

The Importance of Exercise in the Treatment of Rheumatoid Arthritis

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Abstract--Arthritis and other rheumatic diseases are among the most common chronic diseases. Arthritis is one of the main causes of disability. It restricts daily activities such as dressing, climbing stairs, getting up and getting out of bed, or walking [1]. Rheumatoid arthritis (RA) is the most common type of chronic inflammatory arthritis. The inflammatory process associated with RA manifests itself mainly in the synovial tissue [2].

It can affect any joint, large or small. Other parts of the body may be involved in the inflammatory process [3]. Caring for patients with RA is complex and often involves medical professionals from various disciplines [4]. In the treatment of RA, four main treatment approaches are recognized, including medication, exercise, joint protection and lifestyle changes, and surgery. Even though pharmacological interventions have significantly improved management of RA, exercise therapy remains an important part of the treatment.

Keywords--arthritis, physiotherapy exercises, exercises, hydrotherapy

I. INTRODUCTION

The physical condition or condition of patients with rheumatoid arthritis.

RA has a serious impact on physical and psychological health [7]. Despite progress in treatment, it remains a chronic disease with disabilities and a high incidence of disease.

RA causes various physical disorders in those who suffer from this disease [9]. Some of these include inhibition of muscle contraction, myositis, muscle atrophy, loss of muscle strength, loss of movement in joints and decreased aerobic ability.

Rheumatoid cachexia is a term used to describe a simultaneous decrease in body weight, an increase in resting energy expenditure, and an increase in whole body catabolism, which often occurs in RA. The end result of cachexia is skeletal muscle depletion and an increase in fat mass [11].

Patients with RA also have a 60% increased risk of having cardiovascular disease [12]. The cause of cardiovascular diseases is multifactorial, but a low body mass index, dyslipidemia associated with inflammation, and impaired immune regulation, leading to the development of coronary artery atherosclerosis, impaired function, the autonomic heart system, which can predispose patients to arrhythmias, as well as to a decrease physical activity are the main contributing factors [7,13].

Studies have shown that health-related quality of life (HRQOL) or well-being is an important outcome for the patient, along with the treatment of pain, sleep and fatigue, as well as emotional and physical well-being in

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patients with chronic diseases. HRQOL is determined by many interacting factors, including individual relationships, social networks and aerobic training, as well as the nature of the disease itself [7]. Unfortunately, patients with RA has been shown a decrease in HRQOL for a long time.[14].

Levels of physical activity in patients with rheumatoid arthritis

Over the past decade, there is increasing evidence of the benefits of physical activity for the health of patients with RA. Despite this evidence, patients with RA are less physically active than the general population [15,16]. A recent study showed that a group of patients with RA spent almost two hours more each day participating in sedentary activities than their healthy, comparable control participants. The same study also showed that, in general, patients with RA were more passive compared with the control group [17].

Various factors influence inactivity levels in patients with RA. The presence of constant pain limits their ability to function normally, and as a result, levels of physical activity are reduced [18]. Unemployment, possibly associated with a worsening of RA, apparently contributes to a decrease in the level of physical activity [12]. In addition, the limitations of physical exercises traditionally used for patients with RA due to fears of exacerbation of joint inflammation and accelerated joint damage can also contribute to inactivity and deactivation [19].

In general, it seems that patients with RA spend more time than control patients, participating in mild and moderate activities, and less in energetic activities. A higher functional class is apparently associated with higher submaximal energy expenditures and lower levels of physical activity and aerobic ability [18]. Joint swelling, pain, and systemic symptoms lead to a decrease in physical activity, especially during an exacerbation of the disease [20].

In addition to the medical, physical, and psychological benefits of physical activity for patients with RA, it appears that patients with RA who are more physically active are usually better in most functional evaluations than patients with RA with lower levels of physical activity [17].

Prescribing exercises for patients with rheumatoid arthritis

The benefits of appropriate exercises for patients with RA are enormous. In the past, dynamic exercises were believed to exacerbate painful and painful activity and cause joint damage. Therefore, isometric exercises and movement exercises (ROM) were primarily prescribed. Numerous studies have shown that this is not the case with the right choice and proper use of exercises [6,8,14]. Thus, the types of exercises prescribed for patients with RA have changed over the past few years [21]. Rest and exercise are complementary elements for the treatment of an active disease. The best balance should be found for each patient. [22, 23].

