UDC 615.8:616.728: 796.012.62:

Yelyzaveta VORONIUK
3-d year PhD student, Department of Biosafety and Human Health, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Beresteiskyi ave, 37, Kyiv, Ukraine, 03056 (yelyzaveta194@gmail.com)
***ORCID:** 0000-0002-5789-9358*
***SCOPUS:** 58971928900*

Yuliya ANTONOVA-RAFI
Candidate of Technical Science, Associate Professor, Docent at the Department of Biosafety and Human Health, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Beresteiskyi ave, 37, Kyiv, Ukraine, 03056; And Senior Research Fellow in E. O. Paton Electric Welding Institute, 11, Kazymyr Malevych str., Kyiv, Ukraine, 03150 (antonova-rafi@ukr.net)
***ORCID:** 0000-0002-9518-4492*
***SCOPUS:**57202217816*

To cite this article: Voroniuk Ye., Antonova-Rafi Yu. (2024). Syndrom hipermobil′nosti suhlobiv ta profesiyno nabutyy nadmirnyy diapazon rukhiv: kompleksnyy ohlyad suchasnykh doslidzhen [Hypermobility Syndrome and the Spectrum of Excessive Range of Motion: A Comprehensive Review of Current Research]. *Fitoterapiia. Chasopys – Phytotherapy. Journal*, 3, 119–125, doi: https://doi.org/10.32782/2522-9680-2024-3-119

HYPERMOBILITY SYNDROME AND THE SPECTRUM OF EXCESSIVE RANGE OF MOTION: A COMPREHENSIVE REVIEW OF CURRENT RESEARCH

Abstract. *Hypermobility syndrome (HMS) and excessive range of motion (ROM) present distinct challenges for individuals and healthcare providers, particularly physical therapists. HMS is a connective tissue disorder characterized by joint hypermobility, chronic pain, and a predisposition to injuries, often requiring specialized therapeutic approaches. Conversely, individuals such as circus performers, gymnasts, and dancers develop excessive ROM through rigorous training, leading to a unique set of musculoskeletal issues. This literature review aims to delineate the differences between HMS and acquired excessive ROM, highlighting the necessity for tailored physical therapy interventions. By analyzing existing research, we emphasize the importance of specific knowledge and skills for physical therapists to effectively manage and prevent injuries in this population. Our findings suggest that while the underlying mechanisms differ, both conditions benefit from targeted therapeutic strategies focusing on joint stabilization, proprioception enhancement, and injury prevention. This review underscores the critical need for specialized training for physical therapists to address the unique demands of patients with acquired excessive ROM, thereby improving outcomes and reducing the risk of chronic issues.*

The purpose of the study. *This comprehensive literature review was conducted to compare hypermobility syndrome (HMS) and excessive range of motion (ROM) in individuals who do not have HMS but have developed significant flexibility through specific training, such as circus performers, gymnasts, and dancers. The review aimed to identify the specific physical therapy needs for these populations to prevent injuries and manage their unique musculoskeletal challenges.*

Materials and methods. *A systematic search was performed across multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search included articles published up to June 2024. Relevant articles were screened based on their titles and abstracts. Full-text articles of potentially relevant studies were then reviewed. Data were extracted regarding the characteristics of the study, outcomes measured, and key findings. The extracted data were synthesized to identify common themes, differences, and gaps in the existing literature.*

Outcomes and discussion. *Our findings indicate that while the underlying mechanisms of HMS and acquired excessive ROM differ, both conditions benefit from targeted therapeutic strategies focusing on joint stabilization, proprioception enhancement, and injury prevention. For individuals with acquired excessive ROM, tailored interventions that account for their unique biomechanical demands are crucial. T**he literature suggests that these individuals are at risk for overuse injuries, joint instability, and other musculoskeletal issues, necessitating a proactive and informed approach to physical therapy.***

