**Table 1.** Characteristics of included trials

| Trial | Participants | | | Intervention | | Outcome measures |
|---|---|---|---|---|---|---|
| Year, author | Eligible population | Adjunct treatment + exercise | Exercise | Adjunct treatment + exercise | Exercise | |
| **Biophysical agents** | | | | | | |
| Jing et al.[1] 2024 | Patients | Age (y) = 20.90 ± 2.70<br>F/M (%) = 22%/78%<br>BMI = NR | Age (y) = 21.60 ± 3.80<br>F/M (%) = 36%/64%<br>BMI = NR | Neuromuscular electrical stimulation + exercise (n=18) | Exercise (n=14) | Pain (VAS)<br>Function (AKPS) |
| Albornoz-Cabello et al.[2] 2023 | Patients | Age (y) = 42.30 ± 15.52<br>F/M (%) = 41%/59%<br>BMI = 27.10 ± 3.98 | Age (y) = 51.00 ± 10.89<br>F/M (%) = 62%/38%<br>BMI = 28.60 ± 4.32 | Monopolar dielectric diathermy (n=29) | Exercise (n=27) | Pain (VAS)<br>Function (AKPS) |
| Mv et al.[3] 2023 | Patients | Age (y) = 28.80 ± 1.00[#]<br>F/M (%) = NR<br>BMI = 26.30 ± 0.8[#] | Age (y) = 29.20 ± 1.20[#]<br>F/M (%) = NR<br>BMI = 26.70 ± 0.8[#] | Neuromuscular electrical stimulation + exercise (n=31) | Exercise (n=30) | Pain (VAS)<br>Function (AKPS) |
| Qayyum et al.[4] 2022 | Patients | Age (y) = 27.94 ± 6.36<br>F/M (%) = 54%/46%<br>BMI = NR | Age (y) = 27.45 ± 7.16<br>F/M (%) = 39%/61%<br>BMI =NR | High power laser therapy + exercise (n=33) | Exercise (n=33) | Pain (VAS) |
| Rodrigues et al.[5] 2022 | Patients | Age (y) = 21.70 ± 3.40<br>F/M (%) = 100%/0%<br>BMI = NR | Age (y) = 24.10 ± 3.90<br>F/M (%) = 100%/0%<br>BMI = NR | Anodal transcranial direct current stimulation + exercise (n=14) | Sham anodal transcranial direct current stimulation + exercise (n=14) | Pain (VAS) |
| Albornoz-Cabello et al.[6] 2020 | Patients | Age (y) = 48.00 ± 15.60<br>F/M (%) = NR<br>BMI = 28.30 ± 5.26 | Age (y) = 52.00 ± 10.33<br>F/M (%) = NR<br>BMI = 28.20 ± 4.74 | Monopolar dielectric diathermy (n=42) | Exercise (n=42) | Pain (VAS)<br>Function (AKPS) |