Range of motion or stretching exercises

The range of motion is the main focus of exercise in diseases of the joints, because the health of many joint structures and their ability to self-repair depends on the movement of the joint. Maintaining a functional range of motion is also necessary for everyday activity and movement efficiency. When actions are performed with joints in non-optimal positions due to the limited movement of the joints, the muscles are biomechanically deficient. Thus, great effort is applied to the joints, and fatigue occurs earlier [22,24,25].

Unfortunately, daily activities do not move joints through their full range of motion, and therefore they cannot replace stretching exercises and full range of motion. Exercises in the full range of movements include the movement of each joint, as far as convenient, in all directions [26]. Exercises in the full range of movements can be passive, active or actively auxiliary [27].

Active exercises in full should be performed as a treatment procedure for all joints, which shows the involvement of arthritis in the process, as well as other joints, as a precaution. Active exercise is preferred. Passive movement should be used only when it is absolutely necessary, for example, with acute inflammation of the joints, when the patient cannot move due to pain or spasm and / or severe myositis. When performing the exercises in full, it is important to consider the physiology of the joint and work within the residual range of motion of the affected joint, while avoiding compensatory movements [22,24,28].

It is usually recommended that the exercises be fully performed once or twice a day, with 6-10 repetitions. A joint with acute inflammation should undergo the exercise in full only 2-3 times 2-3 times per session. Excessive stretching (the movement does not work in full) or improper technique (using compensatory movements) can be harmful to the joint, especially if it is inflamed or unstable. The presence of a bio kinetics or physiotherapist for the initial monitoring and training of the patient in the correct technique is important (1,22,29).

Cardiorespiratory exercises

In people with RA, cardiorespiratory function and exercise tolerance are very limited, both due to lack of physical activity and the disease. An adequate level of aerobic fitness is necessary to maintain daily life. In addition, cardiorespiratory exercises are important because the life expectancy of patients with RA is lower than that of the general population, and some evidence suggests that the risk of cardiovascular comorbidity in RA can be increased as a result of decreased physical activity and aerobic fitness. [34,35].

In the past, treatment of RA often excluded aerobic exercise due to fear of increased joint inflammation and an accelerated disease process. However, properly designed cardiorespiratory exercises that take into account the level of joint stability, pain and other limiting factors can be very useful for patients with RA who are not in the acute phase of their disease [22]. Exercises that use smooth and repetitive movements are recommended. Previous studies of the effects of aerobic exercise on patients with RA have used cycling, water sports, aerobic dancing, or walking [36-39]

Janse van Rensburg and others found that patients with RA significantly improved flexibility, strength and aerobic abilities, measured after a 12-week aerobic exercise (walking or water sports) in combination with strengthening and stretching exercises [39]. In addition, the exercise group significantly improved activity compared to the control group (DAS28). [39]

Adaptations or precautions such as walking on a softer surface (such as grass) can reduce stress on the joints of the lower extremities. It may also be useful to use appropriate training equipment or equipment, for example, ensuring that the patient has boots specifically designed for walking to help cope with shock, or the use of non-standard orthopedic devices (rigid or semi-rigid) for biomechanical correction of structures [1 , 40,41].

In general, moderate-intensity cardiorespiratory exercises are recommended for 3-5 days a week [30]. However, it is recommended that the intensity be based on an assessment of physical fitness before training and the current status of the disease [25]. Although caution should be exercised with respect to some studies, patients with moderate disease can tolerate high-intensity exercises [23,42]. In a recent study by De Jong and other coauthors in a high-intensity exercise program, it was found that there were no harmful effects on disease activity or radiological damage to large joints [42]. The duration of the exercise session varies greatly and can vary depending on the intensity to provide the desired stimulus exercise [4].

Strengthening exercises

Muscle weakness, contracture, and atrophy often contribute to the clinical presentation of patients with RA. Atrophy of type II fibers is the most common [44]. Adequate functions of muscle strength and endurance to absorb shock and shock during weight transfer, and optimal strength also serves to protect and preserve the joint.

Strengthening exercises provide sufficient resistance or overload so that the muscle fiber reacts with physiological changes or a reinforced set. Such resistance can be provided in isometric, isotonic or isokinetic mode, depending on the biomechanical integrity of the affected joints and the state of activity of the disease.