Conclusions. *This review underscores the critical need for specialized training for physical therapists to address the unique demands of patients with acquired excessive ROM. By incorporating specific strategies aimed at **enhancing joint stability and preventing injury, therapists can improve outcomes and help these individuals maintain their high level of performance.** Future research should continue to explore optimal therapeutic techniques and preventative measures to support these specialised groups.*

Key words: *rehabilitation, performing arts physical therapy, hypermobility, excessive range of motion, circus injury, hypermobility spectrum disorder, pain management, quality of life.*

Єлизавета ВОРОНЮК
аспірантка 3-го року навчання, кафедра біобезпеки та здоров'я людини, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського», просп. Берестейський, 37, Київ, Україна, 03056 (yelyzaveta194@gmail.com)
***ORCID:** 0000-0002-5789-9358*
***SCOPUS:** 58971928900*

Юлія АНТОНОВА-РАФІ
кандидат технічних наук, доцент кафедри біобезпеки і здоров'я людини, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського», просп. Берестейський, 37, Київ, Україна, 03056; старший науковий співробітник, Інститут електрозварювання ім. Є.О. Патона, вул. Казимира Малевича, 11, Київ, Україна, 03150 (antonova-rafi@ukr.net)
***ORCID:** 0000-0002-9518-4492*
***SCOPUS:**57202217816*

Бібліографічний опис статті: Воронюк Є., Антонова-Рафі Ю. (2024). Синдром гіпермобільності суглобів та професійно набутий надмірний діапазон рухів: комплексний огляд сучасних досліджень. *Фітотерапія. Часопис,* 3, 119–125, doi: https://doi.org/10.32782/2522-9680-2024-3-119

СИНДРОМ ГІПЕРМОБІЛЬНОСТІ СУГЛОБІВ ТА ПРОФЕСІЙНО НАБУТИЙ НАДМІРНИЙ ДІАПАЗОН РУХІВ: КОМПЛЕКСНИЙ ОГЛЯД СУЧАСНИХ ДОСЛІДЖЕНЬ

Актуальність. *Синдром гіпермобільності та набутий надмірний діапазон рухів створюють різні виклики для окремих осіб та медичних працівників, зокрема фізичних терапевтів. Синдром гіпермобільності – це розлад сполучної тканини, що характеризується гіпермобільністю суглобів, хронічним болем та схильністю до травм, що часто вимагає спеціалізованих терапевтичних підходів. З іншого боку, такі особи, як циркові артисти, гімнасти та танцівники, розвивають надлишковий діапазон рухів завдяки тренуванням, бо цього вимагає естетика виконавських видів мистецтва. Це призводить до унікальних проблем опорно-рухового апарату. Цей огляд літератури має на меті розмежувати відмінності між синдром гіпермобільності та набутою надмірним діапазоном рухів, підкреслюючи необхідність індивідуалізованих фізіотерапевтичних утручань. Аналізуючи існуючі дослідження, ми підкреслюємо важливість спеціальних знань та навичок для фізичних терапевтів, щоб ефективно керувати та запобігати травмам у цій популяції. Наші висновки свідчать про те, що хоча механізми, які лежать в основі, різняться, обидва стани виграють від цільових терапевтичних стратегій, спрямованих на стабілізацію суглобів, поліпшення пропріоцепції та запобігання травмам. Цей огляд підкреслює критичну потребу у спеціалізованій підготовці фізичних терапевтів для задоволення унікальних вимог пацієнтів із набутим надмірним діапазоном рухів, тим самим покращуючи професійні досягнення артистів та зменшуючи ризик хронічних проблем у довгостроковій перспективі життя.*

Мета дослідження. *Цей усебічний огляд літератури був проведений для порівняння синдрому гіпермобільності та надлишкового діапазону рухів у осіб, які не мають синдрому гіпермобільності, але розвинули значну гнучкість завдяки специфічному навчанню, такому як циркові артисти, гімнасти та танцівники. Огляд мав на меті визначити конкретні потреби у фізичній терапії для цих груп із метою запобігання травмам та управління їхніми унікальними проблемами опорно-рухового апарату.*