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| Celik et al.[7] 2020 | Patients | Age (y) = 39.10 ± 9.10<br>F/M (%) = 64%/36%<br>BMI = NR | Age (y) = 41.50 ± 12.70<br>F/M (%) = 46%/54%<br>BMI = NR | Neuromuscular electrical stimulation + exercise (n=14) | Exercise (n=13) | Function (AKPS) |
| Talbot et al.[8] 2020 | Army recruits | Age (y) = 26.50 ± 6.10<br>F/M (%) = 24%/76%<br>BMI = NR | Age (y) = 26.80 ± 6.60<br>F/M (%) = 24%/76%<br>BMI = NR | Neuromuscular electrical stimulation + exercise (n=33) | Exercise (n=34) | Pain (VAS) |
| Glaviano et al.[9] 2019 | Patients | Age (y) = 23.80 ± 5.60<br>F/M (%) =73%/27%<br>BMI = NR | Age (y) = 23.00 ± 3.70<br>F/M (%) = 80%/20%<br>BMI = NR | Patterned electrical neuromuscular stimulation + exercise (n=11) | Sham patterned electrical neuromuscular stimulation + exercise (n=10) | Pain (VAS)<br>Function (AKPS) |
| Nouri et al.[10] 2019 | Patients | Age (y) = 35.29 ± 3.27<br>F/M (%) = 70%/30%<br>BMI = 23.52 ± 3.99 | Age (y) = 31.43 ± 6.72<br>F/M (%) = 70%/30%<br>BMI = 23.26 ± 2.84 | Higher power laser + exercise (n=20) | Sham laser + exercise (n=20) | Pain (VAS)<br>Function (AKPS) |
| Iammarrone et al.[11] 2016 | Patients | Age (y) = 21.00 ± 7.00<br>F/M (%) = 77%/23%<br>BMI = NR | Age (y) = 24.00 ± 8.00<br>F/M (%) = 71%/29%<br>BMI = NR | Pulsed electromagnetic fields + exercise (n=13) | Exercise (n=17) | Pain (VAS) |
| Bily et al.[12] 2008 | Patients | Age (y) = 27.00 ± 7.70<br>F/M (%) = 53%/47%<br>BMI = NR | Age (y) = 23.70 ± 5.50<br>F/M (%) = 74%/26%<br>BMI = NR | Electric muscle stimulation + exercise (n=19) | Exercise (n=19) | Pain (VAS)<br>Function (AKPS) |
| Akarcali et al.[13] 2002 | Patients | Age (y) = 41.60 ± 9.58<br>F/M (%) = NR<br>BMI = NR | Age (y) = 36.30 ± 9.59<br>F/M (%) = NR<br>BMI = NR | High voltage electric stimulation + exercise (n=20) | Exercise (n=20) | Pain (VAS) |
| **Taping** | | | | | | |
| Lee et al.[14] 2023 | Patients | Age (y) = 27.50 ± 5.40<br>F/M (%) = 75%/25% | Age (y) = 27.30 ± 7.40<br>F/M (%) = 84%/16% | Kinesio taping + exercise (n=20) | Exercise (n=19) | Function (AKPS) |

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| | | BMI = 21.90 ± 2.30 | BMI = 22.20 ± 1.70 | | | |
| Şahan et al.[15] 2023 | Patients | Age (y) = 25.00 ± 6.23<br>F/M (%) = 86%/14%<br>BMI = 24.58 ± 3.66 | Age (y) = 25.23 ± 10.69<br>F/M (%) = 62%/38%<br>BMI = 22.01 ± 2.59 | Star taping + exercise (n=14) | Exercise (n=13)<br><br>Sham star taping + exercise (n=12) | Pain (VAS)<br><br>Function (AKPS) |
| | | | Age (y) = 26.91 ± 9.02<br>F/M (%) = 58%/42%<br>BMI = 24.12 ± 5.26 | | | |
| Songur et al.[16] 2023 | Patients | Age (y) = 31.60 ± 9.50<br>F/M (%) = 75%/25%<br>BMI = 23.53 ± 3.55 | Age (y) = 28.25 ± 7.80<br>F/M (%) = 75%/25%<br>BMI = 23.48 ± 2.47 | McConnell patellar taping + exercise (n=13) | Exercise (n=13) | Pain (VAS)<br><br>Function (AKPS) |
| | | Age (y) = 28.16 ± 8.40<br>F/M (%) = 83%/17%<br>BMI = 22.75 ± 3.89 | | Femoral rotation taping + exercise (n=14) | | |
| Basbug et al.[17] 2022 | Sedentary patients | Age (y) = 34.10 ± 8.90<br>F/M (%) = 100%/0%<br>BMI = 23.90 ± 5.10 | Age (y) = 39.00 ± 6.40<br>F/M (%) = 100%/0%<br>BMI = 23.90 ± 5.30 | Kinesio taping + exercise (n=15) | Exercise (n=15) | Pain (VAS) |
| Arrebola et al.[18] 2020 | Patients | Age (y) = 30.38 ± 8.40<br>F/M (%) = 100%/0%<br>BMI = 24.37 ± 2.60 | Age (y) = 30.31 ± 7.91<br>F/M (%) = 100%/0%<br>BMI = 22.68 ± 2.78 | Kinesio taping (patellar medialisation) + exercise (n=13) | Exercise (n=16) | Pain (NPRS)<br><br>Function (AKPS) |
| | | Age (y) = 27.86 ± 9.38<br>F/M (%) = 100%/0%<br>BMI = 23.37 ± 3.60 | | Kinesio taping (lateral rotation of the femur | | |