In patients with RA with acute forms of the disease, static or isometric exercises can be used to prevent a possible decrease in muscle function [45]. Usually recommended abbreviations that hold for six seconds, repeated 5-10 times. Even a short isometric contraction increases muscle strength [31,32]. It is advisable for patients with RA to strengthen muscles isometrically, because isometric contractions are used in many everyday tasks [31].

Isotonic exercises are a dynamic form of exercise. This follows natural progress: auxiliary contractions, movements without resistance, movements without load, movements against gravity and movements against resistance. Caution should be exercised when participating in dynamic muscle contractions when joints are actively inflamed and painful. 28

However, studies have shown that individually tailored workouts with dynamic strength can improve muscle strength and physical function without adversely affecting disease activity or structural damage to joints and others, found that regular dynamic strength improved muscle strength (19–59%) in patients with early RA, without adversely affecting disease activity or structural damage to joints [46].

As a rule, muscle training with a low load and high repetition rate is recommended, and it has been recommended. they are proven to be clinically safe [33]. Various equipment can be used to provide resistance to dynamic muscle contractions, but the procedure for retaining weight or resistance should not cause stress on the joint of the finger or wrist [47]. Each joint must be used in its joints. The most stable and anatomical plane, as well as excessive force during bending and elbow deviation.

Thus, increased exercise prescribing should be adapted to the needs of a patient with RA, taking into account factors related to the age, severity of the disease, strength, degree of joint destruction and the special needs of the patient. In addition, isometric or dynamic muscle function combined with massive muscle contractions using normal patterns can provide the greatest potential for improving functional performance [4.48].

Although the positive effects of strength training are well described in several studies in patients with RA, the positive results quickly disappear with complete or partial cessation of training [46,48-50]. Therefore, patients with RA need to be motivated in order to keep up with their education. A patient education program that includes an explanation of the goals and benefits of exercise can improve long-term compliance [51].

Other exercises or activities

Entertaining activities are important and beneficial to both physical and psychological condition. Many patients with RA can continue the exercises they like. In some cases, adaptive devices, such as a wrist splint, may be required when participating in recreational activities such as tennis. However, some activities for example, strong bumps and sports, which include jumping and hard descents, should be avoided, as this can aggravate arthritic joints [1,6,41].

Hydrotherapy or water exercises have been shown to increase muscle strength and ROM of joints, improve aerobic abilities, reduce pain and improve function in patients with arthritis [52]. The buoyancy of water makes it the preferred choice for patients with diseases of the muscles and joints. However, when prescribing exercises for patients with RA, the importance and unique advantages of ground exercises, such as improving bone mineral density (BMD), should be considered, since osteoporosis is a well-known extra-articular complication of RA [53], swimming, cycling or rowing studies suggest that these typical non-overweight exercises do not generate the necessary reaction forces to the skeleton to increase BMD [54-56]. The results of a study by Nolte K. showed that both types of exercises (on land and on water) had a positive effect on various parameters of the physical condition and, apparently, did not increase the activity of the disease, although in the group of exercises based on water, showed a significant reduction in edema and joint pain. Therefore, it was suggested that the optimal combination of exercises on land and water should be prescribed to patients with RA depending on the needs of patients and the activity of the disease during this period of time.

Physical assessment and possible side effects of exercise

Balanced joint health, intensity of exercise, and socially desirable activities are necessary to maximize the benefits of exercise and to provide age-appropriate, pleasant and safe exercise opportunities. [4] Therefore, a biokinetics, physiotherapist, or exercise specialist should perform appropriate physical assessment and monitoring of response to exercise. highly recommended for patients with RA. Exercise testing can be problematic in this group of patients because performance is mainly limited by joint pain rather than cardiovascular function. Unaesthetic exercise regimens and / or hand ergometry may be useful because they avoid excessive stress and allow patients with RA to achieve a more reliable level of stress [58]. Patients should also be warned against excessive physical exertion and trained in such signs as physical pain after more than two hours, excessive fatigue, increased weakness, decreased ROM and increased edema.

II. CONCLUSION

RA has a great impact on physical and psychological health [7]. In the treatment of RA, four main approaches to treatment are recognized, including drug treatment, exercise, joint protection and lifestyle changes, as

well as surgical intervention [5]. Despite the well-known advantages of physical activity and exercise, patients with RA are less physically active than the general population [15,16]. The types of exercises prescribed for patients with RA have changed over the past few years²¹. A comprehensive exercise program for patients with RA should include moderate intensity cardiorespiratory exercises 3-5 times a week, strength training for three days a week, as well as stretching exercises or ROMs, at least once a day [59,60]. Some recreational activities can also be beneficial and improve the physical and psychological state of patients with RA [1,6,41].