Матеріал і методи. *Було проведено систематичний пошук у кількох електронних базах даних, включаючи PubMed, Scopus, Web of Science та Google Scholar. Пошук охоплював статті, опубліковані до червня 2024 р. Відповідні статті просіювалися на основі їх заголовків та анотацій. Потенційно відповідні статті були переглянуті у повному обсязі. Дані були витягнуті щодо характеристик дослідження, вимірюваних результатів та основних висновків. Витягнуті дані були синтезовані для визначення загальних тем, відмінностей та прогалин у наявній літературі.*

Результати дослідження. *Наші висновки свідчать про те, що хоча основні механізми синдрому гіпермобільності суглобів та набутої надмірної гнучкості різняться, обидва стани виграють від цільових терапевтичних стратегій, спрямованих на стабілізацію суглобів, поліпшення пропріоцепції та запобігання травмам. Для осіб із набутою надмірною гнучкістю важливі індивідуалізовані втручання, які враховують їхні унікальні біомеханічні вимоги. Література вказує на те, що такі особи піддаються ризику перенапруження, нестійкості суглобів та інших проблем опорно-рухового апарату, що потребує проактивного та обізнаного підходу до фізичної терапії.*

Висновок. *Цей огляд підкреслює критичну потребу у спеціалізованій підготовці для фізіотерапевтів для вирішення унікальних вимог пацієнтів із набутою надмірною гнучкістю. Шляхом упровадження конкретних стратегій, спрямованих на підвищення стійкості суглобів та запобігання травмам, фізичні терапевти можуть поліпшити результати та допомогти цим особам підтримувати високий рівень їхньої виконавської діяльності. Майбутні розвідки повинні продовжувати досліджувати оптимальні терапевтичні техніки та запобіжні заходи для підтримки цієї спеціалізованої популяції.*

Ключові слова: *реабілітація, фізична терапія виконавських видів мистецтва, гіпермобільність, надмірний діапазон рухів, травми у цирку, спектр гіпермобільності, менеджмент болю, якість життя.*

Introduction. Hypermobility syndrome and **excessive range** of motion are terms frequently encountered in discussions surrounding joint flexibility and mobility. Understanding the distinction between hypermobility syndrome and excessive range of motion is crucial for both healthcare professionals and individuals seeking to manage joint-related issues effectively. While both conditions involve increased joint mobility, they differ sig-

nificantly in terms of underlying causes, clinical implications, and management strategies (Micale, Fusco, & Castori, 2021).

Hypermobility syndrome refers to a medical condition where a person's joints move beyond the normal range of motion, often causing joint pain and instability (Castori, Tinkle, Levy, Grahame, Malfait, & Hakim, 2017). Excessive range of motion, on the other hand, simply refers to joints that can move more than what is considered typical for an individual, but without the associated symptoms or medical diagnosis (Clarkson, 2000). Hypermobile joints in hypermobility syndrome are often associated with collagen disorders or connective tissue problems, while excessive range of motion can sometimes be attributed to factors like genetics, training, or individual variation in joint structure (Hakim, 2024; Tinkle, Castori, Berglund, Cohen, Grahame, Kazkaz, & Levy, 2017).

In a scientific context, excessive range of motion and hypermobility are related concepts but differ in their precise definitions:

Excessive Range of Motion:

– Excessive range of motion refers to the ability of a joint to move beyond the typical or normal range that is expected for that particular joint.

– It is a general term indicating that the joint can perform movements beyond what is considered standard, but **it may not necessarily imply a pathological condition.**

– Excessive range of motion can be influenced by factors such as genetics, anatomy, and mostly by professional specific training (circus arts, gymnastics, ballet etc.) (Hakim, 2024).

Hypermobility:

– Hypermobility specifically refers to a condition where joints can move beyond their normal range to an extent that exceeds what is considered typical for the general population.

– It is often associated **with a laxity of connective tissues**, allowing joints to move more freely than usual.

