BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology

Volume 3·Issue 1·June 2021 ISSN 2661-3859(Online)

AOSCI Asia-Pacific Science Citation Index
creative commons
CNKI中国知网 www.cnki.net 中国知识基础设施工程
Google scholar
Crossref
MyScienceWork

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Editor-in-Chief

Dr. Sanjay Kumar

Western Sydney University, Australia

Editorial Board Members

Allaye Hamadoun Garango, Mali
Riju Agarwal, India
Fa Wang, United States
Fabrizia d'Apuzzo, Italy
Salvatore Siracusano, Italy
Salyan Bhattarai, Canada
Marlies Cortes, Spain
Reza Nemati, New Zealand
Mostafa Zamani, Iran
Elham Harati, Iran
Snezana Pantovic, Montenegro
Sofia M. Calado, Portugal
Manas Bajpai, India
Aida Adlimoghaddam, Canada
Richard Kyung, United States
Venkata Ramana Machha, United States
Alastair Forbes, United Kingdom
Arvind Sharma, United States
Casandra Isabel Montoro Aguilar, Spain
Satish Chandrasekhar Nair, United States
Khali Elsaye Shreef, Egypt
Chengyue Jin, United States
Xuejian Wang, China
Jingbo Dai, United States
Dariush Gholami, Iran
Rafik D. Grygoryan, Ukraine
Seyed Alireza Mousavi Shirazi, Iran
Ali Dadras, Iran
Junjie Yang, United States
Anton R Kiselev, Russian Federation
Falak Zeb, China
Morgan Durrette Salmon, United States
Hessam H. Kashani, Canada
Kozaburo Hayashi, Japan
Ronald Allan Magtibay Panganiban, United States
Himanshu Narayan Singh, France
Animesh Chowdhury, Israel
Mukerrem Hale Tasyurek, Turkey
Jennifer Leslie, United States
Toar Jean Maurice Lalisang, Indonesia
Xuejian Wang, China
Piyush Kumar Gupta,India
Joseph Kurian Mukkadan,India
Anju Kumari,USA
Jiaming Fei, China

Volume 3 Issue 1 • June 2021 • ISSN 2661-3859 (Online)

Journal of Human Physiology

Editor-in-Chief

Dr. Sanjay Kumar

BILINGUAL PUBLISHING CO.

Pioneer of Global Academics Since 1984

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Volume 3 | Issue 1 | June 2021 | Page1-31
Journal of Human Physiology

Contents

EDITORIAL

ARTICLE

Copyright

Journal of Human Physiology is licensed under a Creative Commons-Non-Commercial 4.0 International Copyright (CC BY- NC4.0). Readers shall have the right to copy and distribute articles in this journal in any form in any medium, and may also modify, convert or create on the basis of articles. In sharing and using articles in this journal, the user must indicate the author and source, and mark the changes made in articles. Copyright © BILINGUAL PUBLISHING CO. All Rights Reserved.

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology
https://ojs.bilpublishing.com/index.php/jhp

EDITORIAL

A Foreword from the Editor-in-Chief

Sanjay Kumar*

Mayo Clinic, Rochester, Minnesota, United States

ARTICLE INFO

Article history
Received: 26 July 2021
Accepted: 9 August 2021
Published Online: 10 August 2021

In view of advancement of medical and basic science technology, *Journal of Human Physiology*, focus on innovative methods, novel hypothesis in physiology and patho-physiological aspects in human by publishing original articles, case studies, and comprehensive reviews.

The electronic ISSN (Online) for this journal is 2661-3859. So far, three volumes have been published in this journal in different areas of research such as kidney disease, Systemic Lupus Erythematosus, diabetes, physiotherapy and neurological disorders. Here, we briefly describing the significance of articles published recently in volume 3.

The first article of this volume 3 demonstrated the relationship between polymorphism and SLE (systemic lupus erythematosus) of vitamin D metabolic pathway related Gene. The main aim of this paper was to find the any mutation in vitamin D metabolic pathway genes could lead to SLE. Vitamin D is very important to maintain physiological states of organs in human body. A plethora of studies demonstrated that vitamin D regulates not only calcium and phosphorus related metabolism, but also involve in immune response, humoral and cell cycle regulation. SLE is a specific autoimmune disease that damages tissues and organs and is influenced by many factors including genetics and environment. Among these, the vitamin D an important gene involves in metabolic pathways is key molecule influencing SLE. This review paper highlighted the mechanism of genetic polymorphism of vitamin D in association with SLE development.

The second article of this volume 3 published novel concept of whiplash injuries rehabilitation. Whiplash is a neck injury due to forceful, rapid back-and-forth movement of the neck, like the cracking of a whip. The mechanism underlying whiplash injuries is not yet understood and many hypotheses have been given ranging from biomechanical to neurophysiological, focusing on central sensitization, but major disabilities are strictly related to deregulation of somatosensory function. This manuscript used the data based Head Neutral Reference Point (HNRP), to restore valid somatosensory output from cranio-cervical junction that may be useful in the process of central desensitization and rehabilitation process.

A third article of the volume 3 is all about maintaining the health of professional folk dancers in conditions of physical recreation. The health issues related to folk dancer have not been addressed till date. This study is based on sociological survey of the artists of the folk dance ensemble "Joc" following parameters such as eating style, rest regime, physical and mental state, the attitude of respondents to physical activity in fitness clubs, readiness to

**Corresponding Author:*
Sanjay Kumar,
Mayo Clinic, Rochester, Minnesota, United States;
Email: Sanjay.syadavbiotech@gmail.com

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.3259

engage in physical recreation to improve their condition, prevent diseases and fitness programs.

The fourth article was published as regular exercise improved the diabetes condition of type II diabetes mellitus elderly patients. The purpose of this study was to assess the aerobics and walking exercise to improve the illness condition of elderly patients suffering with type II diabetes. The outcome suggested that old aerobics and rope skipping could be very effective in improving the clinical symptoms of diabetic patients.

This journal will continue to publish the articles based on novel theme in diverse areas related to human, which could draw attention from wide range of researchers working in the field of human biology.

I would like to thank all readers for their consistent support, and also will welcome you all to publish the latest breakthrough in human research.

Sanjay Kumar, PhD
Editor in Chief
Journal of Human Physiology

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.3259

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology
https://ojs.bilpublishing.com/index.php/jhp

ARTICLE

Research Progress on the Relationship between Polymorphism and SLE of Vitamin D Metabolic Pathway Related Gene

Rui Han[1] Yuxuan Wang[2] Guanlu Li[3] Yiyu Cai[4] Zhilu Li[1] Yaqi Huang[5] Saijia Li[1] Pingping Yan[6*]

1.First Clinical College of Hainan Medical University, Haikou, Hainan, 570100, China
2.School of Public Health, Hainan Medical University, Haikou, Hainan, 570100, China
3.School of International Education, Hainan Medical University, Haikou, Hainan, 570100, China
4.School of Tropical Medicine and Laboratory Medicine, Hainan Medical University, Haikou, Hainan, 570100, China
5.College of Traditional Chinese Medicine, Hainan Medical University, Haikou, Hainan, 570100, China
6.Clinical Skills Center, Hainan Medical University, Haikou, Hainan, 570100, China

ARTICLE INFO

Article history
Received: 26 January 2021
Accepted: 2 March 2021
Published Online: 10 June 2021

Keywords:
Vitamin D metabolic pathways
Gene polymorphism
Systemic lupus erythematosus

ABSTRACT

Vitamin D is a class of hormones necessary to maintain normal physiological activities of the body. A large number of studies have shown that vitamin D, as a fat-soluble vitamin, is not only related to calcium and phosphorus metabolism, but also closely related to immune regulation, humoral regulation, cell cycle and so on. Systemic Lupus erythema-Tosus (SLE) is a specific autoimmune diffuse connective tissue disease that causes tissue and organ damage under the joint action of multiple factors such as environment and heredity. Among many factors, the vitamin D metabolism pathway gene is particularly important for its influence. Some literature has shown that the genetic polymorphism of vitamin D metabolic pathway genes is correlated with SLE. Therefore, by referring to relevant literature, this paper summarized the progress in the research on the mechanism of genetic polymorphism of vitamin metabolism pathway genes and the development of SLE.