REFERENCES

1. Nieman DC. Exercise soothes arthritis. Joint effects. ACSMS Health Fit J. 2000;4(3):20-27.
2. Scott DL, Kingsley GH. Inflammatory arthritis in clinical practice. London: Springer; 2008.
3. Thompson JM. Arthritis: everything you need to know about arthritis. Johannesburg: Zebra Press; 1997.
4. Walker JM, Helewa A. Physical rehabilitation in arthritis. St. Louis: WB Sanders Company; 2004.
5. Giannini MJ, Protas EJ. Exercise response in children with and without juvenile rheumatoid arthritis: a case comparison study. Phys Ther. 1992;72(5):365-372.
6. Semble EL, Koeser RF, Wise CM. Therapeutic exercise for rheumatoid arthritis and osteoarthritis. Semin Arthritis Rheu. 1990;10(4):32-40.
7. Veena Sharma, Urmila Chaudhary (2015) An Overview On Indigenous Knowledge Of Achyranthes Aspera. Journal of Critical Reviews, 2 (1), 7-19.
8. Chang C, Chui, C, Hung S, et al. The relationship between quality of life and aerobic fitness in patients with rheumatoid arthritis. Clin Rheumatol. 2009;28(6):685-691.
9. O'Dell JR. Therapeutic strategies for rheumatoid arthritis. N Engl J Med. 2004;350(25):2591-2602.
10. Hicks JE, Leguen-Guegan S, Allenet B, et al. Is dynamic exercise beneficial in patients with rheumatoid arthritis? Joint Bone Spine. 2008;75(1):11-17.
11. Iversen MD. Physical therapy for management of rheumatoid arthritis: rehabilitation measures are most effective when starting early. J Musculoskelet Med. 2002;19(9):352-358.
12. Roubenhoff R, Walsmith J, Lundgren N, et al. Low physical activity reduces total energy expenditure in women with rheumatoid arthritis: implications for dietary intake. Am J Clin Nutr. 2002;76(4):774-779.
13. Munsterman T, Takken T, Wittink H. Are persons with rheumatoid arthritis deconditioned? A review of physical activity and aerobic capacity. BMC MusculoskeletDisord. 2012;13:202.
14. Janse van Rensburg DC, Ker JA, Grant CC, Fletcher, L. Autonomic impairment in RA. Int J Rheum Dis. 2012;15(4):419-426.
15. Shidhaye SS, Lotlikar VM, Ghule AM, Phutane PK, Kadam VJ. "Pulsatile Delivery Systems: An Approach for Chronotherapeutic Diseases." Systematic Reviews in Pharmacy 1.1 (2010), 55-61. Print. doi:10.4103/0975-8453.59513
16. Wells GA. Patient-driven outcomes in rheumatoid arthritis. J Rheumatol. 2009;82:33-38.
17. Gaudin P, Leguen-Guegan S, Allenet B, Baillet, et al. Is dynamic exercise beneficial in patients with rheumatoid arthritis? Joint Bone Spine. 2008;75(1):11-17.
18. Fontaine KR, Heo M, Bathon J. Are US adults with arthritis meeting public health recommendations for physical activity? Arthritis Rheum. 2004;50(2):624-628.
19. Prioreschi A. The effects of physical activity on disease activity in patients with rheumatoid arthritis [dissertation]. Johannesburg: University of Witwatersrand; 2013.
20. Sokolove J, Strand V. Rheumatoid arthritis classification criteria. B NYU Hospital for Joint Disease. 2010;68(3):232-238.
21. Mayoux-Benhamou A, Giraudet-Le Quintrec JS, Ravaud P, et al. Influence of patient education on exercise compliance in rheumatoid arthritis: a prospective 12-month randomized controlled trial. D J Rheumatol. 2008;35(2):216-223.
22. Häkkinen A, Sokka T, Hannonen P. A home-based two-year strength training period in early rheumatoid arthritis led to good long-term compliance: a five-year followup. Arthritis Rheum. 2004;51(1):56-62.
23. Jenkinson T. Joint progress: exercise can help in rheumatoid arthritis. Sport Ex. 2001;9:14-17.
24. Banwell BF, Gall V. Physical therapy management of arthritis. New York: Church Livingstone; 1988.
25. Van den Ende CHM, Breedveld FC, Le Cessie S, et al. Effect of intensive exercise on patients with active rheumatoid arthritis: a randomised clinical trial. Ann Rheum Dis. 2000;59(8):615-621.

