

**FIFTH INTERNATIONAL SCIENTIFIC CONFERENCE
"SPORTS, RECREATION, HEALTH"**

CONFERENCE PROCEEDINGS

**COLLEGE OF SPORTS AND HEALTH
BELGRADE, SERBIA
MAY 19, 2023**

Organiser of the Conference and Publisher

College of Sports and Health

Toše Jovanovića 11, Belgrade, Serbia

skola@vss.edu.rs; <https://vss.edu.rs/>

conference@vss.edu.rs; <https://conference.vss.edu.rs/en/>

Editor-in-Chief:

Prof. Ana Krstić, PhD - College of Sports and Health, Belgrade, Serbia

Editor:

Prof. Marijana Mladenović, PhD - College of Sports and Health, Belgrade, Serbia

Tehcnical Editor:

Biljana Đurđević - College of Sports and Health, Belgrade, Serbia

Graphic Design and Layout:

Bojan Ugrinić - College of Sports and Health, Belgrade, Serbia

Conference Sponsor:

Health institution – Pharmacy Lilly Drogerie

ISBN: ISBN-978-86-83687-37-4

SCIENTIFIC COMMITTEE OF THE CONFERENCE

Chair:

Prof. Marijana Mladenović, PhD, College of Sports and Health, Belgrade, Serbia

Members:

College of Sports and Health, Belgrade, Serbia

Prof. Jovan Šurbatović, PhD

Senior Lecturer Nebojša Ilić, PhD

Prof. Ana Krstić, PhD

Prof. Ljubiša Lazarević, PhD

Prof. Milivoje Karalejić, PhD

Prof. Snežana Lazarević, PhD

Prof. Aleksandar Ivanovski, PhD

Prof. Predrag Lazarević, PhD

Prof. Marija Anđelković, PhD

Prof. Sead Malićević, PhD

Prof. Vladimir Puzović, PhD

Prof. Olga Mladenović, PhD

Prof. Divna Kekuš, PhD

Lecturer Dragica Luković Jablanović, PhD

Prof. Nada Trifković, PhD

Senior Lecturer Dubravko Marić, PhD

Spec. Zvezdana Mihailović, MD

Asst. Prof. Zeyner Inci Karadenizli, Duzce, PhD, University, Faculty of Sport Sciences, Turkey

Prof. Robert Dimitrovski, PhD, Institute for Knowledge and Management, Skopje, North Macedonia

Prof. Marija Zegnal Koretić, PhD, University of Applied Sciences, Križevci, Croatia

Prof. Nebojša Knežević, PhD, Faculty of Medicine, University of Illinois, Chicago, USA

Prof. Goran Nikovski, PhD, Faculty of Physical Education, Sport and Health, Skopje, North Macedonia

Prof. Olga Popović, PhD, Serbian Medical Chamber

Assoc. Professor Elvis Vardo, Faculty of Philosophy of University in Tuzla, Pedagogy-Psychology department

Prof. Bujar Saiti, PhD, Faculty of Pedagogy, Skopje, North Macedonia

Prof. Nevenka Breslauer, PhD, Polytechnic of Međimurje in Čakovec, Croatia

Asst. Prof. Renata Vauhnik, PhD, Faculty of Health Sciences, Ljubljana, Slovenia

Prof. Saša Pantelić, PhD, Faculty of Sport and Physical Education in Niš, Serbia

Prof. Veroljub Stanković, PhD, Faculty of Sport and Physical Education, Leposavić, Serbia

Asst. Prof. Nevenka Kregar Velikonja PhD, Faculty of Health Science, University of Novo mesto, Slovenia

ORGANIZING COMMITTEE OF THE CONFERENCE

Chair:

Prof. Dragana Drljačić, PhD, College of Sports and Health, Belgrade, Serbia

Members:

College of Sports and Health, Belgrade, Serbia

Branko Karalejić, MA

Spec. Ivana Topalović, MD

Spec. Kristina Vukušić, MD

Prof. Srđan Milosavljević, PhD

Prof. Ivana Markov Čikić, PhD

Katarina Ćirić-Duvnjak, MA

Spec. Snežana Milićev, MD

Bojan Ugrinić, MA

Conference Secretary:

Biljana Đurđević, College of Sports and Health, Belgrade, Serbia

QUALITY OF LIFE AND PHYSICAL ACTIVITY IN PEOPLE WITH RHEUMATOID ARTHRITIS

Ljiljana Šimpraga¹

Academy of Applied Studies Belgrade, The College of Health Sciences, Belgrade, Serbia

Goran Nedović

University of Belgrade - Faculty of Special Education and Rehabilitation, Belgrade

Mirjana Zlatković Švenda

Institute of Rheumatology, Belgrade, Serbia

University of Belgrade School of Medicine, Belgrade, Serbia

Abstract: Rheumatoid arthritis (RA) is the most common form of inflammatory rheumatism. The onset of synovitis in middle aged population, the irreversibility of damage and the progression of the disease reduce the possibilities and capacities of a person with RA to fulfill their needs and thus achieve the overall quality of life. Quality of life (Qol) is a multidimensional concept defined by the World Health Organization as a state of complete physical, mental, and social well-being. Early diagnosis, the therapeutic approach “*treat to target*” and the application of biological therapy are current recommendations that contribute to the Qol of people with RA. Regular physical activity (PA), or any physical movement that leads to energy expenditure, is a key component of a healthy life. Since existing research has shown a significant impact of PA on chronic diseases of the modern era, the question of the benefits of PA in RA arises. The objective of this paper is to review and analyze the available recent research in order to examine the effects and importance of the implementation of PA on the Qol of people with RA. This study is a review of the literature using PubMed/MEDLINE and Science Direct, not older than ten years. People with RA, in addition to designed programs of therapeutic exercises as part of physiotherapy, also practice different forms of PA in their free time or through organized activities. The results indicate that the implementation of regular PA, dosed according to time and intensity as well as according to the current picture of arthritis reduces the symptoms of arthritis, which improves the overall Qol of these people. Implementation of PA is beneficial for people with RA. In order to improve the Qol, it is necessary to design adapted programs of PA, respecting the specifics of each individual.

Keywords: *rheumatoid arthritis, quality of life, physical activity*

INTRODUCTION

Rheumatoid arthritis (hereinafter RA) is the most common form of inflammatory rheumatism. It represents an autoimmune and systemic disease, with a chronic course, followed by progressive damage to the joints and extra-articular manifestations with limitation of activity and impact on the quality of life. In general, women suffer from rheumatoid arthritis (hereinafter referred to as: RA) three times more often than men, most often between the ages of 40 to 60 (Favalli et al., 2019; Vujasinović Stupar, 2000). The prevalence of RA in developed countries is 0.5 - 1.0% (Smolen et al., 2018), while for comparison, the standardized prevalence of RA in Serbia is 0.34% for the entire population, with a higher prevalence in women (0.49 %) compared to men (0.17%) 3:1 (Zlatković-Švenda et al., 2014), which is in agreement with data in modern research. It is considered that the causes of the development of RA are

¹ simpragali@gmail.com

unknown, however, genetic risk factors as well as several environmental factors can activate RA and trigger an autoimmune response against modified own proteins, years before the appearance of the inflammatory process in the joint synovium (synovitis) and clinical symptoms of the disease (Smolen et al., 2018).

The clinical picture is described from mild to severe, where the severe clinical picture is dominated by chronic pain and permanent joint damage. In addition to articular manifestations, RA is accompanied by the appearance of extra-articular subcutaneous nodules, systemic changes and associated syndromes, as well as cardiovascular changes, which are the cause of up to half of the observed premature deaths, the risk of death is twice as high as in the general population (Biskup et al., 2018). Therefore, the onset of synovitis in middle age, the irreversibility of damage, the chronicity and progression of the disease reduce the opportunities and capacities of a person with RA to fulfill their needs and thus achieve the overall quality of life.

The therapeutic approach “*treat to target*” or treatment according to the set goal and the application of biological therapy are current recommendations that contribute to the quality of life of people with rheumatoid arthritis. However, the application of physiotherapy procedures, as well as occupational therapy, maintains the mobility of the joints, strengthens the muscles and slows down the onset of deformities. On the other hand, education about the disease as well as designed programs of dynamic exercises and even aerobic fitness exercises influence the health and overall status of a person with RA and enable participation in activities of daily life (American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines. 2002).