1. Introduction

Recent studies have shown that serum vitamin D deficiency in patients with SLE [1]. Gao et al. conducted a study on the relationship between vitamin D and SLE and found that 62.81% of the patients had vitamin D deficiency and 34.71% had severe vitamin D deficiency, indicating that vitamin D deficiency would significantly increase the incidence of SLE [2]. Some animal experiments have also shown that moderate vitamin D can reduce the levels of urine protein, impaired joint function and reduce the damage of renal function in lupus rats [3]. In the study of genetic level, Luo Xiongyan, Liu Junlin et al. further studied the genetic polymorphism of vitamin D metabolic pathway genes and SLE [4-5]. In foreign literature, Ozaki, Huang et al also studied the correlation [6-7]. In this paper, we review the research progress on the genetic polymorphism of vitamin D metabolic pathway related to the pathogenesis and development of SLE.

**Corresponding Author:*
Pingping Yan,
Clinical Skills Center, Hainan Medical University, Haikou, Hainan, 570100, China;
Email: 1289762133@qq.com

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2852

2. Research Progress of Systemic Lupus Erythematosus (SLE)

2.1 Pathogenesis

Systemic lupus erythematosus (SLE) is an autoimmune disease that often affects women of childbearing age [8], with a high incidence, multiple system, multiple organs involved, repeated attacks and other characteristics [9-10]. At present, its pathogenesis is not fully understood, mainly including the formation of immune complex which is involved in multiple organ damage, the production of autoantibodies, the over-activation of T cells and B cells and other abnormal regulation of the immune system [11-13].

2.2 Clinical Manifestations

The clinical symptoms of SLE are more complex, mainly including respiratory system damage, kidney damage symptoms, fever, facial erythema, joint pain and so on. In mild cases, only arthralgia or facial rashes are present, while in severe cases, early life-threatening severe thrombocytopenia, neuropsychiatric lupus, progressive lupus nephritis, and alveolar bleeding occur [10,14].

2.3 Common Treatment Methods

The drugs for clinical treatment of SLE mainly include hormones and immunosuppressants, which are known as Stand of Care (SOC). Glucocorticoids are often used in combination with prednisone and metasone. In the acute stage of the onset of SLE, a large amount of glucocorticoids may pull the patient back from the line of life or death, but adverse reactions may occur [15].

3. Single Nucleotide Polymorphism and SNP Detection Techniques

Single nucleo tide polymorphism (SNP) refers to the transformation, transposition, insertion and deletion of a specific nucleotide position in the DNA of the genome, and the frequency of at least one allele in the population is not less than 1%. Although the genetic code consists of four bases, an SNP is usually just a biallelic, or dimorphic genetic variation, in which two different bases are present at that location. If the four bases mutate randomly, the transversions in the SNP should be twice as much as the transversions, but the chance of four bases mutating is not equal. In fact, the conversion accounts for a higher proportion in the SNP. Through the application of sequencing and gene mutation research technology, a large number of SNPs have been obtained, and a common database has been established. The development of efficient SNP analysis techniques has expanded the scope of the study from a small number of variants associated with a particular disease to genetic markers corresponding to multiple variation types within multiple genes. SNP analysis techniques are mainly divided into two categories according to their research objects, namely: (1) analysis of unknown SNPs, that is, finding unknown SNPs or determining the relationship between an unknown SNP and a genetic disease; (2) Analysis of known SNPs, i.e. detection of genetic diversity of SNPs in different populations or genetic diagnosis of genetic diseases with known pathogenic genes in clinical practice. In practical application, many methods for detecting unknown SNPs can also be used to detect known SNPs, and methods for detecting known SNPs can also be used to screen unknown SNPs, and then sequencing method can be used to determine the types and locations of SNP mutations after screening. The following introduction of SNP analysis commonly used method, in addition to the mutation mismatch amplification test (MAMA), SNPshotTM GeneScan and allele specific oligonucleotide fragment analysis (ASO) can only detect known mutations, other methods can be used in the analysis of two kinds of SNP detection, the experimenter can according to their own needs and choose to suit the condition of the experiment equipment, simple and efficient, economy or mass detection method [16].

4. Research Progress on Vitamin D Metabolic Pathway

VD occurs in a variety of forms in the body, including 25-hydroxyvitamin D (25-(OH)D) and 1, 25-dihydroxyvitamin D (1,25- (OH)).2D) [17], 25-(OH)D is first formed by the hydroxylation of 25-α-hydroxylase encoded by CYP2R1 gene in liver, and 25-hydroxyvitamin D is considered to be the most representative biomarker of the overall level of VD in human body [18]; After that, it is formed by hydroxylating 1-α hydroxylase encoded by CYP27B1 gene in the kidney [19], 1, 25 - (OH)2D is the active form of VD,1,25-(OH).2D forms 1,24,25-(OH) under the action of 24 hydroxylase encoded by CYP24A1 gene3,24 hydroxylases also combine 25(OH)D and 1,25-(OH).2D degrades and plays a negative feedback regulating role [20]. Vitamind Binding protein (VDBP), edited by VDBP gene, binds to vitamin D and promotes vitamin D transport in the liver and kidney.1, 25 (OH)2D exerts biological effects by binding to the VitaminD receptor (VDR), which is encoded by the VDR gene.The vitamin D pathway gene is the conversion of VD to 1,25-(OH)2. The genes that play a regulatory role in the process of D mainly include CYP2R1, CYP27B1, CYP24A1, VDBP and VDR. The

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2852

abnormal expression of vitamin D metabolic pathway genes may affect the level of vitamin D, thus affecting the play of biological efficacy [21].

5. Vitamin D Metabolic Pathway Gene Polymorphism and SLE

5.1 CYP2R1 Gene Polymorphism and SLE

CYP2R1 gene is located in human chromosome 11 P15.2, with a span of 15.5 KB and 5 exons [22]. CYP2R1 gene encodes the 25-hydroxylase of vitamin D (CYP2R1), which is present in the liver microsomal cytochrome P450. It is a member of the 2 subfamilies of the P450 family and is composed of 501 amino acids [23]. The main role of CYP2R1 is the 25-position hydroxylation of vitamin D in the liver to produce 25-hydroxyvitamin D(25-(0H)D), which is the main product of the vitamin D metabolic cycle. Genome-wide Association Studies (GWAS) determined that CYP2R1 SNPs were associated with vitamin D levels, and some previous studies also showed a significant association between CYP2R1 variants and 25-(0H)D levels [24-25]. It was also confirmed by Wang et al that both CYP2R1 and CYP27A1 played a role in the 25-hydroxylation of vitamin D [24], but CYP2R gene plays a dominant role, and CYP27A1 is a secondary factor in the synthesis of 25-(0H)D.