26. Gerber LH. Rehabilitative therapies for patients with rheumatic disease. Primer on the rheumatic diseases: INDOCID. Atlanta: Arthritis Foundation; 1998.
27. Hicks JE. Exercise in patients with inflammatory arthritis and connective tissue disease. *Rheum Dis Clin North Am.* 1990;16(4):845-870.
28. Scholtzhauzer TL, McGuire JL. Living with rheumatoid arthritis. Baltimore: The Johns Hopkins University Press; 1993.
29. C.manikandan, and t.nivetha. "accident detection and rescue process using blacbox system." *international journal of communication and computer technologies* 7 (2019), 27-29. Doi:10.31838/ijccts/07.01.06
30. Kisner C, Colby, LN. Therapeutic exercise: foundations and techniques. Philidelphia: FA Davis Company; 1996.
31. Simon L, Blotman F. Exercise therapy and hydrotherapy in the treatment of rheumatic diseases. *Rheum Dis Clin.* 1981;7(2):337-347.
32. Hampton J. Up and about with arthritis. Cape Town: Arthritis Foundation; 1997.
33. Millar AL. Action plan for arthritis: your guide to pain-free movement. *Human Kinetics.* 2003;31-49.
34. Hicks JE. Exercise in patients with inflammatory arthritis and connective tissue disease. *Rheum Dis Clin North Am.* 1990;16(4):845-870.
35. Harris ED. Rheumatoid arthritis. Pennsylvania: WB Saunders Company;1997.
36. Komatireddy G, Leitch R, Cella K, et al. Efficacy of low load resistive muscle training in patients with rheumatoid arthritis functional class II and III. *J Rheumatol.* 1997;24(8):1531-1539.
37. Norceau L, Martineau H, Belzile M. Effects of a modified dance based exercise on cardiorespiratory fitness, pscyhological state and health status of persons with rheumatoid arthritis. *Am J Phys Med and Rehab.* 1995;74(1):19-27.
38. Asanuma Y, Kawai S, Aoshima H. Serum lipoptotein and apolipoprotein phenotypes in patients with rheumatoid arthritis. *Arthritis Rheum.* 1999;42(3):443-447.
39. Metsios GS, Stavropoulos-Kalinoglou A, Veldhuijzen van Zanten JJ, Treharne GJ, et al. Rheumatoid arthritis, cardiovascular disease and physical exercise: a systematic review. *Rheumatology (Oxford).* 2008;47(Suppl 3):239-248.
40. Minor MA, Hewett JE, Webel RR, et al. Efficacy of physical conditioning exercise in patients with rheumatoid arthritis and osteoarthritis. *Arthritis Rheum.* 1989;32(11):1396-1405.
41. Van den Ende CH, Hazes JM, le Cessie S, et al. Comparison of high and low intensity training in well controlled rheumatoid arthritis: results of a randomised clinical trial. *Ann Rheum Dis.* 1996;55(11):798-805.
42. Janse van Rensburg DC, Fletcher L, Viljoen M, et al. Efficacy of an exercise programme on the functional capacity and disease activity in females with rheumatoid arthritis. *SA Orthapedic J.* 2010;34-43.
43. Rimmer JH. Fitness and rehabilitation programs for special populations. Madison: Brown & Benchmark; 1994.
44. Samples P. Exercise for people with arthritis. *Physician Sports Med.* 1990;18(1):122-127.
45. De Jong Z, Munneke M, Kroon HM, et al. Long-term follow-up of a highintensity exercise program in patients with rheumatoid arthritis. *Clin Rheumatol.* 2009;28:663-671.
46. O'Sullivan SB, Cullen KE, Schmitz TJ. Physical rehabilitation: education and treatment procedures. Philidelphia: FA Davis Company; 1981.
47. Kelly WN, Harris ED, Ruddy SR, Sledge CB, editors. Textbook of rheumatology. Philidelphia: WB Saunders Company;1997.
48. Ekdahl C, Andersson SI, Maritz U, Svensson B. Dynamic versus static training in patients with rheumatoid arthritis. *Scan J Rheumatol.* 1990;19(1):17-26.
49. Häkkinen A, Sokka T, Kotaniemi A, Hannonen P. A randomized two-year study of the effects of dynamic strength training on muscle strength activity, functional capacity and bone mineral density in early rheumatoid arthritis. *Arthritis Rheum.* 2001;44(3):515-522.
50. Komatireddy G, Leitch R, Cella K, et al. Efficacy of low load resistive muscle training in patients with rheumatoid arthritis functional class II and III. *J Rheumatol.* 1997;24(8):1531-1539.
51. Schaumacher HR, Gall EP. Rheumatoid arthritis an illustrated guide to pathology, diagnosis and management. Philadelphia: JB Lippincott Company; 1988.
52. Häkkinen A, Sokka T, Kontaniemi A, et al. Dynamic strength training in patients with early rheumatoid arthritis increases muscle strength but not bone density. *J Rheumatol.* 1999;26(6):1257-1263.
53. Stenström C, Arge B, Sundbom A. Dynamic training versus relaxation training as home exercise for patients with inflammatory rheumatic diseases: a randomized controlled study. *Scand J Rheumatol.* 1996;25(1):28-33.

