**Appendix 2**

**Characteristics of Interventions\***

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| **Reference**  **(Year)** | **Location of Study/intervention**  **Provider of intervention and their training** | **Treatment Description/Dosage** | | **Method for Provision of intervention**  **Tailoring of Intervention for Individuals** |
| **Exercise Group** | **Control Group** |
| **Baydogan**  **(2015)** | *Location of Intervention:* Out-patient Physical Therapy department;  *Intervention Provider and Training*: Physical therapist trained to work with children with JIA | **Proprioceptive/Balance Training**  **45 min/3X/wk/12 wks;**  **Total Training time = 27h** | **Strength Training**  **45 min/3X/wk/12 wks;**  **Total Training time = 27h** |
| ***Warm-up* for both groups:**  -Bicycle ergometer (no resistance-10 min.) -Stretching exercises (knee flex/ext) with rhythmic stabilization (PNF\*\*\*) no resistance; Self-stretching- knee flex. | | All participants treated by a single PT in group sessions for 12 weeks  Home exercise program taught in supervised sessions so participants would be independent by end of the 12-week program  No description of tailoring (progression/ regression) intervention for individuals |
| *Proprioceptive Training*  -Stepping back & tandem walking for 25 meters  -Single leg stance  -Knee flexion/extension (SLS)  -Forward, sideways, backward bending in SLS (eyes open & closed)  -Balance board and mini-trampoline | *Strengthening Exercise* (Quadriceps, hamstrings: isometric knee flex. & ext. against towel)  -Resistive ROM with distal weight (sand-bag): terminal knee extension and flexion  -Mini-squat |
| **Repetitions (reps) – Both Groups**  - One set of 8-10 reps, increasing to 10-15 reps  - One set of 3 reps for stretching (gradually increasing to 5 reps)  - Cold application (15-minutes) to knee after each session | |
| **Duration; Frequency**  - 45 minutes total for both groups; 3 days/week supervised by PT; other days at home supervised by parent (calisthenics performed for warm-up; self-stretching; participants in proprioceptive/ balance group performed all balance exercises except mini-trampoline / balance board) | |
|  | | **Combined Hydrotherapy and Land-Based Exercise** | **Land-Based Exercise Only** |  |
| **Epps**  **(2005)** | *Location of Intervention*: First 2 weeks participants treated as in-patients at trial center; next 2 months, intervention provided on out-patient near home  *Intervention Provider and Training:*  -Six senior PTs with expertise/ experience in JIA developed standard exercise protocols for both groups; reached consensus on the suitability & safety of all techniques    -Independent clinical expert observed PTs at all three training centers to ensure the intervention met standard protocol;  -PI provided training sessions at local PT centers treating patients in protocol; outpatient PTs were sent trial protocol with guidelines and contacted by trial PT to discuss patients’ problems; also offered a day of observation at one of trial centers | *Program included the following:*  8 1-hour hydrotherapy sessions and 8 1-hour land-based PT sessions at a trial center over 2 wks; 2 months of community-based hydrotherapy ***only*** (1X/wk or 1X/2 wks); community PT determined if child’s therapy should be continued or stop  ***Exercise Program:***  **Hydrotherapy (8 1-hour sessions)**  **UL & LL stretches in pool**   * Child positioned in water (standing, supine, prone) and supported by therapist as needed based on plane of extremity motion * Float used to for assistance or resistance to limb motion   **Neck stretches in pool**   * Child positioned supine and supported by therapist as needed; active rotation, extension, side-flexion   **Trunk Stretches in pool**   * Child positioned standing, supine or in side floatas needed   **Strengthening (Stage 1)**   * Starting position adapted so buoyancy is counter-balanced * Exercises performed for all joints up to 30 reps for movements with restricted motion or weakness   **Strengthening (Stage 2)**   * Starting positions adapted so buoyancy was resisted, speed of movement increased and/ or bats or flippers were used. * Exercises performed up to 30 reps.   UL exercises not incorporated if no UL arthritis or impairments  **Land-based Exercise (8 1-hour sessions):**   * Same program as land-based group | *Program included the following:*  16 1-hour land-based PT sessions at a trial center over 2 wks followed by 2 months land-based PT (1X/wk or 1X/2 wks) at outpatient center; community PT determined if therapy should be continued or stop  ***Exercise Program:***  **ROM and Stretching**   * *Hold Relax Stretches of all UL joints/movements in all planes* * *Finger and thumb assisted stretches* * *Cervical spine active motion with head/neck supported by therapist* * *Passive and assisted trunk rotation* * *Active LE stretches* * *Patello-femoral mobilization* * *Ankle/foot stretches*   **Active Movements and Strengthening (Stage 1)**   * UE ad LE active motion is all appropriate planes * Active flexion, extension and rotation * Supine - pelvic tilts; sit-ups; bridges; trunk