A large number of studies have shown that single nucleotide polymorphisms of CYP2R1 are significantly associated with many diseases. The occurrence of atypical vitamin D deficiency rickets was related to the mutation of CYP2R1 gene. Xu et al. found that CYP2R1 locus rs10766197 was significantly correlated with low serum vitamin D content in Uyghur population [26]. Wang et al. confirmed through comparative studies that CYP2R1 locus rs10766197 was significantly correlated with serum 25-(0H)D level in patients with type II diabetes [27]. At the same time, CYP2R1 gene polymorphism was found to be significantly associated with the susceptibility to type I diabetes, and the low expression of CYP2R1 may be associated with the decreased 25-(0H)D concentration in blood of patients with type I diabetes. The CYP2R1-induced product 25-(0H)D is associated with susceptibility to a variety of cancers, including pancreatic cancer and breast cancer. Sheng et al. found that the high expression of CYP2R1 gene was significantly correlated with the relapse-free survival rate of breast cancer through a large number of studies and analyses [28]. The loci rs10741657, rs2060793 and rs12794714 in CYP2R1 gene are associated with 20% to 30% susceptibility to pancreatic cancer. In GWAS, these SNPs of CYP2R1 were significantly correlated with 25-(0H)D levels.

In addition to being associated with these diseases, a large number of loci of the CYP2R1 gene also indicate an association with 25-(0H)D levels.25-(0H)D is the main form of vitamin D in the blood. At present, the level of vitamin D in the body is mainly measured by detecting serum 225-(0H)D in clinical practice [29]. Studies have shown that there are widespread problems of insufficient or deficient serum 25-(0H)D levels in patients with SLE [30], Squance et al. found that the serum level of 25-(0H)D in SLE patients was significantly lower than that in normal healthy people by comparing the serum of 80 patients with SLE and 41 healthy people with normal physical examination [31]. Serum 25-(0H)D level plays an important role in the pathogenesis of SLE, and is related to the pathogenesis of SLE, and can be used as a clinical indicator to judge the severity of SLE disease [36]. Studies have found that low 25-(0H)D level in patients with SLE is associated with high activation of B cells and high expression of IFN-α signal, as well as high anti-dsDNA and immunoglobulin levels [32]. This finding provides evidence that low 25-(0H)D levels may trigger the production of autoantibodies, thereby increasing an individual's risk of developing autoimmune diseases. On this basis, it can be concluded that CYP2R1 gene further affects SLE by affecting the liver 25 hydroxylation of vitamin D in the vitamin D metabolic pathway, thereby affecting the blood 25-(0H)D level.

5.2 VDBP Gene Polymorphism and SLE

Vitamin D Binding Protein (VDBP) is encoded by the VDBP gene. VDBP is a plasma Protein that can play a variety of roles and is synthesized in a variety of tissues in the body, but mainly in the liver.It was successfully isolated in 1959 and was originally called group-specific conponent-Gc globulin because of its immunological characteristics [33]. Later, Gc protein and VDBP were found to be the same protein through multiple studies [34]. Genes encoding VDBP GC locates to the long arm of chromosome 4 q11 - q12, at present there are more than 2000 SNPS are found the gene, VDBP with vitamin D has a close connection between VDBP in maintaining serum vitamin D levels, adjust the bioavailability of vitamin D, vitamin D activity and end the response to vitamin D plays and important role [35]. Among them, VDBP plays a very important role in vitamin D pinocytosis, and its gene polymorphism will affect vitamin D level and activity [36]. In addition, studies have shown that VDBP also plays a very important role in the vitamin D metabolic pathway, and its polymorphism is related to the immune response and the ability to bind vitamin D and its derivatives.

There are many studies on the association between sin-

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2852

gle nucleotide polymorphism of VDBP gene and disease at home and abroad [37]. VDBP is associated with lung disease, liver disease, obesity, bone tissue disease, diabetes and many other diseases [38-40]. At present, domestic and foreign studies on VDBP encoding genes mostly focus on rs2282679(A/C), rs45889(C/A) and rs7041(T/G), and studies have found that rs2282679(A/C) polymorphism is correlated with vitamin D level [41-43], and SNP rs2282679 is associated with bone metabolic diseases, obesity, heart and lung diseases, etc [38]. Regulla et al. found that VDBP gene polymorphism was correlated with Graves' disease [44]. Wang Gaoshuai et al. found that the SNP locus rs7041 of VDBP was closely related to obesity [45]. However, at present, the role of VDBP gene polymorphism in the pathogenesis of SLE is still unclear, and there are no large-scale clinical studies and reports on the association between SLE patients and VDBP gene polymorphism, so it still needs to be verified by subsequent experiments.

5.3 CYP27B1 Gene Polymorphism and SLE

CYP27B1 gene is the encoding gene of 1-α-hydroxylase, which exists on the long arm of human chromosome 12 (12q13.1-q13.3). It consists of 9 exons and 8 introns, and is a single-copy gene. Its full length cDNA is 4.8 KB, encoding 508 amino acid polypeptide [46-47], a member of the P450 family of enzymes, encodes 1-α hydroxylase.

α-hydroxylase catalyzes 25-(0H)D to form 1,25-(0H)2A rate-limiting enzyme of D whose main function is to catalyse the hydroxylation and activation of 25-(0H)D in the proximal convoluted tubules and rectus and convert it to its active form 1,25-(0H).2D [48-50]. Panda and Zhang Zengli et al found that the changes of 1-α-hydroxylase activity were correlated with 1,25-(0H) in plasma and local area. 2D levels were associated with immune system dysfunction, and no active vitamin D was found in animals targeted with the CYP27B1 gene [51-53]. Multiple literature reports, 1,25-(0H)2D has a direct effect on both T and B cells, not only promoting the production of various inflammatory cytokines, but also inducing regulatory T cells to participate in a "off" inflammatory response. On this basis, some studies show that [51] Vitamin D is mainly involved in SLE by increasing the number of regulatory T cells and producing anti-proliferation effects. Therefore, it can be concluded that CYP27B1 single nucleotide polymorphism is closely related to the occurrence and development of SLE.

5.4 Calcium-phosphorus Regulation of Vitamin D in SLE

Coexistence of vitamin D and vitamin A in cod liver oil, animal tissues and within the human body skin contains cholesterol, A precursor of vitamin D3 7 - dehydrogenation after sunlight into vitamin D, vitamin D with biological activity of 1, 25 - (OH) 2 D3 form play A role, the calcium, phosphorus, and children's bone growth has very important meaning. Studies have reported that the level of 1,25- (OH) 2D3 is positively correlated with bone mineral density in patients with SLE, and the incidence of SLE combined with osteoporosis is 1.4% ~ 68% [54-46], the larger span was due to differences in genetic background, ethnicity, age, and disease activity, and postmenopausal women were at higher risk for lumbar osteoporosis. Children with SLE are also at a higher risk of developing osteoporosis, considering that long-term use of hormones may affect the growth of their normal peak bone mass [57]. The causes of osteoporosis in SLE are very complex, including disease factors, drug influencing factors (glucocorticoid) and renal damage, etc., and defective osteogenic differentiation of mesenchymal stem cells in SLE may also lead to osteoporosis [58-59]. 1,25-(OH) 2D3 can regulate calcium and phosphorus levels in patients with SLE through binding with vitamin D receptor (VDR), maintain mineral stability, thus promoting bone metabolism and bone transformation, and reducing the occurrence of osteoporosis in patients with SLE. Vitamin D can also regulate osteoblasts and osteoclasts.

