**Needs Analysis**

**Overview**

The swimming and water polo teams have been attending two Mad Fit online sessions via YouTube per week. The sessions are usually 30-40 minutes duration. Some members of the team have been maintaining some cardiovascular fitness by either running or walking and other members of the team have not participated in any cardiovascular fitness activities during the UK lockdown.

The members of the swimming team are both short distance and long distance swimmers but all would need to have a good base of strength and endurance.

Team members would like 1-2 strength & conditioning sessions per week that focus on the shoulders and injury prevention. Interest was also shown in additional sessions focusing on core body strength and cardiovascular fitness.

There are a number of athletes in the team who have injuries and limitations in mobility. Training sessions would need to be modified for these athletes. More details will be provided regarding these athletes and their limitations by email.

**Time Motion Data OR Movement Analysis**

Currently we do not have access to time motion data or movement analysis equipment due to the UK lockdown restrictions. Normally we would be able to utilize time motion data or movement analysis to observe; range of motion of both upper limb and lower limb to highlight areas of restriction in range or poor control; assess body alignment superiorly, laterally and inferiorly for symmetry of movement; stroke rate per minute, rhythm and timing; and finally body position in the water to reduce drag forces and improve stroke efficiency.

Functional movement screening is often used to assess athlete’s movement across a range of movements. The screen consists of 7 different tests, which are each scored out of 3: 0 – pain during test, 1 – some errors of movement pattern, 2 – minor errors in movement pattern, 3- correct movement pattern with good technique. The movements include a deep squat, hurdle step, in-line lunch, shoulder mobility, active straight leg raise, trunk stability push-up and rotary stability. While it is not possible to screen every member of the swim team at present, the exercise sessions that we plan to run will be video-recorded via MS Teams. We will be able to observe form and technique of each participant after each session and assess whether there are biomechanical issues with functional movement when performing specific exercises.

**Physiological Responses to Training and Competition**

Resting and maximum heart rate and VO2 max can be measured using fitness trackers, during training and competition. Fitness trackers record health fitness data and have been in addition to existing methods for health collection data in research (Henriksen et al., 2018). As we have limited access to more sophisticated equipment to measure physiological responses to training and competition, fitness trackers are a good substitute. We will be able to establish improvements in fitness as both resting heart rate and maximum heart will reduce and VO2 max will increase as the swimmers’ fitness improves. Fitness trackers also provide data that show how much time the athlete spends in different training zones (based upon heart rate) during a training session. This information is really helpful to establish whether the load and intensity is appropriate for that athlete, whether they are overtraining and working at high intensity to often or when they are tired. This data is also helpful when an athlete is preparing for competition. We can establish from the data whether an athlete is tapering effectively and ensure that the gains in adaptation from the training overload in previous weeks are not lost, so that they are in the best, possible shape for competition.

We can ask those members of the swimming team, before they participate in the training program, whether they have fitness trackers and if they would be happy to share their VO2 max, heart rate and heart rate training zone data with us on a weekly basis. The data will help us to monitor their response to the training that we have put in place and observe improvements in fitness.

**Injury Risks**

When developing a training program to prevent injury it is important to consider the injuries that athletes are predisposed to within specific sports. Within swimming, studies have found shoulder pain is the most common injury to be reported, with a prevalence between 40% and 91%. The cause of the shoulder injuries is multifactorial including overuse of the shoulder muscles or instability of the shoulder (Wanivenhaus, Fox, Chaudhury, & Rodeo, 2012). A systematic review of the current literature by Miller and colleagues (2018) investigating the incidence and intrinsic risk factors for shoulder injury in water polo players, found that shoulder pain and injury are also common in water polo with reported injury rates for male players ranging from 24% to 51%. Also, studies show swimmers and water polo players normally have an increase in internal rotation strength and decreased strength in external rotation causing muscle imbalances therefore, to help prevent shoulder injuries a strengthening programme focusing on the shoulders (rotators cuffs) and upper back will be required (Batalha et al., 2020; Miller et al., 2018).

Injuries of the knee are the second most-reported source of pain in swimmers, with a greater incidence of knee pain occurring in breaststroke swimmers (Wanivenhaus et al., 2012). Overuse, extreme hip abduction, increased varus and valgus loads occurring at the knee and rapid knee extension increase the risk of knee injury. The inclusion of a training session focusing on core strength and stability to increase control of the pelvis will help to prevent knee injury (Chivate & Bharucha, 2019).

A strengthening program will improve flexibility and range of motion, increase rotator cuff and scapular muscle strength, and reduce musculoskeletal imbalances. The inclusion of core stability and strengthening exercises will also improve balance, power and stability and enable swimmers to hold their body higher in the water reducing drag. A stronger core will also improve flip turns and underwater dolphin kick for swimmers and give water polo players more explosive power in and out of the water.

**Anaerobic Qualities**]

Incorporate HIIT training – 1 session per week for cardiovascular training, which would normally be done in the pool, but has not been possible because of the UK lockdown restrictions and the pool being closed for repairs. This session combined with the athletes running and walking activities during the week will help to improve cardiovascular fitness.

HITT is defined as High Intensity Interval Training and is a cardiovascular form of exercise that involves alternating short bursts of maximum exertion to increase the heart rate (80-95% HRmax and 15-18 RPE), with recovery periods of lower intensity or rest to lower the heart rate back to normal. HITT training has been shown to improve VO2 max, increase in fitness in a short period of time compared to other exercise, improve cardio metabolic health, and it is a great form of exercise for strengthening muscle groups for specific sports (Batacan, Duncan, Dalbo, Tucker, & Fenning, 2017).

**Aerobic Capacity:**

Normally aerobic capacity can be established by VO2 max testing, submaximal and bleep tests. However in the current pandemic we do not have access to the required equipment, therefore we have to consider adopting other methods. Fitness trackers provide regular updates on an individual’s VO2 Max. As the athlete’s fitness improves the VO2 max increases. VO2 max also reduces when an athlete is overtraining because their performance reduces as a result of fatigue or stress on the body.

**Performance testing**

Recording online training sessions will enable us to observe the athletes’ technique and to establish whether they are finding the current load too challenging. We can adjust the load to ensure that the training load is not increased too soon.

We can also use the rate of perceived exertion (RPE) scale to establish whether the load is too high (Gunnar A.V. Borg & Bruce J. Noble, 1974). Ideally we want participants RPE to be within 13-15 (somewhat hard to hard) during S&C and aerobic exercise sessions and 17-18 (very hard) during high intensity training sessions. We can use RPE to assess whether the exercise challenges the athletes enough to ensure gains in their fitness, overtime with the right level of overload and adaptation.

**Recommendations for Training**

The following training sessions were suggested and agreed to fill the current gaps in the swimming and water polo teams’ training:

Strength & Conditioning twice per week with emphasis on the shoulder

1 core strengthening session once per week

1 HIIT session per week for cardio-vascular fitness

All sessions will include a warm up and cool down section.

Cool down stretches at the end of each session will help improve flexibility.

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