Quality of life (hereinafter QoL) is a multidimensional concept defined by the World Health Organization as a state of complete physical, mental, and social well-being. Another definition reads “*individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*” (WHOQOL Group, 1993: 153). There are different definitions of this concept in relation to the area of interest. Thus, QoL can be viewed in relation to health as a subjective assessment from the patient’s point of view. By applying this concept and the instrument of Health-related quality of life (HRQoL), the focus is on the effects of the disease and the impact of treatment on the QoL. On the other hand, QoL is a much broader concept that includes the domains of physical and psychological health, social relationships and environment. RA can affect all of the aforementioned domains and significantly compromise an individual’s QoL (Chang et al., 2009). QoL can also be threatened by socioeconomic factors – age, work and economic status as well as lifestyle habits of a person with RA (Malm et al., 2016).

Regular physical activity (hereinafter PA), or any physical movement that leads to energy expenditure, is a key component of a healthy life. Moderate to high intensity PA is thought to improve muscle strength and cardiovascular capacity (Scrutinio et al., 2005). Also, existing research points to the importance of the impact of PA on chronic diseases of the modern age, and we find that regular exercise and PA significantly reduce the occurrence of cardiovascular changes and the process of atherosclerosis, as well as the slowing down of radiographic changes in arthritis (Stavropoulos-Kalinoglou et al., 2013; Verhoeven, et al., 2016). Despite this, people with RA tend to lead a sedentary lifestyle and avoid PA (Metsios et al., 2008). The reason may be the clinical picture of RA dominated by pain, reduced range of motion in the joints, reduced muscle strength and hand grip, stiffness of varying intensity, as well as the appearance of fatigue and reduced general functionality. The question arises as to how exercising PA affects the QoL in people with RA.

METHOD

The objective of this paper is to review and analyze the available recent research in order to examine the effects and importance of the implementation of PA on the QoL of people with RA. This study is a review of the literature using PubMed/MEDLINE and Science Direct, not older than ten years, available in full text and in English. The analyzed works had to be of a research nature, published in their entirety and in accordance with the stated topic, where at least one variable had to be related to quality of life and physical activity in people with rheumatoid arthritis.

In the search of electronic databases, we used the following keywords: Rheumatoid arthritis (lat./engl.), Rheumatic disease, physical activity, exercising, quality of life, well-being. Based on the processing and selection of collected studies, we chose to analyze six studies in order to examine the connection between quality of life and physical activity in people with rheumatoid arthritis.

RESULTS

Malm et al. (Malm et al., 2016) analyzed the influence of lifestyle habits (physical activity, diet, smoking, alcohol consumption) on the QoL of people with RA. The descriptive exploratory study included a total of 22 respondents with RA, 14 female and 8 male (aged 30 to 84). The study participants were asked an open-ended question: “How do your lifestyle habits affect your quality of life?”. A qualitative analysis of the content of the received answers was performed, where the influence of lifestyle habits on the QoL of the respondents was observed through three categories in terms of limitations, self-regulation and socializing. Based on the analyzed answers, it was determined that people with RA try to achieve a balance between their lifestyle habits and their disease in order to achieve a normal life and influence the quality of their life. QoL here includes health consequences, pain, fatigue, as well as physical functioning and social participation (Malm et al., 2016). Priorities in everyday life change as well as the choice of lifestyle habits, so it is concluded that people with RA balance between the ideal situation and reality.

Shao et al. (Shao et al., 2021) conducted a randomized controlled trial on the application of a *self-management* program in patients with RA. The aim of this program was to develop behavioral awareness among people with RA in terms of preserving joints from further damage and improving their own PA. During the program (25-40 min per day), participants were trained how to recognize activities that increase pain, sensitivity and cause the appearance of other symptoms or, on the contrary, provide relief. The ultimate goal of the program was improvement in activities of daily living and QoL. According to the appropriate criteria, the research included a total of 224 patients with RA (intervention group and control group). Assessment instruments were administered at the beginning of the trial, at two and three months during the implementation of the intervention and after 6 months from the start of the trial. To assess QoL, Short-form Health Survey-36 (SF-36) was used and within it Physical Component Score and Mental Component Score, Modified Health Assessment Questionnaire (MHAQ) was used to assess functionality, while to assess the level of self-control in preserving joints and physical activities a designed and modified scale was applied. The results showed that in the group in which the *self-management* program was implemented in order to reduce the symptoms of arthritis and through the improvement of PA, there were significant improvements in physical functioning, self-efficacy and behavior, while the impact on disease activity and quality of life was not significant. It seems that for patients with chronic diseases, a longer period of time is needed for program training, but also for monitoring the results. Thus,

the aforementioned interventions would lead to more significant changes in the daily life and lifestyle of a person with RA, as well as improving QoL as the ultimate goal.