– Hypermobility is commonly assessed using tools like the Beighton Score, which evaluates the flexibility of certain joints (Gensemer, Burks, Kautz, Judge, Lavallee, & Norris, 2021).

Excessive range of motion is a broader term indicating a joint's ability to move beyond the expected range, while hypermobility is a more specific condition characterised by joints moving excessively and often associated with connective tissue laxity.

Pain management is a critical component of treating conditions involving hypermobility syndrome and excessive range of motion. Individual pain perception was quantitatively assessed using a visual analog scale, providing a subjective yet standardized method of evaluating pain intensity(Jung & Chae, 2019). Additionally, muscle flexibility was determined by the Schober method, which is frequently used to measure the range of motion in the lumbar spine. Furthermore, both patients and investigators evaluated the efficacy of the treatment using a rating scale, emphasizing the importance of a comprehensive approach to pain management that includes multiple perspectives on treatment outcomes.

In the realm of performing arts, as a physical therapist specialising in this field, two main challenges arise: firstly, the tendency to misdiagnose any abnormal range of motion as hypermobility syndrome, which is not always accurate; and secondly, the lack of specific knowledge among physical therapists regarding the treatment nuances required for individuals with excessive range of motion, as many techniques often necessitate adaptation.

Hypermobility disorders such as hEDS/ HSD are more prevalent in performing artists including dancers and circus artists but are often overlooked or improperly managed. Physical therapists can help to screen for multi-system involvement in patients with hypermobility and facilitate referrals for earlier diagnosis and improved collaborative interprofessional management. Hypermobile aesthetic artists also need additional assessment and unique management strategies to optimise their participation and performance (Callahan, 2022)

Joint Hypermobility Syndrome (JHS) is a connective tissue disorder associated with hypermobility in which musculoskeletal complaints are present in the absence of systematic rheumatological disease (Simpson, 2006). JHS is diagnosed by the Revised Brighton criteria (BC) (1998) (Grahame, Bird, & Child, 2000) consisting of 2 major and 8 minor criteria which includes the presence of symptoms including arthralgia, dislocation, subluxation, spinal conditions, soft tissue rheumatism, marfanoid habitus, abnormal skin, eye signs, varicose veins and hernia. JHS has been associated with injury in dance as identified by the BC (Ruemper, & Watkins, 2012, Amstrong, 2019).

The purpose of the study. This comprehensive literature review was conducted to compare hypermobility syndrome and excessive range of motion in individuals who do not have hypermobility spectrum disorder but have developed significant flexibility through specific training, such as circus performers, gymnasts, and dancers. The review aimed to identify the specific physical therapy needs for these populations to prevent injuries and manage their unique musculoskeletal challenges.

Materials and methods. This comprehensive literature review was conducted to differentiate the treatment

strategies for hypermobility syndrome and excessive range of motion in individuals who do not have hypermobility syndrome but have developed significant flexibility through specific training, such as circus performers, gymnasts, and dancers. The review aimed to identify the specific physical therapy needs for these populations to prevent injuries and manage their unique musculoskeletal challenges.

Data sources and search strategy. A systematic search was performed across multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search included articles published up to June 2024. Keywords and search terms used were "hypermobility syndrome," "excessive range of motion," "physical therapy," "injury prevention," "circus performers," "gymnasts," "dancers," and "musculoskeletal disorders."

Inclusion and exclusion criteria. Inclusion criteria for selecting articles were:

– Peer-reviewed articles.

– Studies focusing on hypermobility syndrome and its management.

– Research on excessive range of motion treatment and injury prevention due to training in performers, gymnasts, and dancers.

– Articles discussing physical therapy interventions for injury prevention and management in the context of hypermobility syndrome or excessive range of motion.

Data extraction and synthesis. Relevant articles were screened based on their titles and abstracts. Full-text articles of potentially relevant studies were then reviewed. Data were extracted regarding the characteristics of the study population, types of interventions, outcomes measured, and key findings. The extracted data were synthesised to identify common themes, differences, and gaps in the existing literature.