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| | | | | and tibia) + exercise (n=14) | | |
| Ghourbanpour et al.[19] 2018 | Patients | Age (y) = 33.85 ± 10.29<br>F/M (%) = NR<br>BMI = 24.70 ± 6.76 | Age (y) = 37.15 ± 12.45<br>F/M (%) = NR<br>BMI = 28.90 ± 4.99 | McConnell patellar taping + exercise (n=15) | Exercise (n=15) | Pain (VAS)<br><br>Function (KOOS-ADL) |
| Günay et al.[20] 2017 | Patients | Age (y) = 36.00 ± 7.95<br>F/M (%) = 69%/31%<br>BMI = 25.60 ± 2.64 | Age (y) = 31.00 ± 6.70<br>F/M (%) = 38%/62%<br>BMI = 25.20 ± 3.90 | Kinesio taping + exercise (n=16) | Exercise (n=13) | Pain (VAS)<br><br>Function (AKPS) |
| | | | Age (y) = 30.80 ± 8.54<br>F/M (%) = 50%/50%<br>BMI = 24.20 ± 3.30 | | Sham Kinesiotaping + exercise (n=14) | |
| Akbaş et al.[21] 2011 | Patients | Age (y) = 41.00 ± 11.26<br>F/M (%) = 100%/0%<br>BMI = 25.17 ± 4.80 | Age (y) = 44.88 ± 7.75<br>F/M (%) = 100%/0%<br>BMI = 28.64 ± 5.77 | Kinesio taping + exercise (n=15) | Exercise (n=16) | Pain (VAS)<br><br>Function (AKPS) |
| Mousavi et al.[22] 2011 | Male students | Age (y) = NR<br>F/M = 0%/100%<br>BMI = NR | Age (y) = NR<br>F/M = 0%/100%<br>BMI = NR | Kinesio taping + exercise (n=10) | Exercise (n=11) | Pain (VAS) |
| Whittingham et al.[23] 2004 | Arm recruits | Age (y) = 18.80 ± 1.30<br>F/M (%) = 20%/80%<br>BMI = NR | Age (y) = 18.70 ± 1.40<br>F/M (%) = 20%/80%<br>BMI = NR | McConnell patellar taping + exercise (n=10) | Exercise (n=10) | Pain (VAS)<br><br>Function (FIQ) |
| | | | Age (y) = 18.60 ± 1.10<br>F/M (%) = 20%/80%<br>BMI = NR | | Sham taping + exercise (n=10) | |

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| Tunay et al.[24] 2003 | Patients | Age (y) = 32.65 ± 6.22<br>F/M (%) = NR<br>BMI = 23.05 ± 2.67 | Age (y) = 28.00 ± 8.54<br>F/M (%) = NR<br>BMI = 21.69 ± 1.96 | Patellar taping + exercise (n=20) | Exercise (n=20) | Pain (VAS) |
| Clark et al.[25] 2000 | Patients | Age (y) = 26.00 ± 7.40<br>F/M (%) = 50%/50%<br>BMI = 24.80 ± 5.70 | Age (y) = 29.50 ± 6.20<br>F/M (%) = 40%/60%<br>BMI = 24.90 ± 4.20 | Taping + exercise (n=20) | Exercise (n=20) | Pain (VAS)<br><br>Function (WOMAC) |
| **Whole body vibration** | | | | | | |
| Wu et al.[26] 2022 | Patients | Age (y) = 27.50 ± 0.00<br>F/M (%) = 44%/56%<br>BMI = 22.20 ± 0.00 | Age (y) = 27.30 ± 0.00<br>F/M (%) = 50%/50%<br>BMI = 21.70 ± 0.00 | Whole body vibration + exercise (n=18) | Exercise (n=18) | Pain (VAS)<br><br>Function (AKPS) |
| Rasti et al.[27] 2020 | Athletes | Age (y) = 25.91 ± 5.16<br>F/M (%) = 0%/100%<br>BMI = 24.01 ± 0.78 | Age (y) = 24.16 ± 5.21<br>F/M (%) = 0%/100%<br>BMI = 24.31 ± 0.00 | Whole body vibration + exercise (n=12) | Exercise (n=12) | Pain (NRS) |
| Yañez-Álvarez et al.[28] 2020 | Patients | Age (y) = 48.00 ± 13.00<br>F/M (%) = 56%/44%<br>BMI = 27.80 ± 3.80 | Age (y) = 52.00 ± 10.70<br>F/M (%) = 48%/52%<br>BMI = 28.50 ± 4.70 | Whole body vibration + exercise (n=25) | Exercise (n=25) | Pain (VAS)<br><br>Function (AKPS) |
| Corum et al.[29] 2018 | Patients | Age (y) = 32.70 ± 7.30<br>F/M (%) = 100%/0%<br>BMI = 24.20 ± 4.20 | Age (y) = 33.70 ± 7.70<br>F/M (%) = 100%/0%<br>BMI = 23.50 ± 3.10 | Whole body vibration + exercise (n=18) | Exercise (n=16) | Pain (VAS)<br><br>Function (AKPS) |
| **Dry needling** | | | | | | |
| Ma et al.[30] 2020 | Patients | Age (y) = 22.48 ± 2.40<br>F/M (%) = 48%/52%<br>BMI = 22.68 ± 2.69 | Age (y) = 25.14 ± 6.02<br>F/M (%) = 56%/44%<br>BMI = 21.84 ± 3.32 | Dry needling + exercise (n=25) | Sham needling + exercise (n=23) | Pain (VAS)<br><br>Function (AKPS) |