5.5 VDR Gene Polymorphism and SLE

VDR is a nuclear receptor of 50 kDa, belonging to the second class of the steroid receptor family, similar to retinoic acid receptor and thyrotropin [60]. 1, 25 - (0 h)2D binds to the nuclear VDR genome and determines genomic responses by regulating the transcription of certain genes [56]. VDR is synthesized by a gene located at position 12q13.1 on chromosome 12, known as VDR gene [57]. The gene is basically composed of 9 exons distributed in the 5 'promoter and the 3' regulatory region. In the latter region, a long 3 'untranslated region, known as the 3' untranslated region, is involved in the regulation of gene expression, in particular by regulating the stability of messenger RNA. VDR gene showed some polymorphisms in the promoter region between exons 2 and 9 in the 3 'translation region, especially in the promoter region around exons 1, F and C [61]. Polymorphism BSMI located in intron 8 and adenine - guanine replacement results (A-G) [62]. *Apai and Taqi polymorphisms were distributed in this region of the 3′ gene.* Polymorphic APAI is defined as thymine substitution (T-G) in intron 8, while polymorphic TAQI is defined as cytosine-thymine substitution (C-T), resulting in codon exchange (ATC→ATT), but maintaining the same isoleucine amino acid [63]. Functional correlations of these polymorphisms were associated

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2852

with increased mRNA stability [64]. *Foki polymorphism is caused by the substitution of cytosine-thymine (C-T) at the junction of intron 1 and exon 2, resulting in an additional start codon (ACG→ATG), three codons close to the transcription start site.* This polymorphism can be considered as an independent genetic marker because it does not appear to be in linkage imbalance with other VDR gene polymorphisms. *An occurrence variant of Foki, defined as a mutation in F (Atg codon) resulting in complete production of VDR protein (427 amino acids)* [65]", and the mutation Foki, defined as F (codon GCA), starts translating at a different site to produce a slightly shorter VDR protein containing three fewer amino acids (424 amino acids). In vitro studies have shown that short proteins seem to have higher transcriptional activity than long proteins [66]. This may increase the function of VDR and thus alter the role of vitamin D in different cells and tissues. The effect of Foki polymorphism on the transcriptional activity of immunospecific transcription factors in lymphocyte proliferation and immunocell protein synthesis suggests that Foki polymorphism is involved in immune regulation and immunoregulatory polymorphism [67].

In vitamin D transport and metabolism pathway, the SNP of VDR gene is associated with the susceptibility to severe respiratory syncytial virus infection, tuberculosis, asthma, systemic lupus erythematosus, colorectal tumor, melanoma, periodontitis, renal cell tumor, gout, multiple sclerosis, AIDS, Parkinson's disease and other diseases [68-70].

A large number of researchers have conducted experiments on the relationship between BSMI polymorphism of VDR gene and SLE. In 2000, a study of 58 Japanese patients with SLE demonstrated a higher incidence of B/B genotypes compared with healthy controls (15.5 vs. 5.7%,p<0.0001). In addition, a higher frequency of genotype B/B was found in nephrotic syndrome (61.5% vs. 35.7%,p<0.0034) in nephrotic patients [67]. In 2002, Chinese authors studied 47 patients with systemic lupus erythematosus and 90 healthy controls and found a higher B allele frequency in patients with systemic lupus erythematosus (39.4% vs. 8.3%,OR=0.74, P <0.0001) [71]. A study of 101 Thai and 60 Iranian patients in 2006 and 2010, respectively, found no association between BSMI polymorphisms and SLE or clinical and laboratory manifestations of the disease. In 2002, a study assessed FOKI polymorphisms in 52 patients with SLE and 90 healthy controls and found no significant differences in allele and genotype frequencies [72]. In 2010, a meta-analysis was published that found no significant Foki polymorphism. However, due to the small number of studies included, these results should be interpreted with caution, and they apply only to European and Asian ethnic groups [73]. A case-control study conducted in Brazil also investigated the association between BSMI and Foki VDR gene polymorphism and susceptibility to SLE in 195 patients of European or African origin and 201 control patients. The results showed no association between BSMI and Foki VDR gene polymorphisms and SLE susceptibility. In this study, the mean serum level of 25-(0H)D in patients with SLE was 25.51±11.43 ng/ml. *25-(0H)D level in F/F genotype patients was significantly higher than that in F/F genotype patients (31.6±14.1 vs 23.0±9.2 ng/ml, P <0.004)*. Although there is no significant association between FOKI polymorphism and SLE, the authors suggest that FOKI polymorphism has an important effect on vitamin D metabolism in patients with SLE [71], BSMI and Foki VDR polymorphisms have recently been found in Chinese patients. The frequency of homozygous F/F was higher in SLE patients than in controls (42.8 vs 25.4%, P =0.001). Seritis, anti-dsDNA antibodies, anti-Sm antibodies, and anti-hiprotein antibodies in SLE patients with homozygous F/F and heterozygous F/F were higher than those in SLE patients with homozygous F/F. Patients with SLE show a marked increase in the frequency of the B allele, which is associated with lupus nephritis and with the production of anti-nucleosome antibodies [74].

6. Conclusions

At present, a large number of studies have explored the relationship between vitamin D deficiency and the occurrence and development of SLE disease, but most of the studies on its mechanism remain at the cellular level, and a few involve genetic level. However, with the deepening of the research on SLE, it is not difficult to find that genetic polymorphism of genes plays a non-negligible role in the occurrence and development of SLE. As an important pathway of vitamin D production, vitamin D metabolic pathway has a direct impact on vitamin D level, which further affects the occurrence and development of some diseases, especially autoimmune diseases (such as SLE). To sum up, in view of the vitamin D in SLE properties of calcium phosphate, immunity adjustment, system and SLE and VDR gene polymorphism, the correlation of atherosclerosis, improve the level of 1, 25 - (OH) 2 d3 to improve SLE patients with osteoporosis, disease activity, atherosclerosis, cardiovascular disease and clinical symptoms may play a role, but the kinds of vitamin D supplements, dose and treatment remains to be more large-scale clinical trials research further defined. It remains to be further investigated whether vitamin D and VDR can reduce or even replace hormone and immunosuppressive therapy, and whether adequate vitamin D supplementation can prevent the occurrence of SLE [75].

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2852

References

[1] Huang Yuxi, Zhang Hao, Zhang Shuang, et al. Expression and significance of vitamin D receptor and MCP-1 in patients with systemic lupus erythematosus [J]. Journal of Southern Medical University, 2020,40 (01): 99-103.

[2] GAO CC, LIU SY, WU ZZ, et al. Severe vitamin D deficiency increases the risk for moderate to severe disease activity in Chinese patients with SLE [J]. Lupus, 2016, 25(11) : 1224-1229.

[3] MARINHOA,TAVEIRAM,VASCONCELOSC.Topics on vitamin D in systemic lupus erythematosus: analysis of evidence and critical literature ZZreview[J].Immunologic Research,2017,65(2) :495-511.

[4] Luo Xiongyan, Chen long, Yang Minghui, et al. Association between vitamin D receptor gene polymorphisms and systemic lupus erythematosus [C]. Proceedings of the 17th National Academic Conference on rheumatology, Chinese Medical Association, Chinese Medical Association rheumatology: Chinese Medical Association, 2012:102-103.

[5] Liu Junlin. Meta analysis of the association between PDCD1 gene and systemic lupus erythematosus, vitamin D receptor gene and psoriasis [D]. Anhui Medical University, 2008.

[6] Ozaki Y, Nomura S, Nagahama M, et al. Viamin-D receptor genotype and renal disorder in Japanese patients with systemic lupus erytheMatosu[J]. Nephron. 2000 May,85(1):86-91.

[7] Huang CM, Wu MC, Wu JY, et al. No association of vitamin D reeptor gene start codon fokl polymorphisms in Chinese patients with systemic lupus erythematosus [J].Rheumatol. 2002 June; 29(6):1211-3.

[8] Mohan C, Putterman C. Genetics and pathogenesis of systemic lupus erythematosus and lupus nephritis[J]. Nat Rev Nephrol, 2015, 11(6):329-341.

[9] Ahmadpoor P, Dalili N, Rostami M. An update on pathogenesis of systemic lupus erythematosus[J]. Iran J Kidney Dis, 2014, 8(3):171-184.

[10] Xie Changhao, Li Zhijun. Diagnosis and treatment of systemic lupus erythematosus [J]. Chinese Journal of general practice, 2020, 18 (4): 527-528.

