninetendo Wii + cc | convenctional ther | Quest Grasp domai | 1 | + | + | + | + | + | + |
| | C3 | El-Shamy 2020 | Nintendo Wii + usu | Usual care | PDmS-2 Grasp dor | 1 | + | + | + | + | + | + |
| | C4 | Ren 2016 | Virtual reality trair | Conventional train | PDMS-2 grasp dom | 1 | ? | + | + | + | ? | ! |
| | D1 | Tarakci 2019 | Leap motion contr | Conventional ther | Duruoz Hand Index | 1 | + | + | + | + | + | + |
| | D2 | G.Acar 2016 | Nintendo Wii+NDT | Neurodevelopmen | AbilHand-Kids | 1 | ? | + | + | + | + | ! |
| | D31 | Kasse 2017 | Wii traning | Resistance traning | AbilHand-Kids | 1 | − | − | + | ? | + | − |
| | D4 | Wang 2021 | Nintendo Wii +Cor | Constraint-induce | AbilHand-Kids | 1 | + | + | + | + | + | + |
| | E1 | G.Acar 2016 | Nintendo Wii+NDT | Neurodevelopmen | Jebsen Taylor Hand | 1 | ? | + | + | + | + | ! |
| | E21 | Chiu 2014 | Nintendo Wii | Usual Therapy | Jebsen Taylor Hand | 1 | + | + | + | + | + | + |
| | E3 | Tarakci 2019 | Leap motion contr | Conventionak trea | Jebsen Taylor Hand | 1 | + | + | + | + | + | + |
| | E4 | Sajan 2016 | Nitendot Wii+ Con | Conventional ther | Box and Blocks test | 1 | + | + | + | + | + | + |
| | E5 | Kasse 2017 | Nitendo Wii | Resistance training | Melbourne Assessn | 1 | − | + | + | ? | + | − |
| | E6 | Choi 2021 | Virtual reality + CO | Conventional occu | ULPRS | 1 | + | + | + | + | + | + |
| | E7 | Aalsaif 2015 | Nintendo Wii | No training | m-ABC-2 | 1 | ? | + | + | ? | + | ! |
| | D5 | R.Bedair-2016 | physical therapy+v | physical therapy | AbilHand kids | 1 | + | + | + | + | ? | ! |
| | C6 | O.Fidan-2023 | Virtual reality trair | Neurodevelopmen | QUEST grasp subdo | 1 | + | + | + | + | + | + |
| | C7 | A.Katinkar 2023 | Computer Games | CIMT and HABIT | PMDS" grasp subdc | 1 | + | + | + | + | + | + |
| | A6 | M.Daliri 2023 | LMC games | Occupational ther | Grip strength | 1 | + | + | + | + | + | + |
| | C8 | M. Daliri 2023 | LMC games | Occupational ther | QUEST GRASP | 1 | + | + | + | + | + | + |
| | D6 | G. Saussez 2023 | REAtouch+HABIT-I | HABIT-ILE | Abilhand-Kids | 1 | + | + | + | + | + | + |
| | D7 | Choi 2023 | VR rehabilitation ( | Occupational Ther | Abilhand-Kids | 1 | + | + | + | + | + | + |
| | C5 | A.K.Menekseoglu | VR therapy+ Exerci | Exercise therapy | QUEST Grasp subdc | 1 | + | + | + | + | + | + |
| | D8 | A.K.Menekseoglu | VR tehrapy+ exerci | Exercise therapy | Abilhand-kids | 1 | + | + | + | + | + | + |
| | F1 | R.Bedair | Virtual reality+ phy | Physical therapy | PMDS2 | 1 | + | + | + | + | ? | ! |
| | F2 | Choi 2023 | VR rehabilitation | Occupational ther | Melbourne Assessn | 1 | + | + | + | + | + | + |
| | F3 | G.Saussez 2023 | REAtouch+ HABIT-I | HABIT-ILE | Jebsen Taylor Hand | 1 | + | + | + | + | + | + |
| | D9 | L.Zoccolillo 2016 | video-game based | conventional ther | Abilhand-Kids | 1 | + | + | + | + | + | + |
| | C9 | L.Zoccolilo 2016 | Video-game based | Conventional ther | QUEST score | 1 | + | + | + | + | + | + |