rotation * Prone – trunk extension   **Active Movements and Strengthening (Stage 2) – based on PT judgment**   * Repetitions (reps) for all exercises reduced to 10; 1 lb weight added to wrist or ankle; reps increased to 30   **Active Movements and Strengthening (Stage 3) – based on PT judgment**   * Repetitions for all exercises reduced to 10; 2 lb weight added to wrist or ankle; reps increased to 30   **Active Movements and Strengthening (Stage 4) – based on PT judgment**   * Repetitions for all exercises reduced to 10; 3 lb weight added to wrist or ankle; reps increased to 30   **Functional Activity**   * Sit-to-stand/stand-to-sit; up/down on toes; step-ups; transition from floor to stand; step-ups   **Aerobic Activity**: increase from 5-20 minutes within single session   * Static bike step machine, side-steps, walking forward/backward, skipping, hopping, bunny jumps | PTs knowledgeable about JIA and trained to implement this program provided all therapy.  *Land-based exercises* were designed to increase ROM, muscle strength, activities, independence and fitness. The program included passive stretches and hold-relax techniques performed at each joint where motion was restricted in any plane. Exercises aimed at muscle strengthening used repetitive movement; ankle weights were used in joints were judged by treating PT to be inactive  *Hydrotherapy exercises* were designed to produce the same effects as the land-based program. Stretches were performed without floats if the child had active or unstable joints, ligament laxity or joint deformity. Program was designed to use hydrodynamic and hydrostatic principles, hold relax techniques, passive stretches, functional activities and aerobic exercise. Patient position varied to use buoyancy to assist or resist movements. Difficulty level of any exercise was modified by changing limb position, speed of movement and use of equipment (floats, bats, flippers)  Frequency and duration of exercises were varied based on the child’s ability and speed of progress as well as disease status of individual joints.  Protocol for both land and hydrotherapy designed so child could perform large portion of exercises independently under supervision and most could be performed in a group session to promote interaction with other children with JIA. |
| **Mendonca**  **(2013)** | *Location of Intervention:* Outpatient clinic of pediatric rheumatology and rehabilitation department  *Intervention Provider and Training:* A PT trained to provide the same degree of motivation for each intervention. | **Pilates Program** | **Conventional Exercise Program** | Both groups performed exercise program in morning and afternoon at different locations  *Pilates Program:*  - Exercises introduced in order of increasing difficulty; each performed for 5 reps during first 3 sessions; 8 reps for next 3 sessions, 10 reps in remaining sessions  - Child asked to perform exercises slowly and completely 5-10 reps without movement of spine or rib cage  - Advised to stop any exercise if pain increased  *Conventional Exercise Program:*  - Adapted for each child and available as handout tochild  - Child told to perform each exercise 2X/wk for 50 minutes (5-10 reps each)  - Child told to perform each exercise slowly and without movement of spine or rib cage - Child advised to stop exercise if pain increased |
| *Exercise Prescription:*  50 min/2X/wk for 6 months; 48 sessions planned for each child  Exercises followed the Canadian Stott-Pilates methods, adapted to the physical and cognitive needs of each age group (8-11y and 13-18y) and JIA disease status  Authors describe details of programs for 8-12 year olds and 13-18 year olds; each program includes floor exercises and specific positions and exercises using the Pilates equipment (Reformer, Stability Chair, Cadillac and Ladder Barrel)  Supplemental video demonstrates small segment of a Pilates session; available online at  <http://www.archives-pmr.org/>  Patients instructed to perform each exercise slowly and to complete 5-10 repetitions without movement of spine or rib cage  Program requires Pilates equipment to replicate | *Exercise Prescription:*  50-min/2X/week for 6 months; 48 sessions planned for each child  *Warm-up:*  Speed skips, heel kicks, hopping, trunk twists while hopping, push-ups, high knee skip, standing hip circles, hip twists, leg/hip swings standing facing wall and hands on wall for support, lunges, ankle bounces with hands on wall for support, half squatting  *Workout:* (perform 10 reps each)  -Supine, both knees to chest; single knee to chest  - Supine, posterior and anterior pelvic tilts  - Supine, leg over ball, rotate legs and trunk from side to side  - Seated, stretch bilateral hip adductors, bending both legs and bringing feet together  - Prone, raise upper body by pushing up with arms, keeping pelvis on floor  - Supine, bridges, curl-ups  -Sitting against wall, shoulder flexion and upper cervical flexion  -Standing facing wall, slide arms up wall and adduct scapulae  *Cool-down:*  Stretching quadriceps, hamstrings, gastrocnemius, gluteal muscles – hold stretches for 30 seconds  Supplemental video demonstrates each component of the conventional exercise session; available online at <http://www.archives-pmr.org/> |
