MAPS Therapy

MOBILIZATION ANALYTICAL PROGRESSIVE AND SEQUENTIAL (MAPS) THERAPY

Loss of mobility and pain are two of the main complications of the injured hand [1,2] . When stiffness is established, mobilization techniques are indicated to correct the deficiencies. These techniques must be focused on re-establishing normal kinematics and must be able to offer the necessary dose of therapy to modify the tissues, but should always respect the limits guided by pain. Mobilization techniques require a high degree of precision in order to focus the specific movement on the involved anatomical structure/s. The dose can be adapted by increasing the time and intensity [3,4,5]. Increasing the dose through intensity has the risk of exceeding the physiological limits of the tissue and may cause damage [6, 7], which is why therapists prefer to increase the doses over time [3, 5]. However, the use of splinting allows us to increase the dose over time, but it does not always allow us the precision that manual therapy gives. But then, manual therapy can be applied with precision, but hardly allows the application of forces for prolonged periods.

Having adjustable intensity techniques which have the precision of manual therapy, and which can be applied for extended periods would be a clear benefit since it would give more therapeutic possibilities for the hand therapist [8-13].

What is MAPS Therapy?

MAPS stands for Mobilization Analytical Progressive and Sequential. It is a method for treating hands which combines the knowledge and art of hand therapy with the design of a hand therapy exercise device.

MAPS therapy devices are based on the modification of an old hand therapy device called the “hand pegboard” (also known as the “Canadian plateau") [14]. This pegboard consists of a board with multiple holes. A range of pegs of different sizes and shapes are secured to the pegboard to create personalized mobilization exercises.

Figure 1: Precision area

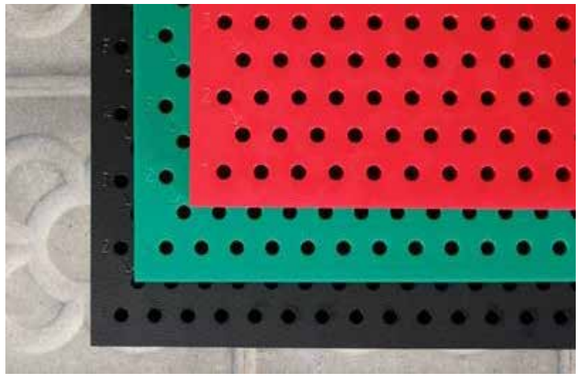

Figure 2: Hole code system

The modifications of the original hand pegboard include an increased density of holes in the center of the pegboard creating a precision area (Fig. 1), a new hole-code system that helps the therapist and the patient replicate the same therapy session, grade the session and chart the progress (Fig. 2), and a variety of accessories that can be used in two- or three-dimensional pegboards (Fig 3).

Figure 3: Accessories to work in two and three dimensions

Figure 4: Elastic tension swinging technique with lever type 1 for extension of the PIPJ

This further enables the therapist to deliver a large repertoire of exercises and fosters creativity in treatment sessions. If the restriction is in the flexion and extension plane, exercises in this plane generally suffice. For example visco-elastic lengthening of the volar plate of the PIP joint is shown in Figure 4.

However when joints work in a transverse plane or on two different planes or between them, the basic pegboard is not enough. For example, specific structures which tighten between different movement planes, such as the radial collateral ligament of the wrist which tightens in extension and ulnar deviation (Fig. 5) as well as in supination of the forearm (Fig. 6). In cases like these, stiffness can be treated using the 3D accessories, working simultaneously in different planes.

Figure 5: Tightening of the radial collateral ligament of the wrist

Figure 6: Supination

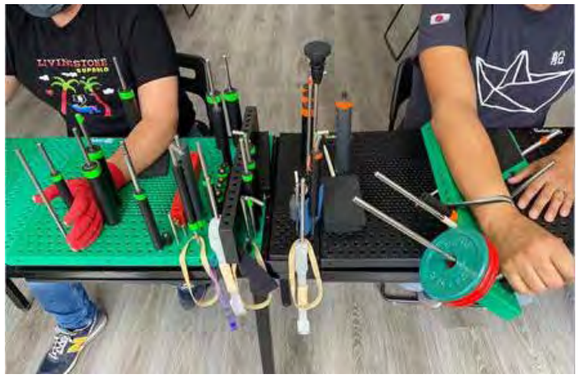

Figure 7: Patient at the clinic using MAPS

Why we developed MAPS Therapy

With increasing demands on health services, time is a precious resource that needs to be directed as much as possible to patient care. The MAPS therapy device evolved as a method to protect this precious resource by ensuring sufficient treatment time to treat several patients simultaneously with a high quality of mobilization techniques. The therapist will do a comprehensive assessment of each patient and establish specific treatment goals. Once completed, the therapist can construct exercises on the pegboard within a few minutes enabling the patient to continue with self-assisted exercises under supervision. In situations where the patient suffers from fear-avoidance, this can be effectively managed because the exercise intensity, as suggested by the therapist, is however controlled by the patient. In this way the patient can work independently freeing the therapist to attend to other patients. In our experience this is a win-win situation for both patient and therapist (Fig.7).