Due to the COVID 19 pandemic, many restrictions were introduced, which, among other things, also affected the reduced practice of PA in the general population. In accordance with the health situation, people with chronic diseases such as cancer, diabetes or RA have been advised to reduce their movements in a targeted manner and stay at home. Balchin et al. (Balchin et al., 2022) investigated the current topic, taking into account that sedentary behavior and avoidance of PA due to the onset of pain or worsening of symptoms are very common in people with RA. The aim of the research of the mentioned authors was to determine the consequences of “lockdown” during the pandemic on participation in PA in people with RA (n=27) compared to people without arthritis (n=101). Data on the disease, the subject’s body weight, mental well-being and QoL were collected using an online protocol specially created for the mentioned research. To assess QoL in relation to the two groups of subjects, different Rheumatoid Arthritis Quality of Life (RAQoL) and WHOQOL-BREF instruments were used, which were then transformed into a scale of 0-100 using a standardized formula. Analysis of the obtained results revealed a significantly lower participation in PA during isolation for people with RA compared to the control group ($p < 0.001$). This trend was characteristic in the first months of the pandemic, which additionally influenced people with RA to reduce their PA practicing (59%). Closed gyms and unavailability of equipment are some of the reasons for these results. The outdoor environment and going out into nature affect mental well-being (Brady et al., 2021) and may also be the reason for lower QoL in people with RA who were under care. Encouraging PA is important for the mental health and QoL of people with RA during isolation situations such as a pandemic. Another group of authors who followed these patients in a lockdown situation (Lévy-Weil et al., 2021) reported that 50% of subjects reduced PA, by 57% in frequency and 47% in relation to exercise intensity ($p < 0.005$). The result showed that the worsening of arthritis affected the indicators of the quality of life - on the increase of pain and fatigue, restriction of movement, deterioration of the quality of sleep, which is also related to the reduction of PA.

Raczkiewicz et al. (Raczkiewicz et al., 2015) analyzed the relationship between vitamin D deficiency, quality of life, physical activity, and RA disease activity. From the total sample (86 subjects), the research included 74 subjects with RA and 22 patients with osteoarthritis as a control group (all with different concentrations of vitamin D deficiency). The QoL assessment instruments Medical Outcome Study Short Form 36 (SF-36) and Health Assessment Questionnaire (HAQ) were applied, then, a 5-point scale for quantifying PA (no exercise - 0, at least three times a week - 4), DAS28 for assessment of disease activity and laboratory tests. The aforementioned authors also took into account the results of certain previous studies that confirmed the relationship between the physical components of QoL and PA, according to which a lower degree of PA is associated with poorer QoL. Current research (Raczkiewicz et al., 2015) indicates that there is an association between vitamin D deficiency, higher rates of disease activity and poorer quality of life, where regular physical activity is correlated with higher vitamin D concentrations and better quality of life in RA.

The aim of a recent prospective controlled study (Özlu et al., 2022) was to compare kinesiophobia, fatigue, PA and QoL in RA patients in remission versus a healthy population. Kinesiophobia is a behavior caused by fear of movement, physical activity and exercise. Due to the damaged joint structures and the resulting chronic pain in some people with RA, the painful experience is a “harmful sensory stimulus” and the person avoids PA in order not to increase the pain and possibly cause an injury (Knapik et al., 2011). The mentioned study

included 45 female patients with RA in remission and the same number of female persons from the general population who made up the control group. The following assessment instruments were applied: HAQ, DAS28, VAS, Tampa Scale of Kinesiophobia, Fatigue Severity Scale, and International Physical Activity Questionnaire, which examines PA (duration of at least 10 minutes) in the past week, intensity and frequency of activity. PA is divided into activities of high (soccer, aerobics, weights), moderate intensity (cycling at normal speed, dancing, bowling), walking and sitting and is calculated in minutes and displayed with the corresponding score. The results of the study indicate a lower QoL in subjects with RA in remission compared to the control group, as well as a significant correlation between kinesiophobia, moderate-intensity PA and QoL among subjects with RA in remission. It is recommended that appropriate interventions are used to reduce the occurrence of kinesiophobia in order to create conditions for participation in physical activities and improve the QoL of people with RA.