| **Sandstedt**  **(2012; 2013)** | *Location of Intervention:* Home-exercise program: participants given instructions and pictures of exercises and a 12-week diary at the first test session.  All measures performed at medical center1  Participants also kept a separate 12-week diary to record physical activity outside of program | **Physical Exercise** | **Assessment Only** | Exercise program and exercise diary provided to participants for HEP  (Program shown in appendix of 2nd paper)  Authors do not provide information regarding tailoring of intervention to each participant |
| *Exercise Prescription*: 3X/wk/12 wks  *Activities:*  - 100 2-footed jumps with a rope  - Muscle strength core exercises (supine curl-ups and bridges (3 sets of 10 reps)  - Exercises with free weights for arms and shoulders: load (0.5 – 2 kg); 3 sets of 10 reps each  Documented daily PA with a 12-wk diary. Activities categorized into 3 groups based on weight-bearing status:  1) jogging and ball sports  2) walking, gymnastics, horse riding  3) cycling and swimming | Documented daily PA with a 12-wk diary. Activities categorized into 3 groups based on weight-bearing status:  1) jogging and ball sports  2) walking, gymnastics, horse riding  3) cycling and swimming |
| **Takken**  **(2003)** | *Location of Intervention*: Heated (30-33° C) community pools at 20 different locations throughout the Netherlands  *Intervention Provider and Training*:  Community PT at each site educated about JIA and aquatic training program. | **Aquatic Exercise Training**  **(2-4 children/group)** | **Assessment Only** | Participants treated in groups of 2-4 children supervised by community therapist  No information was provided regarding modifications to the exercises or activities based on child’s disease status or physical abilities. |
| *Exercise Prescription*:  1 hour/week exercise conducted in a community pool supervised by a PT trained in program; if only one patient at a training location, child was allowed to bring relative or friend to join the program. Program included 20 sessions over 6-months.  Exercise program (available to participants on paper and video) consisted primarily of aerobic exercise: warm-up; aerobic conditioning; short rest; second conditioning period; cool-down.  *Warm-up, rest period and cool-down:* low intensity swimming, water aerobics, play and flexibility exercises or ball games in water.  *Conditioning sections:* high intensity swimming, diving, walking through water, aqua jogging or splashing with legs. Duration and intensity increased step-wise throughout the program.  Participants wore portable HR monitor to measure exercise intensity | Completed three assessment sessions: baseline, 3 months after start of program, immediately after end of training program |
| **Tarakci**  **(2012)** | *Location of Intervention: Patient’s home*  *Intervention Provider and Training*: Home exercise program 3X/week supervised by a parent; additional session at the hospital 1X/week supervised by a PT knowledgeable about JIA and trained to administer the exercise program | **Land-Based Home Exercise (LBHE) Program** | **Wait-List Control Group** | Exercise program was individualized for each participant (ROM, strengthening, posture exercises)  Participants kept a diary of the exercise program that was reviewed each week by the therapist supervising the hospital exercise session  To insure adherence to the program:  - Active and active-assisted exercise used in early weeks; progressed to active and active-resisted exercise  - Exercise time limited to 20 minutes initially, increased gradually to 45 minutes  - Number of reps initially limited to 3; gradually increased to maximum of 15  Exercise progression in was individualized based on participant’s tolerance. |
| *Exercise Prescription*:  Length of Program: 12 weeks  Duration: 20-45 minutes/session  Frequency: 4 days/week (3 days at home; 1 day/week at hospital PT department  Target of exercise program was to improve strength, flexibility, functional activities, quality of life and use of affected limb in a controlled manner.  Program was individualized for each participant and performed at home:  -Active or active-assisted ROM exercises targeted affected joints  - UL and LL strengthening exercises performed with elastic bands  - Stretching exercises (pectorals, hamstrings, hip flexors, Achilles tendon) were performed using moderate tension for 20-30 seconds  - Scapular and back extensors were trained to control posture during exercise  -Practice of functional activities: walking, squats, stair climbing | CG participants were assigned to a wait list until the end of the study |
| **Elnagger (2016)** | *Location of Intervention:* Research laboratories of Salman bin Abdulaziz University and King Khalid Hospital  In Saudi No specific description of the location for either the pool exercise (EG) program nor the traditional PT for the control group (CG)  *Intervention Provider and Training:* No description was provided for the individual(s) providing intervention, nor their training. | **Pool-Based Strength Training (Quadriceps and Hamstrings) and Interferential Current (ICF)** | **Traditional Physical Therapy (PT) Intervention** | Authors do not provide information regarding tailoring of intervention to each participant |