54. Kannus P, Jozsa L, Renström P, et al. The effect of immobilization on myotendinous junction: an ultrastructural, histochemical and immunohistochemical study. *Acta Physiol Scand*. 1992,144(3):387-394.
55. Brawley LR, Culos-Reed SN. Studying adherence to therapeutic regimens: overview, theories, recommendations. *Control Clin Trials*. 2000;21(5 Suppl):156S-163S.
56. Tork SC, Douglas V. Arthritis water exercise programme evaluation: a selfassessment survey. *Arthrit Care Res*. 1989,2(1):28-30.
57. Deodhar A, Woolf A. Bone mass measurement and bone metabolism in rheumatoid arthritis: a review. *Br J Rheumatol*. 1995,35(4):309-322.
58. Heinonen A, Sievänen H, Kannus P, et al. Effects of unilateral strength training and detraining on bone mineral mass and estimated mechanical characteristics of the upper limb bones in young women. *J Bone Miner Res*. 1996,11(4):490-501.
59. Orwoll E, Ferar J, Oviatt S, et al. The relationship of swimming exercise to bone mass in men and women. *Arch Intern Med*. 1989,149(10):2197-2200.
60. Taaffe D, Snow-Harter C, Connolly D, et al. Differential effects of swimming versus weight-bearing activity on bone mineral status of eumenorrheic athletes. *J Bone Miner Res*. 1995,10(4):586-593.
61. Nolte K, Janse van Rensburg DC, Krüger PE. Land-and water-based exercises in rheumatoid arthritis patients: a series of case reports. *South African Journal of Sports Medicine*. 2011,23(3):84-88.
62. Armstrong L, Balady GJ, Berry MJ. ACSM guidelines for exercise testing and prescription. Philadelphia: Lippincott, Williams and Wilkins; 2006.
63. Häkkinen A. Effectiveness and safety of strength training in rheumatoid arthritis. *Curr Opin Rheumatol*. 2004,16(2):132-137.
64. Van den Ende CH, Vliet Vlieland TP, Munneke M, Hazes JM. Dynamic exercise therapy for rheumatoid arthritis. *Br J Rheumatol*. 1998,37(6):677-687.
65. Anoop,T.R.,& Mini,M.G. (2015). Altered Fingerprint Matching Using Ridge Texture and Frequency in the Unaltered Region. *Bonfring International Journal of Advances in Image Processing*, 5(2), 06-09.
66. Sindhuja,R. (2019). An Analysis of Image Segmentation techniques. *Journal of Computational Information Systems*, 15(1), 171-175.
67. Temkin, A.Y. Possible role of clairvoyance in the evolution: Quantum mind as a factor and a subject of the evolution (2010) *NeuroQuantology*, 8 (4), pp. 546-549.
68. Persinger, M.A., Corradini, P.L., Clement, A.L., Keaney, C.C., Macdonald, M.L., Meltz, L.I., Murugan, N.J., Poirier, M.R., Punkkinen, K.A., Rossini, M.C., Thompson, S.E. Neurotheology and its convergence with neuroquantology (2010) *NeuroQuantology*, 8 (4), pp. 432-443.