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| Zarei et al.[31] 2020 | Athletes | Age (y) = 22.25 ± 3.25<br>F/M (%) = 100%/0%<br>BMI = NR | Age (y) = 25.65 ± 8.49<br>F/M (%) = 100%/0%<br>BMI = NR | Dry needling + exercise (n=20) | Exercise (n=20) | Pain (NPRS)<br><br>Function (AKPS) |
| Sutlive et al.[32] 2018 | Arm recruits | Age (y) = 30.30 ± 5.50<br>F/M (%) = 43%/57%<br>BMI = 26.40 ± 4.40 | Age (y) = 31.10 ± 5.10<br>F/M (%) = 33%/67%<br>BMI = 26.80 ± 3.20 | Dry needling + exercise (n=30) | Sham needling + exercise (n=30) | Pain (NPRS)<br><br>Function (AKPS) |
| **Knee brace** | | | | | | |
| Petersen et al.[33] 2016 | Patients | Age (y) = 28.00 ± 9.40<br>F/M (%) = 66%/34%<br>BMI = 23.00 ± 1.50 | Age (y) = 28.00 ± 8.10<br>F/M (%) = 79%/21%<br>BMI = 23.00 ± 1.30 | Patellar brace + exercise (n=78) | Exercise (n=78) | Pain (NAS)<br><br>Function (AKPS) |
| Denton et al.[34] 2005 | Patients | Age (y) = 33.50 ± 8.80<br>F/M (%) = 100%/0%<br>BMI = NR | Age (y) = 31.50 ± 9.80<br>F/M (%) = 100%/0%<br>BMI = NR | Knee brace + exercise (n=17) | Exercise (n=17) | Pain (VPS)<br><br>Function (AKPS) |
| Lun et al.[35] 2005 | Patients | Age (y) = 35.00 ± 11.00<br>F/M (%) = NR<br>BMI = NR | Age (y) = 35.00 ± 11.00<br>F/M (%) = NR<br>BMI = NR | Patellar bracing + exercise (n=32) | Exercise (n=34) | Pain (VAS)<br><br>Function (KFS) |
| **Manual therapy** | | | | | | |
| Anwar et al.[36] 2022 | Patients | Age (y) = NR<br>F/M (%) = NR<br>BMI = NR | Age (y) = NR<br>F/M (%) = NR<br>BMI = NR | Pain release phenomenon technique + exercise (n=NR) | Exercise (n= NR) | Pain (VAS)<br><br>Function (LEFS) |
| Fatimah et al.[37] 2021 | Patients | Age (y) = 29.88 ± 3.06<br>F/M (%) = 77%/23%<br>BMI = NR | Age (y) = 29.38 ± 3.45<br>F/M (%) = 73%/27%<br>BMI = NR | Tibiofemoral mobilisation + exercise (n=26) | Exercise (n=26) | Pain (NPRS) |