| Small groups (4-5 children)  3x/week: 45-minutes supervised  Regimen: 5-minute warm-up with stretching for LE muscle groups (hip, knee, ankle flexors); free walking and jogging in the pool; 20-min of resistance exercise: 5 exercises selected to achieve effect of dragging force (moving legs underwater with maximum effort to achieve highest possible speed and thus resistance;  Rest allowed between exercises or whenever child felt “faint”  Exercises included 1) Repeated knee flexion/extension while seated; 2) bilateral simultaneous flexion/extension of both knees;  3) reciprocal knee flexion/ extension from sitting; 4) water kicking exercises: knee flexed with hip extended; knee extended with hip flexed; 5) fast walking in water; 5-min cool-down of free low intensive ex in water; gentle stretching of LEs  IFC stimulation for 15 minutes: child positioned supine, knees cleaned; ICF delivered at knee with amplitude-modulated Fx of 100 Hz and pulse duration = 125 μsecs with 2 pairs of electrodes (1 applied medial-lateral; 1 applied anterior-posterior; procedure began with sensory threshold and intensity was gradually increased until child reported discomfort | Individual supervised PT sessions: 3X/week for 45 minutes.  Regimen: 5-minute warm-up and hot packs, ROM, isometric exercise for quadriceps and hamstrings; hold-relax techniques; weight-bearing exercise; gentle stretching; cycling or treadmill walking exercise  The specific exercise prescription was not provided by authors |
| **Singh-Grewal**  **(2007)** | *Location of Intervention*: Supervised sessions were held in one of 6 locations; exact locations were not described.  *Intervention Provider and Training:*  *Exercise* therapist; specific training to work with children with JIA was not described  Unsupervised sessions occurred in the participant’s home, monitored by parent/caregiver. | **High-Intensity Aerobic Training**  **(Dance and marital arts)** | **Low-Intensity Exercise Training**  **Based on qigong** | Supervised exercise sessions (1X/week) were led by an exercise therapist with a 1:4 instructor to subject ratio  Control group sessions were held at same location as experimental group sessions but at different times  Rating of perceived exertion was used to determine exercise intensity for individual participants; exercise intensity ranged from low to moderate based on individual tolerance  Study coordinator and fitness instructors kept in frequent contact with participants to maintain adherence. Instructors met monthly to review each participant’s progress.  Safety was monitored in daily records of pain and through joint examination at on-site testing sessions  To encourage adherence, participants were rewarded with stickers for completed sessions and could trade these for small gifts. |
| *Exercise Prescription*:  30 minutes/3X/week/12 weeks:  -1 supervised exercise session-led by exercise instructor with a 1:4 instructor-subject ratio;  -2 unsupervised / home exercise sessions followed the same program as supervised using a video of the program.  Subjects instructed to complete 2 sessions/week at-home and to make up missed sessions.  **30-minute Supervised Sessions:**  -10-minute warm-up mimicking the exercise program followed by light stretching  Aerobic training (cardio-karate) was designed to avoid activities that might be unsafe for joints. Intensity progressed from low to moderate/ high as tolerated by each participant;  -5-10 minutes of passive stretching  HR measured as 15-second count at carotid artery or by HR monitor: target HR set at > 75% of HRmax determined from VO2max testing at enrollment. RPE using children’s OMNI Scale used to determine exercise intensity\*\* | *Exercise Prescription:*  30 minutes/3X/week/12 weeks:  -1 supervised exercise session-led by exercise instructor with a 1:4 instructor-subject ratio;  -2 unsupervised home exercise sessions followed the same program using a video of program  Subjects instructed to complete 2 sessions/week at-home and to make up missed sessions.  **30-minute Supervised Sessions:**  -Gentle relaxation program similar to Tai Chi: 18-posture program, with each posture performed 8 times. The program was designed to be low intensity and to avoid raising HR. Cool-down consisted of gentle stretches. Participants recorded RPE and HR and to ensure it was below MHR. |

\* TIDieR Checklist for reporting clinical trials: <http://www.equator-network.org/reporting-guidelines/tidier/> (accessed 8-29-2017)

\*\* Robertson RJ, Goss FL, Boer NF, Peoples JA, Dabayebeh IM et al. Children’s OMNI scale of perceived exertion: mixed gender and race validation. Med

Sci Sports Exerc. 2000;32:452-8

Abbreviations: UL = upper limb; LL = lower limb; PI = Principal Investigator; HR = heart rate; RPE = rate of perceived exertion; MHR = maximal heart rate; ROM = range of motion; SLS = single limb stance