[11] Sanz I. New Perspectives in Rheumatology : May You Live in Interesting Times : Challenges and Opportunities in Lupus Research[J]. Arthritis Rheumatol, 2017, 69(8):1552-1559.

[12] Dorner T, Lipsky PE. Beyond pan-B-cell-directed therapy-new avenues and insights into the pathogenesis of SLE[J]. Nat Rev Rheumatol, 2016, 12(11):645-657.

[13] Luo Chunhua, Li Peng, Li Qianyuan, Zhao Wu, Wang Zuoxin, et al. Changes and clinical significance of serum cytokines in patients with systemic lupus erythematosus [J]. Medical review, 2020, 26 (08): 1641-1644 + 1649.

[14] Ospina FE, Echeverri A, Zambrano D, et al. Distinguishing infections vs flares in patients with systemic lupus erythematosus[J]. Rheumatology(Oxford), 2017, 56(suppl_1) : i46-54.

[15] Kamal A, Khamashta M. The efficacy of novel B cell biologics as the future of SLE treatment: a review[J]. Autoimmun Rev, 2014, 13:1094-1101.

[16] [1] Luo Huairong, Shi Peng, Zhang Yaping. Single nucleotide polymorphism research technology [J]. Genetics, 2001 (05): 471-476.

[17] Zeng Qin, Yuan Jingjing, Xie Zhongjian. Research status of vitamin D and thyroid cancer [J]. Chinese Journal of Endocrinology and metabolism, 2017, Vol. 33 (6): 525-528.

[18] Wu Lili, Liu Chunli. Vitamin D and respiratory infectious diseases [J]. Huaxia medicine, 2018, Vol. 31 (2): 159-163.

[19] ChenSai-Ming;ZhouXiao-Liu;LIZhi-Lu,et al.Association between the genetic variation of vitamin D binding protein gene and chronic sinusitis of elder in Hainan province[J].Chinese Journal of Gerontology,2019, 39, (11): 2694-2697.

[20] Yu Songcheng. Relationship between vitamin D metabolic pathway gene polymorphism, copy number and methylation variation and type 2 diabetes [D]. Zhengzhou University, 2018.

[21] Li Jiaheng. Study on the relationship between vitamin D level and gene expression related to metabolic pathway and embryo quality [D]. Zhengzhou University, 2019, Xia medicine, 2018, Vol. 31 (2): 159-163.

[22] Cheng JB, Motola DL, Mangelsdorf DJ, et al. De-orphanization of cytochrome P450 2R1: a microsomal vitamin D 25-hydroxilase[J]. J Biol Chem, 2003, 278(39):38084-38093.

[23] LI Ling, Zhao Huijia, Chen binyao, et al. Genetic polymorphism of cyp2r1 and its application in individualized therapy [J]. Chinese Journal of clinical pharmacology and therapeutics, 2019,24 (09): 1053-1059.

[24] Wang TJ, Zhang F, Richards JB, et al. Common genetic determinants of vitamin D insufficiency: a genome-wide association study[J]. Lancet, 2010, 376(9736):180-188.

[25] Cheng JB, Motola DL, Mangelsdorf DJ, et al. De-orphanization of cytochrome P450 2R1: a microsomal vitamin D 25-hydroxilase[J]. J Biol Chem, 2003, 278(39):38084-38093.

[26] Xu X, Mao J, Zhang M, et al. Vitamin D deficiency in Uygurs and Kazaks is associated with polymorphisms in CYP2R1 and DHCR7/NADSYN1

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2852

genes[J]. Med Sci Monit, 2015, 21: 1960-1968.

[27] Wang Y, Yu F, Yu S, et al. Triangular relationship between CYP2R1 gene polymorphism, serum 25(OH) D3 levels and T2DM in a Chinese rural population[J]. Gene, 2018, 3(18):30863-30871.

[28] Sheng L, Callen DF, Turner AG. Vitamin D3 signaling and breast cancer:Insights from transgenic mouse models[J]. J Steroid Biochem Mol Biol,2018, 178:348-353.

[29] Zhang Yongfeng, Zheng Yi. Changes and significance of serum 25 hydroxy vitamin D and vitamin D antibody levels in patients with newly diagnosed systemic lupus erythematosus [J]. Chinese Journal of Rheumatology, 2012, 16 (10): 661 - 664.

[30] Schoindre Y,Jallouli M,Tanguy ML,et al. Lower vitamin D levels are associated with higher systemic lupus erythematosus activity, but not predictive of disease flare-up.[J]. Lupus science & medicine,2014,1(1): e000027.

[31] Squance ML, Reeves GE, Tran HA. Vitamin D Levels are associated with expression of SLE, but not flare frequency[J]. Int J Rheumatol, 2014, 2014: 362834.

[32] Chen siliang, Fu Qingsong, Luo Guanchao, et al. Clinical application of 25 - hydroxyvitamin D3 and IL - 10 in systemic lupus erythematosus [J]. Journal of molecular diagnosis and treatment, 2018, 10 (03): 180-183195.

[33] Szodoray P,Tarr T,Bazso A,et al.The immunopathological role of vitamin D in patients with SLE: data from a single centre registry in Hungary[J].Scandinavian Journal of Rheumatology,2011,40(2): 122.

[34] HIRSCHFELD J, BECKMAN L. A new group-specific serum system (Gc-groups) in relation to blood and serum groups.[J]. Acta genetica et statistica medica, 1960, 10:48-53.

[35] Daiger S P,Schanfield M S, Cavalli-Sforza L L. Group-specific component (Gc) proteins bind vitamin D and 25-hydroxyvitamin D[J]. Proceedings of the National Academy of Sciences of the United States of America . 1975, 72 (6):2076-2080.

[36] Liu Fengying, Ren Wei, Zhang Suhua. Vitamin D binding protein gene polymorphism and type 2 diabetes [J]. Chongqing Medical Journal, 2004 (06): 923-925.

[37] Wilson PW , Cupples LA, Meigs JB.et al.Genome scan for impaired glycemic status:results from the Framingham Heart Study[J] .Diabetes, 1997 , 46(Supple 1):76A.

[38] Chen saiming, Huang Jing, Zhou Xiaoliu, et al. Association between vitamin D binding protein gene polymorphism and chronic allergic rhinitis in Hainan [J]. Journal of Hainan Medical College, 2018,24 (22): 2019-2022.

[39] Yang Junjie, Zhang Yan, Li Chenguang, et al. Research progress of vitamin D binding protein and its gene polymorphism [J]. Shanghai Medical Journal, 2019,42 (05): 308-313.

[40] Kitanaka S, Isojima T, Takaki M, et al. Association of vitamin D -related genepoly morphisms with manifestation of vitamin D deficiency in children [J]. Endocr J, 2012, 59(11): 1007-1014.

[41] Lester E, Skinner R K, Wills M R. Seasonal variation in serum25 -hydroxyvitamin D in the elderly in Britain [J]. Laneet, 1977, 1(8019): 979-980.

[42] Cleve H, Constans J. The mutants of the vitamin-D-binding protein: more than 120 variants of the GC/DBP system.[J]. Vox Sanguinis, 1988, 54(4):215-25.

[43] Viau, Constans, Debray, et al. Isolation and characterization of the O-glycan chain of the human vitamin-D binding protein[J]. Biochemical and Biophysical Research Communications, 1983, 117(1):324-331.

[44] Lisa B. Signorello, Jiajun Shi, Qiuyin Cai, et al. Common Variation in Vitamin D Pathway Genes Predicts Circulating 25-Hydroxyvitamin D Levels among African Americans[J]. PLOS ONE, 2011, 6(12).