Non-pharmacological procedures such as exercise and diet reduce the possibility of cardiovascular problems, hence a group of authors (García-Morales et al., 2020) researched the effect of a dynamic exercise program combined with a Mediterranean diet on QoL in women with RA. García Morales et al conducted a randomized clinical trial (duration of 24 weeks) among 144 female subjects with RA, divided into three groups that carried out a single and combined intervention, as well as a control group. The diet program was carefully balanced and based on the principles of the Mediterranean diet (olive oil, fruits, vegetables, cereals, legumes), exercises were planned twice a week (80-90 min), carried out through five phases (warm-up, aerobic exercises, anaerobic, sports games, stretching) under the supervision of a therapist. SF-36 was used to assess QoL, followed by HAQ, DAS28 (low disease activity), VAS and laboratory analyses. The results of the study indicate that the combination of the aforementioned interventions (exercises and the Mediterranean diet) affects the improvement of QoL and daily activities in people with RA. The main effect comes from the synergistic effect of both interventions and the duration of the program, with the note that the continuity of the nutrition program, the frequency and intensity of the exercises are important.

DISCUSSION

This study demonstrated the positive impact of physical activity on quality of life in people with RA through various programs and interventions. People with RA, in addition to designed programs of therapeutic exercises as part of physiotherapy, also practice different forms of PA in their free time or through organized activities. The results indicate that the implementation of regular PA, dosed according to time and intensity as well as according to the current picture of arthritis reduces the symptoms of arthritis, which improves the overall QoL of these people. As the findings suggest, PA generally contributes to health status and QoL both in the general population (Haskell et al., 2007) and in people with chronic diseases (Hernández-Hernández et al., 2017). Through the presented review of the literature, we found that a significant number of people with RA practice some form of PA to a lesser extent or spend less time in activities of moderate intensity compared to the general population (Balchin et al., 2022; Özlü et al., 2022). According to some researches (Jahanbin et al., 2014; Katz et al., 2020) PA, most often in the form of exercises, can influence the activity of the RA disease, reducing pain, fatigue, and improving functional and mental status, which is in accordance with the results of the presented research (Rackiewicz et al., 2015). Considering the social aspect of participation in PA, for example by exercising in a group, conditions are created for socializing and making social contacts. It brings satisfaction and a sense of belonging to people with RA, who are often isolated and not very active in everyday life, which improves the QoL of the individual (Malm et al., 2016). PA in people with RA has been shown to be hindered by joint pain, limited

movement, and fatigue, as well as fear of falling, which belongs to the *limitation* category (Malm et al., 2016). In order to overcome limiting situations and remain physically active, people with RA use different strategies, adapted equipment and aids. The current health situation and modern means of communication have enabled the availability of PA video programs online, through applications and social networks (Balchin et al., 2022; Lévy Weil et al., 2021). Since we analyzed the practice of structured physical activity programs from the field of complementary methods in one of the previous papers (Šimpraga et al., 2019), in this paper we did not include the Yoga system of exercises that significantly improves the physical and mental status of people with RA. Yoga represents a suitable therapeutic possibility and an acceptable PA that, with the guidance of a trained yoga instructor or even a physiotherapist, as we have previously established, can affect the improvement of the quality of life of people with RA.

The selected studies are different in design, belonging to the type of descriptive exploratory (Malm et al., 2016), randomized trials (García-Morales et al., 2020; Shao et al., 2021), and prospective controlled studies (Özlu et al., 2022). In the analyzed studies, quality of life was measured with different instruments, the Rheumatoid Arthritis Quality of Life Questionnaire (Balchin et al., 2022) specific for RA was used, then the frequently applied generic Short-form Health Survey-36, which includes several domains (physical function, pain, vitality, general health, social participation, emotional and mental health) and gives the possibility to compare QoL with the population in good health or with other diseases (García-Morales et al., 2020; Raczkiwicz et al., 2015; Shao et al., 2021). We noticed that in some studies (Özlu et al., 2022) the Health Assessment Questionnaire was used to assess QoL, a standard instrument for assessing functional abilities in RA. We found that due to the significant impact of RA on functionality decline, the HAQ is sometimes used as a “surrogate marker” of quality of life also with generic measures to collect more data (Kingsley et al., 2011).