Quality assessment. The quality of the included studies was assessed using standardised criteria, considering aspects such as study design, sample size, methodological rigour, and relevance to the research question.

Study outcomes and discussions of them. The comprehensive literature review analyzed 32 articles to discern the nuances between hypermobility syndrome and excessive range of motion. The primary challenge identified in the literature is the differentiation between individuals diagnosed with hypermobility syndrome and those who simply exhibit an excessive range of motion without underlying genetic connective tissue disorders. This distinction is crucial as it impacts diagnosis, treatment, and management strategies.

Many studies focus on hypermobility spectrum disorders, encompassing a range of conditions where joint hypermobility is a prominent feature. These disorders are often associated with genetic anomalies in connective tissues, leading to widespread systemic symptoms beyond joint hypermobility, such as pain, fatigue, and autonomic dysfunction. Researchers have extensively explored the etiology, diagnostic criteria, pain management, and treatment options for hypermobility syndrome, aiming to improve patient outcomes and quality of life (Hamonet, Schatz, Bezire, et al., 2018; Harte, Thomas, Beeton, & Almack, 2020)

There is some fundamental research related to dancers, contemporary dancers and pole dancers in terms of hypermobility (Ruemper, & Watkins, 2012; Wolfenden, & Angioi, 2017; Oosterwijk, Nieuwenhuis, van der Schans, & Mouton, 2018).

Depending on the criteria used, epidemiological studies suggest that hypermobility among dancers can be as high as 44%, especially in students. As hypermobility has been linked to fatigue in the general population, the hypermobile dancer should be careful given the association between fatigue and aetiology of injury in dance. Similarly, in light of research encouraging dancers to become fitter, this recommendation may not be appropriate for hypermobile dancers. In addition, the Beighton score used in most dance related studies may not be an appropriate measure of hypermobility in these populations (Day, Koutedakis, Wyon, 2011).

The outcomes of pain management strategies in patients with hypermobility syndrome and excessive range of motion reveal that an integrated approach, combining both objective and subjective assessment methods, is essential. Pain levels, as measured by the visual analog scale, showed significant variation depending on the flexibility and mobility levels of the patients.

These researches mostly focused on fatigue influence, hypermobility related injuries or injury prevention in general. However, these researches omit dancers with excessive range of motion but without hypermobility spectrum disorder.

Medical management of the circus performer requires a transdisciplinary, multicultural, and multifaceted approach. The skill sets and performance requirements of circus performers are diverse and highly specialized with a wide variety of injury conditions which present (Faltus, & Richard, 2022).

Conversely, **there is limited research specifically addressing individuals with excessive range of motion resulting from intensive physical training rather than genetic predisposition.** Notably, fundamental research has been conducted on circus artists, who frequently exhibit hypermobility due to rigorous training regimens (Miller 2014, Gensemer, 2021).

One significant issue identified is the tendency for healthcare providers to diagnose hypermobility syndrome in both populations. This overlap can lead to inappropriate treatment strategies, as the underlying causes and associated symptoms differ significantly between genetically predisposed hypermobility and acquired excessive range of motion. **The absence of clear diagnostic guidelines exacerbates this issue, underscoring the need for more precise criteria and assessment tools** (Palmer, Cramp, Clark, Lewis, Brookes, Hollingworth, Welton, Thom, Terry, Rimes, 2016).

The review highlights a critical gap in educational resources for physical therapists. There is a dearth of information on how to treat individuals who have developed an excessive range of motion through training, rather than genetic disorders. Physical therapists often lack the nuanced knowledge required to address the unique needs of these patients, who may not exhibit the same systemic symptoms as those with hypermobility syndrome but still require specialised care to prevent injury and manage their condition.

To bridge this gap, t**here is an urgent need to develop targeted educational materials and training programs for physical therapists.** These resources should focus on the specific challenges faced by individuals with acquired hypermobility, emphasizing preventive measures, tailored exercise programs, and effective management strategies. By equipping physical therapists with the right tools and knowledge, it is possible to improve outcomes for this distinct patient population.