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| | | | | | | Function (AKPS) |
| Telles et al.[38] 2016 | Patients | Age (y) = 63.30 ± 12.10<br>F/M (%) = NR<br>BMI = 27.20 ± 5.10 | Age (y) = 61.80 ± 17.30<br>F/M (%) = NR<br>BMI = 27.70 ± 4.50 | Myofascial technique + exercise (n=9) | Exercise (n=9) | Pain (NPRS)<br>Function (LEFS) |
| **Blood flow restriction** | | | | | | |
| Constantinou et al.[39] 2022 | Patients | Age (y) = 25.50 ± 14.00<br>F/M (%) = 43%/57%<br>BMI = 24.60 ± 3.00 | Age (y) = 30.50 ± 16.00<br>F/M (%) = 47%/53%<br>BMI = 24.70 ± 4.30 | Blood flow restriction + exercise (n=30) | Exercise (n=30) | Pain (VAS)<br>Function (AKPS) |
| Giles et al.[40] 2017 | Patients | Age (y) = 28.50 ± 5.20<br>F/M (%) = 60%/40%<br>BMI = NR | Age (y) = 26.70 ± 5.50<br>F/M (%) = 49%/51%<br>BMI = NR | Blood flow restriction + exercise (n=40) | Placebo blood flow restriction + exercise (n=39) | Pain (VAS)<br>Function (AKPS) |
| **Electromyography biofeedback** | | | | | | |
| Qi et al.[41] 2007 | Patients | Age (y) = NR<br>F/M (%) = NR<br>BMI = NR | Age (y) = NR<br>F/M (%) = NR<br>BMI = NR | EMG Biofeedback + exercise (n=13) | Exercise (n=13) | Pain (PSS) |
| Dursun et al.[42] 2001 | Patients | Age (y) = 36.90 ± 9.20<br>F/M (%) = 80%/20%<br>BMI = NR | Age (y) = 36.60 ± 10.60<br>F/M (%) = 80%/20%<br>BMI = NR | EMG Biofeedback + exercise (n=30) | Exercise (n=30) | Pain (VAS)<br>Function (FIQ) |
| **Internal and external attentional focus** | | | | | | |
| Aghakeshizadeh et al.[43] 2021 | Recreational athletes | Age (y) = 28.60 ± 7.70<br>F/M (%) = 52%/48%<br>BMI = 23.70 ± 1.90<br><br>Age (y) = 29.90 ± 8.00<br>F/M (%) = 65%/35% | Age (y) = 28.90 ± 6.50<br>F/M (%) = 54%/46%<br>BMI = 23.70 ± 1.70 | Internal focus + exercise (n=23) | Exercise (n=24) | Pain (VAS)<br>Function (AKPS) |

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| | | BMI = 23.90 ± 1.30 | | External focus + exercise (n=23) | | |
| **Mindfulness** | | | | | | |
| Bagheri et al.[44] 2021 | Recreational runners | Age (y) = 27.90 ± 7.50<br>F/M (%) = 100%/0%<br>BMI =23.70 ± 2.30 | Age (y) = 28.80 ± 6.80<br>F/M (%) = 100%/0%<br>BMI = 23.20 ± 2.60 | Mindfulness + exercise (n=15) | Exercise (n=14) | Pain (VAS)<br><br>Function (KOS) |
| **Foot orthoses** | | | | | | |
| Eng et al.[45] 1993 | Adolescents | Age (y) = 14.40 ± 1.10<br>F/M (%) = 100%/0%<br>BMI = NR | Age (y) = 15.10 ± 1.40<br>F/M (%) = 100%/0%<br>BMI = NR | Foot orthoses + exercise (n=10) | Placebo foot orthoses + exercise (n=10) | Pain (VAS) |

*Abbreviation: F,* female*; M,* male*; n,* sample size*; BMI,* body mass index; *NR,* not reported; *VAS,* visual analogue scale; *FIQ,* functional index questionnaire; *NPRS,* numerical pain rating scale; *AKPS,* anterior knee pain scale; *WOMAC,* Western Ontario and McMaster Universities; *PSS*, pain severity scale; *EMG,* electromyographic; *NAS,* numerical analogue scale; *NRS,* numerical rating scale, *LEFS,* lower extremity functional scale; [#]: standard error; *KOOS-ADL,* Knee Injury and Osteoarthritis Outcome - Activities of Daily Living; *VPS,* verbal pain scale; *KFS,* knee function scale; *KOS,* knee outcome survey.

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