CONCLUSION

Implementation of PA is beneficial for people with RA. In order to improve the QoL, it is necessary to design adapted programs of PA, respecting the specifics of each individual. It is very important for people who have some form of chronic, rheumatic disease to learn about the benefits of PA both in the purpose of preventing further development of the clinical picture of the disease and in the purpose of having a recommended therapy. With a multidisciplinary approach, PA and education on proper lifestyle habits and healthy eating, then availability of modern means and equipment, health workers in daily clinical practice as well as other participants in rehabilitation can significantly influence the improvement of the quality of life of people with RA.

REFERENCES

1. American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines. (2002). Guidelines for the management of rheumatoid arthritis: 2002 update. *Arthritis & Rheumatism*, 46(2), 328-346.
2. Balchin, C., Tan, A. L., Wilson, O. J., McKenna, J., & Stavropoulos-Kalinoglou, A. (2022). Participation in physical activity decreased more in people with rheumatoid arthritis than the general population during the COVID-19 lockdown: A cross-sectional study. *Rheumatology international*, 42(2), 241-250.
3. Biskup, M., Biskup, W., Majdan, M., & Targońska-Stępnik, B. (2018). Cardiovascular system changes in rheumatoid arthritis patients with continued low disease activity. *Rheumatology international*, 38(7), 1207-1215.

4. Brady, S. M., Fenton, S. A., Metsios, G. S., Bosworth, A., Duda, J. L., Kitas, G. D., & Veldhuijzen van Zanten, J. J. (2021). Different types of physical activity are positively associated with indicators of mental health and psychological wellbeing in rheumatoid arthritis during COVID-19. *Rheumatology international*, *41*, 335-344.
5. Chang, C. L., Chiu, C. M., Hung, S. Y., Lee, S. H., Lee, C. S., Huang, C. M., & Chou, C. L. (2009). The relationship between quality of life and aerobic fitness in patients with rheumatoid arthritis. *Clinical Rheumatology*, *28*, 685-691.
6. Favalli, E. G., Biggioggero, M., Crotti, C., Becciolini, A., Raimondo, M. G., & Meroni, P. L. (2019). Sex and management of rheumatoid arthritis. *Clinical reviews in allergy & immunology*, *56*(3), 333-345. <https://doi.org/10.1007/s12016-018-8672-5>
7. García-Morales, J. M., Lozada-Mellado, M., Hinojosa-Azaola, A., Llorente, L., Ogata-Medel, M., Pineda-Juárez, J. A., & Castillo-Martínez, L. (2020). Effect of a dynamic exercise program in combination with Mediterranean diet on quality of life in women with rheumatoid arthritis. *JCR: Journal of Clinical Rheumatology*, *26*(7S), S116-S122.
8. Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., & Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*(9), 1081.
9. Hernández-Hernández, M. V., & Díaz-González, F. (2017). Role of physical activity in the management and assessment of rheumatoid arthritis patients. *Reumatología Clínica (English Edition)*, *13*(4), 214-220.
10. Jahanbin, I., Moghadam, M. H., Nazarinia, M. A., Ghodsbin, F., Bagheri, Z., & Ashraf, A. R. (2014). The effect of conditioning exercise on the health status and pain in patients with rheumatoid arthritis: a randomized controlled clinical trial. *International journal of community based nursing and midwifery*, *2*(3), 169.
11. Katz, P., Andonian, B. J., & Huffman, K. M. (2020). Benefits and promotion of physical activity in rheumatoid arthritis. *Current opinion in rheumatology*, *32*(3), 307-314.
12. Kingsley, G., Scott, I. C., & Scott, D. L. (2011). Quality of life and the outcome of established rheumatoid arthritis. *Best practice & research Clinical rheumatology*, *25*(4), 585-606.
13. Knapik, A., Saulicz, E., & Gnat, R. (2011). Kinesiophobia - introducing a new diagnostic tool. *Journal of Human Kinetics*, *28*(2011), 25-31.
14. Lévy-Weil, F. E., Jousse-Joulin, S., Tiffreau, V., Perez, R., Morisseau, V., Bombezín-Domino, A., & Flipo, R. M. (2021). Physical activity and quality of life of patients with rheumatoid arthritis at the time of COVID-19 lockdown: an online patient survey. *Joint Bone Spine*, *88*(5), 105212.
15. Malm, K., Bremander, A., Arvidsson, B., Andersson, M. L., Bergman, S., & Larsson, I. (2016). The influence of lifestyle habits on quality of life in patients with established rheumatoid arthritis—A constant balancing between ideality and reality. *International journal of qualitative studies on health and well-being*, *11*(1), 30534.
16. Metsios, G. S., Stavropoulos-Kalinoglou, A., Veldhuijzen van Zanten, J. J. C. S., Treharne, G. J., Panoulas, V. F., Douglas, K. M., ... & Kitas, G. D. (2008). Rheumatoid arthritis, cardiovascular disease and physical exercise: a systematic review. *Rheumatology*, *47*(3), 239-248.
17. Özlü, A., & Leblebici, M. A. (2022). Does remission in rheumatoid arthritis bring kinesiophobia, quality of life, fatigue, and physical activity closer to normal?. *Archives of Rheumatology*, *37*(4), 603-612.
18. Raczkiwicz, A., Kisiel, B., Kulig, M., & Tlustochowicz, W. (2015). Vitamin D status and its association with quality of life, physical activity, and disease activity in rheumatoid arthritis patients. *JCR: Journal of Clinical Rheumatology*, *21*(3), 126-130.
19. Scrutinio, D., Bellotto, F., Lagioia, R., & Passantino, A. (2005). Physical activity for coronary heart disease: cardioprotective mechanisms and effects on prognosis. *Monaldi archives for chest disease*, *64*(2).