While significant strides have been made in understanding hypermobility spectrum disorders, there is a pressing need for more research and educational initiatives focused on excessive range of motion due to training. Differentiating between these two groups is essential for providing accurate diagnoses and effective treatments, ultimately enhancing patient care and outcomes.

Hypermobility syndrome is a complex condition characterized by joint hypermobility, musculoskeletal symptoms, and connective tissue abnormalities. Diagnosis relies on clinical assessment tools like the Beighton score and Brighton criteria, alongside genetic and connective tissue research (Scheper, Rombaut, de Vries, et al., 2017). Management involves physical therapy, pain management, and a multidisciplinary approach to enhance the well-being of affected individuals. Ongoing research in genetics and connective tissue biology continues to **deepen our understanding of hypermobility syndrome, providing hope for more targeted therapies in the future.**

Conclusion

The synthesis of findings from the analyzed articles underscores the critical need for further research in distinguishing between excessive range of motion and hypermobility syndrome with underlying connective tissue abnormalities. Despite advancements in understanding these conditions, challenges persist in accurately diagnosing and effectively treating individuals presenting with increased joint mobility. Addressing this gap through targeted research efforts will not only enhance diagnostic precision but also improve treatment strategies, ultimately optimizing patient outcomes and quality of life. As we continue to unravel the complexities of joint hypermobility, collaboration among researchers, clinicians, and individuals affected by these conditions will be paramount in advancing knowledge and improving clinical practice.

This review underscores the critical need for specialized training for physical therapists to address the unique demands of patients with acquired excessive range of motion. By incorporating specific strategies aimed at enhancing joint stability and preventing injury, therapists can improve outcomes and help these individuals maintain their high level of performance.

Perspectives of further research. Future research should continue to explore optimal therapeutic techniques and preventative measures to support this specialized population. This includes developing and testing specific exercise programs tailored to individuals with acquired excessive range of motion, investigating the long-term effects of various interventions, and identifying key factors that contribute to successful management and injury prevention. Additionally, there is a need to establish standardized diagnostic criteria to distinguish between hypermobility syndrome and excessive range of motion due to training, ensuring appropriate and effective treatment. Collaborative efforts between researchers, clinicians, and physical therapists are crucial in advancing our understanding and improving care for these individuals. Enhanced educational programs and resources for healthcare providers will also be essential to translate research findings into clinical practice, ultimately benefiting patients through more informed and effective therapeutic approaches.

BIBLIOGRAPHY

Baum J., Larsson L.G. Hypermobility syndrome–new diagnostic criteria. The Journal of rheumatology, 2000, vol. 27, no. 7, pp. 1585–1586.

Bolling C., Mellette J., Pasman H.R., Van Mechelen W., Verhagen E. From the safety net to the injury prevention web: applying systems thinking to unravel injury prevention challenges and opportunities in Cirque du Soleil. BMJ open sport & exercise medicine, 2019, vol. 5, no. 1, art. no. e000492.

Greenspan S. Injury frequency and characteristics in adolescent and adult circus artists: A pilot prospective cohort study. Medical Problems of Performing Artists, 2021, vol. 36, no. 2, pp. 103–107.

Kisielova H., Dubrava T., Goltsev A. Disturbed cytokine profile in adjuvant arthritis – A target of the therapeutic potential of dendritic cells derived from cryopreserved precursors. Innovative Biosystems and Bioengineering, 2023, vol. 7, no. 3, pp. 32–43. DOI: https://doi.org/10.20535/ibb.2023.7.3.285432.

Knight I. A guide to living with hypermobility syndrome: Bending without breaking. London: Singing Dragon, 2011. 240 p.

Luder G., Aeberli D., Mebes C.M., Haupt-Bertschy B., Baeyens J.P., Verra M.L. Effect of resistance training on muscle properties and function in women with generalized joint hypermobility: A single-blind pragmatic randomized controlled trial. BMC Sports Science, Medicine and Rehabilitation, 2021, vol. 13, art. no. 10.