[32]NDT[33]LMC[34]HABIT-ILE[35]VR[36]CIMT[37]WeeFim[38]QUEST[39]PMDS-2[40]ULPRS[41]mABC-2

[32] Neurodevelopmental treatment

[33] Leap motion controller

[34] Hand Arm Bimanual Intensive Training Including Lower Extremity

[35] Virtual Reality

[36] Constraint induced movement therapy

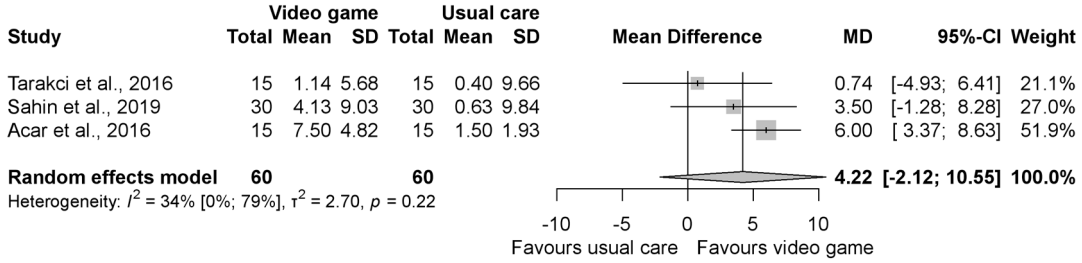
[37] Functional Independence Measure for Children

[38] Quest quality of upper extremity skills test

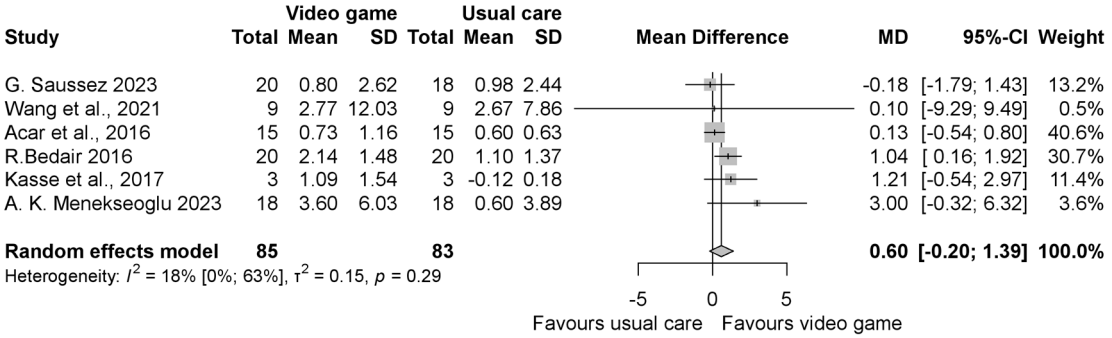
[39] Peabody Developmental Motor Scales-2

[40] Upper Limb Physician's Rating Scale

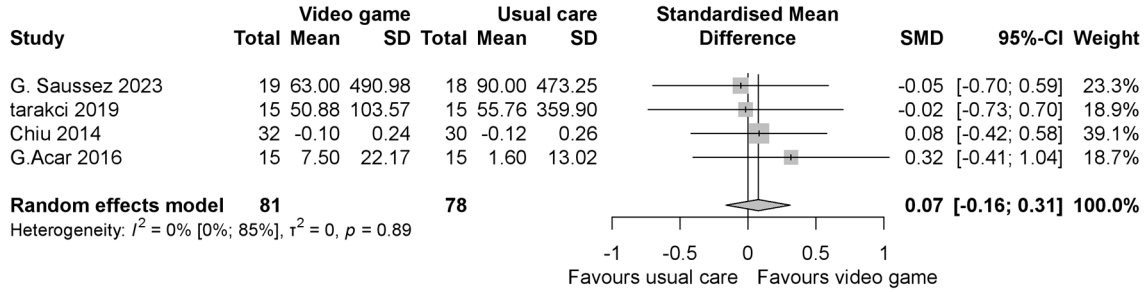
[41] Movement Assessment Battery for Children-2




**Supplementary Figure S1.** Forest plot of Mean Differences in Self Care (WeeFim), comparing the intervention video game-based therapy to other rehabilitation forms (conventional therapy, neurodevelopmental therapy, and occupational therapy).




**Supplementary Figure S2.** Forest plot of Mean Differences in ABILHAND-Kids, comparing the intervention video game-based therapy to other rehabilitation forms (conventional, neurodevelopmental, resistance training, constrain induced therapy, and exercise therapy).




**Supplementary Figure S3.** Forest plot of Standardized Mean Differences in the Jebsen Taylor Hand Function, comparing the intervention video game-based therapy to other rehabilitation forms (conventional, neurodevelopmental, and HABIT.