[45] Pani Michael A, Regulla Karoline, Segni Maria, et al. A polymorphism within the vitamin D-binding protein gene is associated with Graves' disease but not with Hashimoto's thyroiditis.[J]. The Journal of Clinical Endocrinology & Metabolism, 2002, 87(6):2564-7.

[46] Wang Jianshe, Wang gaoshuai, Li Yuqian, et al. Relationship between rs7041 polymorphism of DBP gene and obesity susceptibility in Han population [J]. Journal of Zhengzhou University (Medical Edition), 2015,50 (03): 331-334.

[47] Portale AA, Miller WL. Human 25-hydroxyvitamin-D-lalphahydroxylase: cloning, mutations, and gene expression [J].Pediatr Nephrol, 2000, 14(7): 620-625.

[48] Yang Jing. Association between CYP27B1 gene polymorphism and susceptibility to autoimmune thyroid disease [D]. Chongqing Medical University, 2008.

[49] Hewison M, Zehnder D, Bland R, et al. 1-Hydroxylase and the action of vitamin D[J]. Journal of Molecular Endocrinology. 2000, 25: 141-148.

[50] Miller WL, Portale AA. Vitamin D 1-alpha-hydroxylase[J]. Trends in Endocrinology and Metabolism. 2000, 11: 315-319.

[51] Panda DK, Miao D, Tremblay ML, et al. Targeted ablation of the 25-hydroxy vitamin D 1alpha-hydroxylase enzyme:evidence for skeletal, reproductive, and immune dysfunction [J].Proc Natl Acad Sci MSA.

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2852

2001; 98: 7498-7503.

[52] Zhang Zengli, Li Bingyan, Tong Jian. Study on the role of vitamin D in the development of immune function by using gene knockout mice [J]. Chinese Journal of Microbiology and immunology. 2007,27 (3): 260-263.

[53] Wang Rui, Wang Dan, AI Jiao, et al. Effect of vitamin D on systemic lupus erythematosus [J]. Medical review, 2019,25 (21): 4251-4256.

[54] Wang Xiaofei, Xu Jingjing. Osteoporosis associated with systemic lupus erythematosus [J]. Chinese Journal of practical internal medicine, 2015,35 (10): 810-813.

[55] MOK CC,WONG SN,MA KM,et al.Childhood-onset disease carries a higher risk of low bone mineral density in an adult population of systemic lupus erythematosus[J]. Rheumatology,2012,51 (3):468-475.

[56] TANG Y,XIE H,CHEN J,et al.Activated NF-κB in bone marrow mesenchymal stem cells from systemic lupus erythematosus patients inhibits osteogenic differentiation through down regulating Smad signaling[J]. Stem Cells Dev,2013,22(4):668-678.

[57] DeLuca Hector F. Overview of general physiologic features and functions of vitamin D.[J]. The American journal of clinical nutrition,2004,80(6 Suppl).

[58] Yamada Sachiko,Makishima Makoto. Structure-activity relationship of nonsecosteroidal vitamin D receptor modulators.[J]. Trends in pharmacological sciences,2014,35(7).

[59] Miyamoto K,Kesterson R A,Yamamoto H, et al. Structural organization of the human vitamin D receptor chromosomal gene and its promoter.[J]. Molecular endocrinology (Baltimore, Md.),1997,11(8).

[60] André G. Uitterlinden,Yue Fang,Joyce B.J. van Meurs, et al. Genetics and biology of vitamin D receptor polymorphisms[J]. Gene,2004,338(2).

[61] Morrison N A,Yeoman R,Kelly P J, et al. Contribution of trans-acting factor alleles to normal physiological variability: vitamin D receptor gene polymorphism and circulating osteocalcin.[J]. Proceedings of the National Academy of Sciences of the United States of America,1992,89(15).

[62] Faraco J H,Morrison N A,Baker A, et al. ApaI dimorphism at the human vitamin D receptor gene locus.[J]. Nucleic acids research,1989,17(5).

[63] Morrison N A,Qi J C,Tokita A, et al. Prediction of bone density from vitamin D receptor alleles.[J]. Nature,1994,367(6460).

[64] Coleman Gross,T. Ross Eccleshall,Peter J. Malloy, et al. The presence of a polymorphism at the translation initiation site of the vitamin D receptor gene is associated with low bone mineral density in postmenopausal mexican - American women[J]. Journal of Bone and Mineral Research,1996,11(12).

[65] Arai H,Miyamoto K,Taketani Y, et al. A vitamin D receptor gene polymorphism in the translation initiation codon: effect on protein activity and relation to bone mineral density in Japanese women.[J]. Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research,1997,12(6).

[66] Evelyne van Etten,Lieve Verlinden,Annapaula Giulietti, et al. The vitamin D receptor gene Fok I polymorphism: Functional impact on the immune system[J]. European Journal of Immunology,2007,37(2).

[67] Milena Despotovic,Tatjana Jevtovic Stoimenov,Ivana Stankovic, et al. Vitamin D Receptor Gene Polymorphisms in Serbian Patients With Bronchial Asthma: A Case - Control Study[J]. Journal of Cellular Biochemistry,2017,118(11).

[68] Harishankar Mahto,Rina Tripathy, et al. Association between vitamin D receptor polymorphisms and systemic lupus erythematosus in an Indian cohort[J]. International Journal of Rheumatic Diseases,2018,21(2).

[69] Pan Zhipeng,Chen Mengya,Hu Xingxing, et al. Associations between VDR gene polymorphisms and colorectal cancer susceptibility: an updated meta-analysis based on 39 case-control studies.[J]. Oncotarget,2018,9(16).

[70] Ozaki Y, Nomura S, Nagahama M, et al. Vitamin-D receptor genotype and renal disorder in Japanese patients with systemic lupus erythematosus[J]. Nephron 85(1):86 -91.

[71] C-M Huang. Association of vitamin D receptor gene BsmI polymorphisms in Chinese patients with systemic lupus erythematosus. 2002, 11(1):31-34.

[72] Huang CM, Wu MC, Wu JY, et al .No association of vitamin D receptor gene start codon fok 1 polymorphisms in Chinese patients with systemic lupus erythematosus. 2002,29(6):1211 -1213.

[73] Lee YH, Bae SC, Choi SJ, et al.Associations between vitamin D receptor polymorphisms and susceptibility to rheumatoid arthritis and systemic lupus erythematosus: a metaanalysis [J].2011,38:3643 -3651.

[74] Monticielo OA, Brenol JC, Chies JA, et al.The role of BsmI and FokI vitamin D receptor gene polymorphisms and serum 25-hydroxyvitamin D in Brazilian patients with systemic lupus erythematosus[J]. 2012,21 (1):43 -52.

[75] Wu jinqiong, he Zifeng, Luo Minyi. Research progress on the relationship between vitamin D and systemic lupus erythematosus [J]. Rheumatism and arthritis, 2021,10 (01): 75-80.

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2852

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology
https://ojs.bilpublishing.com/index.php/jhp

ARTICLE

New Concept of Whiplash Injuries Rehabilitation

Piotr Godek[1*] Michał Guzek[2] Jakub Przychodzeń[2]

1.Sutherland Medical Center, Warszawa, 04-036, Poland
2.RehaDent, Warszawa, Poland

ARTICLE INFO

Article history
Received: 7 December 2020
Accepted: 2 June 2021
Published Online: 10 June 2021

Keywords:
Whiplash injuries
Rehabilitation
Somatosensory disorder
Craniocervical injury
Pain management

ABSTRACT

Whiplash injuries are a global health problem and a significant financial burden for both health care systems, and insurance providers. The diverse symptomatology after whiplash injury both in the somatic, emotional and behavioral sphere prompted separation of the Whiplash Associated Disorders (WAD) as a separate category of diseases. The exact mechanism of whiplash injury is still under debate and theories explaining pathogenesis of WAD are very diverse ranging from purely biomechanical to neurophysiological, emphasizing central sensitization but the core disability seems to be strictly connected to somatosensory dysfunction. As a result, the optimal algorithm of rehabilitation has not been established and data published in the current literature on effectiveness of such algorithms are inconsistent. Based on the presented here of Head Neutral Reference Point (HNRP), the objective of central desensitization is to restore valid somatosensory output from Cranio - cervical Junction (CCJ). This new concept of rehabilitation after whiplash presented here is based on clinical observations and is supported by initial results.