20. Shao, J. H., Yu, K. H., & Chen, S. H. (2021). Effectiveness of a self-management program for joint protection and physical activity in patients with rheumatoid arthritis: A randomized controlled trial. *International Journal of Nursing Studies*, 116, 103752.
21. Smolen, J., Aletaha, D., Barton, A., Burmester, G. R., Emery, P., Firestein, G. S., Kavanaugh, A., McInnes, I. B., Solomon, D. H., Strand, V., & Yamamoto, K. (2018). Rheumatoid arthritis. *Nat Rev Dis Primers*, 4, 18001. <https://doi.org/10.1038/nrdp.2018.1>
22. Stavropoulos-Kalinoglou, A., Metsios, G. S., Van Zanten, J. J. V., Nightingale, P., Kitis, G. D., & Koutedakis, Y. (2013). Individualised aerobic and resistance exercise training improves cardiorespiratory fitness and reduces cardiovascular risk in patients with rheumatoid arthritis. *Annals of the rheumatic diseases*, 72(11), 1819-1825.
23. Šimpraga, Lj., Pešterac-Kujundžić, A., Trajkov, M., Nikolić, J. (2019). Effects of implementation of yoga on physical and mental health of patients with rheumatoid arthritis. In A. Ivanovski, I. M. Čikić, S. Lazarević (Eds.), 3rd International Scientific Conference, Conference proceedings „SPORT, RECREATION, HEALTH“ (346-352). College of Sports and Health, Belgrade.
24. Verhoeven, F., Tordi, N., Prati, C., Demougeot, C., Mougín, F., & Wendling, D. (2016). Physical activity in patients with rheumatoid arthritis. *Joint bone spine*, 83(3), 265-270.
25. Vujasinović Stupar, N. (2000). Reumatoidni artritis. U: N. Pilipović (Ured.), *Reumatologija*. (str. 274) Beograd: Zavod za udžbenike i nastavna sredstva.
26. WHOQOL Group. (1993). Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument (WHOQOL). *Quality of life Research*, 2, 153-159. <https://doi.org/10.1007/BF00435734>
27. Zlatković-Švenda, M. I., Stojanović, R. M., B Šipetić-Grujičić, S., & Guillemin, F. (2014). Prevalence of rheumatoid arthritis in Serbia. *Rheumatology international*, 34, 649-658. <http://doi.org/10.1007/s00296-013-2897-7>