Treatment Structure

Treatment should begin with a 'clinical reasoning process' to determine:

1. What is the movement dysfunction (e.g. PIPJ extension)?
2. What structures are potentially contributing to the movement dysfunction? Therapists should test these structures to ascertain or confirm the cause of this deformity (e.g. volar plate shortening, fibrosis of the volar recess of PIPJ, collateral ligament fibrosis, flexor tendon adhesions and muscle contracture).
3. A treatment protocol prioritizing the treatment of all the involved key structures and to treat them one by one (distal gliding of flexor tendons, increased flexibility of capsular elements, proximal gliding of extensors).

Treatment should be applied in the following order:

1. Passive mobilization techniques are applied first. These techniques can involve swinging movements or accessory movements; they can also use self-range exercises or use external devices such as elastic or plastic bands to apply forces on the hand. The goal is to obtain softer scar tissue before commencing active exercises (e.g. elastic tension exercise for volar translation of the head of P1 on P2). The therapist then evaluates the result obtained and will know if the dose and/or the direction needs any modification. Dose parameters are related to intensity and time. We suggest intensities inside the tightness and outside pain (we recommend an intensity of between 0 and 3 on a 10 numerical rating pain scale). Time dosage is usually 20 minutes but it can be increased depending on the goals and patient tolerance.
2. Once passive movement has improved, the patient then progresses to actively move the joint and to integrate their hand into functional use.
3. If the patient is not able to actively use the new motion obtained then the therapist can introduce more intensive active exercises with the same device or use an orthotic device to help in the progression of treatment. If these goals cannot be achieved because of weakness or tendon lag then this therapy is not indicated.

Types of Mobilization Techniques

Active or passive mobilization techniques are applied depending on which structures needs addressing. Passive mobilization is used when a passive restriction is present. Techniques are precise following biomechanical approaches (e.g. Katernborn). The therapist can focus on global swinging techniques (Fig. 4) or more specific techniques related to accessory movements like rolling or gliding exercises (Fig. 8).

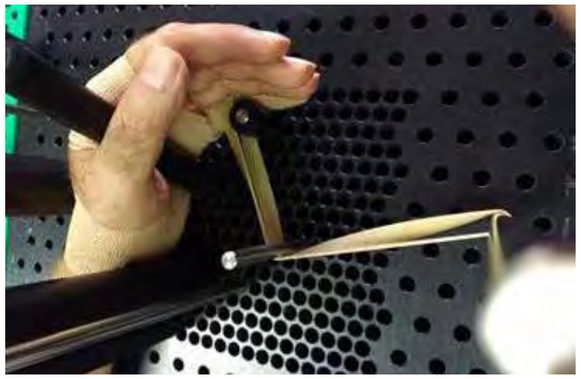

Figure 8: Elastic tension exercise for volar translation of the head of P1 on P2

Figure 9: Deep flexor tendon proximal gliding

When active mobilization is used, one should consider the need to improve muscle function or proximal tendon gliding first (Fig. 9). If the muscle is affected, then progressive active exercises can be used progressing from active assisted to full active range of motion, or active-intensive contraction when strength is required (Fig. 10).

Passive mobilization is applied first to make any scar tissue and soft tissue supple, before progressing to active mobilization to avoid fatigue. As soon as active motion improves, more function-based exercises are introduced (Fig. 11). This program is individualized for each patient depending on the cause of their movement dysfunction and treatment goals.

Figure 10: Finger flexion plus wrist extension

Figure 11: Functional exercise

Educating Patients in MAPS Therapy

When using the MAPS therapy device, the therapist creates the exercise, but it is the patient who manages the dose. Intensity and duration can be combined in multiple ways. All exercises should be inside the limits imposed by pain while respecting the biological processes of tissue healing. The patient must be educated to understand their symptoms, the pathology and the reasoning behind the treatment protocol [11, 13].

Indications and Contraindications

The MAPS therapy device can be applied to any movement impairment of the wrist, hand and elbow. It is especially indicated when there are movement restrictions relating to various conditions emanating from orthopedic, traumatic, rheumatoid or neurological conditions. It is a versatile hand exerciser which is dependent on the therapist's creativity.