1. Introduction

The term "whiplash" was used for the first time by Harold Crowe in 1928, during the San Francisco Orthopaedic Congress when he presented eight cases of cervical injury resulting from traffic accidents [1].

Dynamic technological development and increase of road traffic, resulted in tremendous increase in numbers of vehicle collisions, which became a huge socio-medical problem. The most recent report of the US National Highway Traffic Safety Administration published in 2010 shows 3.9 million traffic injuries with damages to 24 million vehicles in the US in that year. The total, direct economic costs associated with these accidents were astronomical and reached $242 billion. Together with the indirect costs, like long-term disability, legal costs, rehabilitation costs, etc., total costs of these accidents reached a staggering $836 billion. By comparison, the costs of direct, immediate medical treatments of all victims of car accidents, excluding fatal accidents, in 2010 were estimated at $23.4 [2,3].

In the USA whiplash injuries account for around 83% of all traffic injuries, resulting in a total yearly incidence of between 235 - 300 / 100,000. The total cost of treating only whiplash injuries including medical care, disability, sickness absence is estimated at 3.9 billion USD annually, while including procedural and compensation costs up to 29 billion USD, due to their extent, complex symptomatology hindering treatment and a tendency to leave the long-term effects of injury are a significant socio-medical

**Corresponding Author:*
Piotr Godek,
Sutherland Medical Center, Warszawa, 04-036, Poland;
Email: piotrgodek.smc@gmail.com

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2668

problem [4].

Due to wide variety of symptoms presented by the whiplash victims, a working group, called The Québec Task Force introduced in 1995 the term "Whiplash Associated Disorders" (WAD) to describe a set of somatic, emotional and behavioral symptoms resulting from a cervical spine injury during road collision [1].

The onset of symptoms may be delayed up to 12-15 hours. The most common complaints are similar regardless of the time of the onset and include: neck pain, often also in the thoracic and even in the lumbar region, upper limb paraesthesia, headache, dizziness and other balance disorders, visual disturbance (double vision, accommodation disorder), auditory sensation (tinnitus), swallowing disorder, hoarseness, nausea, vomiting, and impaired concentration. Usually a physical examination reveals "only" limitation of the range of motion in the cervical segment, raised muscle tone, numerous tender points. Much less often neurological deficits are detected, and almost always nothing more than diminished cervical lordosis in radiological findings is registered.

The mechanism of the injury is much more complicated than the flexion - extension as the term "whiplash" would suggest. Many theories attempted to define the pathophysiology of the WAD, among them purely biomechanical (injury of the anterior ligament complex and facet joint compression), hydrodynamic (displacement of the cerebrospinal fluid) and neurophysiological (central sensitisation) ones, but none is regarded to adequately describe the pathophysiology of the WAD [5,6,7].

Despite many attempts to develop an optimal algorithm for rehabilitation and in-depth analyses indicating progressive muscle disorders suggesting that activation of deep cervical muscles should be a part of the rehabilitation process, there is still lack of consensus on the optimal rehabilitation approach to whiplash injuries. This is evidenced by conclusion of the Cochrane meta-analysis prepared by Verhagen et al. regarding treatment of whiplash injuries, where it was enigmatically stated: "the trend is observed, that active therapy probably has an advantage over passive management, but none of the methods has a clear advantage over another" [8].

Indeed, it has not been shown that any of the methods proposed thus far have definitely better outcome.

The new concept attempts to link the pathomechanics and really bothersome symptomatology of whiplash injury with the post-traumatic loss of the sense of the Head Neutral Reference Point (HNRP). The HNRP is not the same as Head Neck Center of Gravity (HNCG) described in details by Dempster (1955) as "the point located 8 mm anterior to the basion on the inferior surface of the base of occiput or within the bone 24±5 mm from the crest of the dorsum sellae. On the surface of the head a point is located 10 mm anterior to the supratragic notch above the head of the mandible is directly lateral" [9].

The HNRP has a much broader, functional meaning and describes position of the head which, apart from visual and vestibular control, the somatosensory system allows keeping with minimal effort. The cornerstone of this somatosensory system are mechanoreceptors, located mostly in the muscle spindles, which provide the nervous system with information about the muscle's length and velocity of contraction, thus contributing to the individual's ability to discern joint movement and a sense of head's position. There is strong evidence that impairment of this system leads to a chronic neck pain, postural sway, poor position sense and dizziness [10].

Human muscle spindles in the suboccipital area are extremely rich in mechanoreceptors, (part of Cranio-cervical Junction, CCJ) but these mechanoreceptors are also found in ligaments, joint capsules, fascia and even in dura where, besides conveying purely mechanical information, they may regulate cranial blood vessels, as it was shown in animal studies [11,12].

It is widely accepted that mechanoreceptor impulses from the occiput to C3 have a direct impact on vestibular nuclear complex (VNC) - a reflex centre that coordinates vision and neck movements. This same mechanoreceptor input also converges on the central cervical nucleus (CCN), which is a pathway to the cerebellum integrating vestibular, ocular and proprioceptive information. Simplistically speaking, the mechanoreceptor input from the upper cervical region helps to coordinate vision, balance, movement of the neck and postural control. Disruption of normal afferent/ efferent stream after whiplash injuries produce more harm to the upper cervical region than to the lower one, because the upper region contains more muscle spindles and has more complicated connections to the visual and vestibular systems, and receives feedback from it. Malmström et al. have shown how powerful is mechanoreceptor system of the CCJ because even subjects with bilateral vestibulopathy did not differ significantly from controls in their ability to reproduce different target positions [13].

Thus, the mechanoreceptor system of upper cervical spine can be viewed as independent Head Position Control System (HPCS). Through afferent pathways it relays to the central nervous system the least necessary afferent stimulation, and with minimal energy expenditure of well-balanced muscles the head is kept around HNRP. In clinical practice, achieving the correction of the habitual defective malposition of the head enables the patient to

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2668

breathe freely and swallow without pain and any effort.

The HNRP pattern is defined by 2 lines:

1) a vertical line passes through the center of the sternal jugular notch, the center of the chin (gnation), nasion and the center of the glabella;

2)an horizontal line passes from the nasal chondro-osseous junction to the supratragic notch.

The malalignment of these lines from the vertical reference line in the frontal plane (usually in the side-bending and rotation direction) and from the horizontal reference line in the sagittal plane (usually in the extension direction) is a measure of true HPCS dysfunction.

The loss of HNRP after whiplash injury results not only in defective stimulation from position receptors to muscles which produce abnormal head position, but can be responsible for disturbance of brain perfusion and "dark cloud" of behavioral symptoms (catastrophic attitude, kinesiophobia, dysphoric mood) which jeopardise rehabilitation results. Restoring of HNRP may be of fundamental importance for the rehabilitation process.

2. Methodology

Successful evaluation of the patient begins as usual with a detailed history-taking process. Subjects with a loss of HNRP report typical symptoms of dizziness, tinnitus, visual disturbances (diplopia, accommodation disorders), impaired vocal function due to irritation of laryngeal recurrent nerve (muscle imbalance results elevated hyoid bone and narrowed passage conflicting the nerve), dysphagia, hoarseness, nausea, impaired concentration and nonradicular pattern paraesthesia.