Munro D. Injury patterns and rates amongst students at the national institute of circus arts: an observational study. Medical problems of performing artists, 2014, vol. 29, no. 4, pp. 235–240.

Nicholas J., Weir G., Alderson J.A., Stubbe J.H., Van Rijn R.M., Dimmock J.A., Donnelly C.J. Incidence, mechanisms, and characteristics of injuries in pole dancers: a prospective cohort study. Medical problems of performing artists, 2022, vol. 37, no. 3, pp. 151–164.

Ralovich F.V., Kiss N., Horváth K., Kárpáti S., Medvecz M. Az Ehlers–Danlos-szindrómák korszerű osztályozása és multidiszciplináris tünettana [Up-to-date classification and multidisciplinary symptoms of Ehlers-Danlos syndromes]. Orvosi Hetilap, 2019, vol. 160, no. 16, pp. 603–612. DOI: https://doi.org/10.1556/650.2019.31351.

Scott C., Scott Q., Muscat S. Incidence, prevalence, and characteristics of injuries in pole dancers: a systematic review. Medical problems of performing artists, 2024, vol. 39, no. 2, pp. 108–118.

Volodina T.T., Korotkevich N.V., Romanyuk S.I., Galkin O.Y., Kolybo D.V., Komisarenko S.V. Implementation of dietary supplements with effect of dezintoxication and improvement of osteogenesis and metabolism. Science and Innovation, 2017, vol. 13, no. 6, pp. 39–50. DOI: https://doi.org/10.15407/scin13.06.041.

Zabriskie H.A. Rationale and feasibility of resistance training in hEDS/HSD: A narrative review. Journal of Functional Morphology and Kinesiology, 2022, vol. 7, no. 3, art. no. 61.

REFERENCES

Armstrong, R. (2019). The Beighton score and injury in dancers: A prospective cohort study. Journal of Sport Rehabilitation, 29(5), 563–571. https://doi.org/10.1123/jsr.2018-0390

Callahan, A.P.T., Squires, A.P.T., & Greenspan, S.P.T. (2022). Management of hypermobility in aesthetic performing artists: A review. Orthopaedic Physical Therapy Practice, 34(3), 134-145.

Castori, M., Tinkle, B., Levy, H., Grahame, R., Malfait, F., & Hakim, A. (2017). A framework for the classification of joint hypermobility and related conditions. American Journal of Medical Genetics Part C: Seminars in Medical Genetics, 175(1), 148–157.

Clarkson, H.M. (2000). Musculoskeletal assessment: Joint range of motion and manual muscle strength. Lippincott Williams & Wilkins.

Day, H., Koutedakis, Y., & Wyon, M.A. (2011). Hypermobility and dance: A review. International Journal of Sports Medicine, 32(7), 485–489. https://doi.org/10.1055/s-0031-1273690

Faltus, J., & Richard, V. (2022). Considerations for the medical management of the circus performance artist and acrobat. International Journal of Sports Physical Therapy, 17(2), 307.

Gensemer, C., Burks, R., Kautz, S., Judge, D.P., Lavallee, M., & Norris, R.A. (2021). Hypermobile Ehlers-Danlos syndromes: Complex phenotypes, challenging diagnoses, and poorly understood causes. Developmental Dynamics, 250(3), 318–344. https://doi.org/10.1002/dvdy.220

Grahame, R., Bird, H.A., & Child, A. (2000). The revised (Brighton 1998) criteria for the diagnosis of benign joint hypermobility syndrome (BJHS). The Journal of Rheumatology, 27(7), 1777–1779.

Hakim, A. (2024). Hypermobile Ehlers-Danlos syndrome. In GeneReviews® [Internet].

Hamonet, C., Schatz, P.-M., Bezire, P., et al. (2018). Cognitive and psychopathological aspects of Ehlers-Danlos syndrome–Experience in a specialized medical consultation. Research Advances in Brain Disorders and Therapy, 1(1), 1–5.