In order to achieve measurement consistency, the hand should always be stabilized in the same position using the hole-code system. Evaluating passive or active motion can easily be done using a goniometer or a camera. In this way any improvement can be detected and recorded immediately (Fig. 12).

Figure 12: Measuring with MAPS

While this device is used mainly in a Hand Therapy Clinic, some patients may not be able to attend therapy regularly. In such a scenario, the patient is taught how to use the pegboard with illustrations and instructions. The patient reproduces the same session at home as many times as required while waiting for the next session with the therapist (Fig. 13). This could also be achieved via video call (Fig. 14).

Figure 13: Recording a session

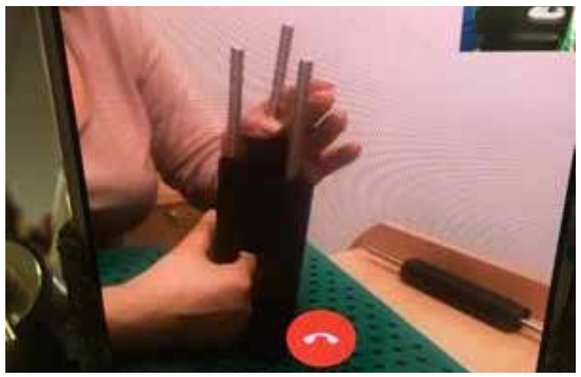

Figure 14: Online treatment

Conclusion

The MAPS therapy device does not replace established mobilization techniques. Instead, it is a new modality in the therapist's toolbox. Tool-assisted mobilization can treat many structures of the hand with precision.

The techniques allow progressive loading with prolonged stretching with the dose of each adapted to the patient's needs. It is an accessible treatment which can be used in the clinic or at home with the therapist providing guidance virtually.

Understanding anatomy and biomechanics is a necessity for administering this technique. MAPS exercises are the final part of a clinical reasoning process. The therapist should have clinical experience, with a good knowledge of physiology, the healing process and the cause of the dysfunction. They should be skilled to test all the involved structures in all movement restricted directions.

Also, the therapist needs to be able to set up a personalized exercise program with a sequence of passive, active and functional exercises involving the restricted structures. And finally, the therapist should not only be able to administer the treatment, but be able to explain understandable information to the patient.

For more information on the MAPS Therapy and related training: info@mapstherapy.com

Reference

1. Innis PC, Clarck GL, Curtis RM. Management of the stiff hand. In: Hunter JM, Mackin EJ, Callahan AD (eds). Rehabilitation of the hand: Surgery and Therapy. 4th ed. St Louis, MO: Mosby. 1995, 1129-39.
2. Amadio, P. C. (2005). Friction of the Gliding Surface. Journal of Hand Therapy, 18(2), 112–119.
3. Flowers KR, LaStayo P. Effect of Total End Range Time on Improving Passive Range of Motion. Journal of Hand Therapy. 1994, 7: 150-7.
4. Flowers KR. A proposed decision hierarchy for splinting the stiff joint, with an emphasis on force application parameters. Journal of Hand Therapy. 2002, 15: 158-162.
5. Light KE, Nuzik S, Personius W, Barstrom A. Low-load prolonged stretch vs. high-load brief stretch in treating knee contractures. The Physical Therapy. 1984, 64: 330-3.
6. Fess EE. A History of splinting: To understand the present, view the past. Journal of Hand Therapy. 2002, 15, 97-132.
7. Flowers KR. Reflections on mobilising the stiff hand. J Hand Ther. 2010;23(4):402-3
8. Glasgow C, Tooth LR, Fleming J. Mobilising the stiff hand: combining theory and evidence to improve clinical outcomes. Journal of Hand Therapy. 2010, 23: 392-400.
9. Kaltenborn FM. Fisioterapia manual extremidades. 10th ed. Madrid: McGraw-Hill-Interamericana de España. 2001.
10. Maitland GD. Vertebral Manipulation. Elsevier Science, 2013.
11. Sahrmann SA. Movement System Impairment Syndromes Of The Extremities, Cervical And Thoracic Spines. Elsevier: Mosby. 2011.
12. 12.- Zusman M. The Modernisation of Manipulative Therapy. International Journal of Clinical Medicine. 2011, 2:644-9.
13. Butler, David S, and G L. Moseley. Explain Pain. Adelaide: Noigroup Publications, 2003. Print.
14. Quilici V. Le plateau Canadien. In Boutan M, Thomas D, Célérier S, Casoli V, Moutet F. Rééducation de la main et du poignet. 1st edition Issy.les-Moulineux Elsevier-Masson, 2013 137-141.

VICENÇ PUNSOLA-IZARD, PT, CHT, MSc
Hand Therapy Barcelona, Barcelona, Spain
Email: v.punsola@handtherapybcn.com