Harte, H., Thomas, H., Beeton, K., & Almack, K. (2020). The experience of diagnosis with hypermobile Ehlers Danlos syndrome: A literature review. Physiotherapy, 107, 195-196.

Jung, H., & Chae, H. (2019). The Safety and Efficacy of Methocarbamol as a Muscle Relaxant with Analgesic Action: Analysis of Current Data. *Innovative Biosystems and Bioengineering*, *3*(4), 201–211. https://doi.org/10.20535/ibb.2019.3.4.183336

Micale, L., Fusco, C., & Castori, M. (2021). Ehlers-Danlos syndromes, joint hypermobility and hypermobility spectrum disorders. Advances in Experimental Medicine and Biology, 1348, 207-233. https://doi.org/10.1007/978-3-030-80614-9_9

Miller, E., & Grosel, J.M. (2020). A review of Ehlers-Danlos syndrome. JAAPA, 33(4), 23-28. https://doi.org/10.1097/01.JAA.0000657160.48246.91

Munro, D. (2014). Injury patterns and rates amongst students at the National Institute of Circus Arts: An observational study. Medical Problems of Performing Artists, 29(4), 235-240. https://doi.org/10.21091/mppa.2014.4046

Oosterwijk, A.M., Nieuwenhuis, M.K., van der Schans, C.P., & Mouton, L.J. (2018). Shoulder and elbow range of motion for the performance of activities of daily living: A systematic review. Physiotherapy Theory and Practice, 34(7), 505–528. https://doi.org/10.1080/09593985.2017.1422206

Palmer, S., Cramp, F., Clark, E., Lewis, R., Brookes, S., Hollingworth, W., Welton, N., Thom, H., Terry, R., Rimes, K.A., et al. (2016). The feasibility of a randomised controlled trial of physiotherapy for adults with joint hypermobility syndrome. Health Technology Assessment, 20, 1–264.

Roussel, N.A., Nijs, J., Mottram, S., Van Moorsel, A., Truijen, S., & Stassijns, G. (2009). Altered lumbopelvic movement control but not generalized joint hypermobility is associated with increased injury in dancers: A prospective study. Manual Therapy, 14(6), 630–635. https://doi.org/10.1016/j.math.2008.12.004

Ruemper, A., & Watkins, K. (2012). Correlations between general joint hypermobility and joint hypermobility syndrome and injury in contemporary dance students. Journal of Dance Medicine & Science, 16(4), 161-166.

Scheper, M., Rombaut, L., de Vries, J., et al. (2017). The association between muscle strength and activity limitations in patients with the hypermobility type of Ehlers-Danlos syndrome: The impact of proprioception. Disability and Rehabilitation, 39(14), 1391-1397. https://doi.org/10.1080/09638288.2016.1196396

Simpson, M.M.R. (2006). Benign joint hypermobility syndrome: Evaluation, diagnosis, and management. Journal of Osteopathic Medicine, 106(9), 531-536. https://doi.org/10.7556/jaoa.2006.106.9.531

Tinkle, B., Castori, M., Berglund, B., Cohen, H., Grahame, R., Kazkaz, H., & Levy, H. (2017). Hypermobile Ehlers-Danlos syndrome (a.k.a. Ehlers-Danlos syndrome Type III and Ehlers-Danlos syndrome hypermobility type): Clinical description and natural history. American Journal of Medical Genetics Part C: Seminars in Medical Genetics, 175(1), 48-69. https://doi.org/10.1002/ajmg.c.31538

Wolfenden, H.E.G., & Angioi, M. (2017). Musculoskeletal injury profile of circus artists: A systematic review of the literature. Medical Problems of Performing Artists, 32(1), 51–59.

Стаття надійшла до редакції 31.05. 2024.
Стаття прийнята до друку 26.07.2024.

Conflict of interests: none.
Contribution of authors:
Antonova-Rafi Y. – developing of the study concept and design, editing;
Voroniuk Y. – materials collection, data analysis, text preparation.

Email address for corresponding with the authors:
yelyzaveta194@gmail.com