Inspection indicates significant malalignment of vertical and horizontal line from reference lines mentioned above. (Figure 1 & 2)

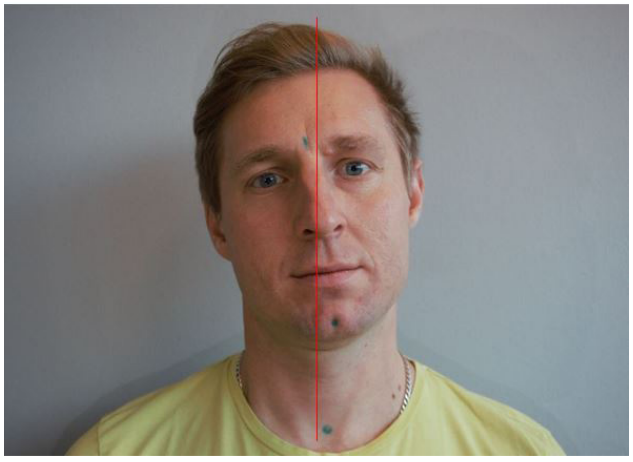


Figure 1. Frontal view with malalignment of vertical line in side bending.

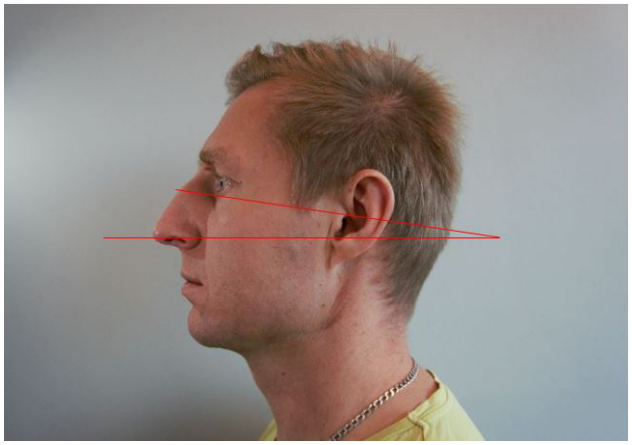


Figure 2. Lateral view with malalignment of horizontal line in extension pattern

Soft tissue palpation reveals muscle tone disbalance - raised tone of suboccipital mm. (SOM), sternocleidomastoid m. (SCM) and suprahyoid mm. (SHM) with hypoactive longus colli m. and longus capitis m. (LCoM, LCaM).

Then follows analysis of CCJ mobility and ligaments integrity.

Test for alar ligaments - during passive rotation of the head (e.g. to the left) countermovement of C2 spinus process can be felt by the thumb placed on its right aspect - if no consecutive movement of C2 spinal process during the first 15 deg. of rotation occurs it may indicate alar ligaments injury.

Sharp purser test - passive compression of C2 spinous process with a thumb with consecutive resisted short active flexion of the upper cervical spine, when "click" or loss of support under the thumb is felt the transverse ligament of C1 may be compromised.

Passive translation test for C0/C1 segment - manual assessment by the three-finger grip (mandibular angle, C1 transverse process, mastoid) - translational passive movements - C0 / C1 is normally combined with lateral flexion. If no connection between translation and side-bending - disfunction C0/C1 is likely.

Passive rotation test for C0/C1 segment - two - finger grip (occiput, C1) - extension test with an unilateral side-bending and rotation - normally occiput can easily approximate C1.

Special consideration is given to detection of compensatory mobility malfunctions.

Open mouth test - in normal conditions two - fingers wide opening occurs without co-existent compensatory movements and no painful protrusion of the mandible is noted (physiologically up to 30 mm). (Figure 3).

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2668

Figure 3. Open mouth test with properly made correction of HNRP

Subjects after whiplash present extension in the upper cervical segment, side - bending or elevation /compression to one side during mouth opening test. During active rotation of the neck malalignment usually increases significantly. (Figure 4 & 5)

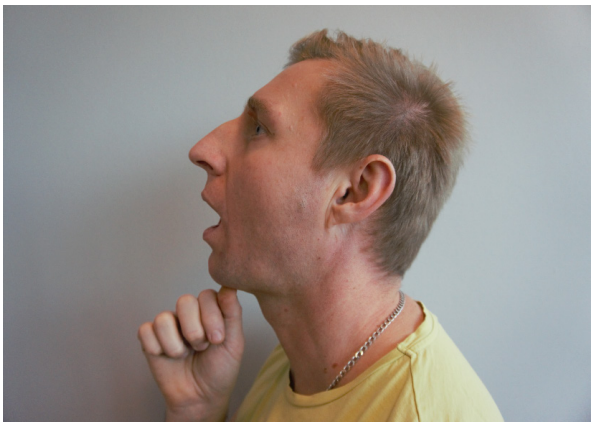


Figure 4. Open mouth test with extension pattern

Figure 5. Open mouth test with malalignment of vertical line during rotation.

Apart from significant limitations of the range of motion in the cervical segment active neck movements disclose wrong pattern of rotation, side - bending and flexion / extension usually with engagement of whole torso or upper limb.

Re-education of HNRP

Phase I - self-correction

Information and reassurance for the patient are crucial. It is worthy of time to start with the explanation of the treatment objective, prognosis and above all to invite the patient to be equally responsible for the final outcome as an active "co-producer".

Mirror therapy - active self - correction of reference line following 3 points marked on the skin assisted by therapist.

Mouth opening (two - fingers wide) with active correction of horizontal lateral line assisted by therapist (repeated until no pain, resistance or compensation occurs).

Phase II - self-correction and active movement

Active rotation of the neck - the main objective is to keep corrected position of 3 reference points marked on the face and rotation is continued within comfortable range without triggering any suboccipital tension.

Phase III - self-correction, active movement, resistance

Active rotation of the neck - the main objective is to keep corrected position of 3 reference points and rotation is continued within comfortable range then followed by gentle resistance but without triggering any suboccipital tension.

Resisted mouth opening with assisted control of SCM attachments (conscious lowering of SCM hypertonus) by activation of suprahyoid muscles (repeated until no pain, resistance or compensation occurs). Recommendation for further home therapy 2-3 minutes twice a day

Resisted mouth opening with rotation and self - correction. (Figure 6).

Figure 6. Open mouth test with rotation and self-correction in vertical line

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2668

After successfully accomplishing the tasks in open chain some closed-chain tasks can be introduced e.g. active gentle pressure bregma point against wall with correction of the position of the shoulder blade in all fours supported position as an activation of LCoM and LCaM mm.

Above mentioned training sessions (ca. 45 min each) are applied usually twice a week in acute or subacute phase of WAD, then the appointments are spread to once weekly, twice monthly, once monthly until resuming full function. During each session manual intervention (mobilisation, manipulation, soft tissue release) is performed when needed.

An objective test to validate the progress of HNRP re-education is very simple - eyes closed, active head rotation and return to zero position evaluated by therapist, repetition five times both sides before beginning each new session. Patient gathers 1 point for single restoration of the target position correctly. Obtaining 10 points ends the therapy.

3. Material and Method

In the period between 01/2018 and 09/2020 totally 112 patients were qualified to rehabilitation program and were treated according to the rules described above, in the clinic Arenamed, Warsaw, Poland.

Serious neurological deficits, fractures/dislocations or operative treatment were the only excluding criteria. Two experienced physiotherapist and manual therapists took care of the patients, which were enrolled to the therapy in order of submissions. The patients were treated twice a week (8 sessions) and the follow up visit was made after two months. Most of them continued further therapy and the mean period of therapy reached 19,25 weeks (13,12 sessions) but the longest period of therapy reached even 68 weeks to resume full function.

End points: the beginning of therapy (Visit 0,V0), after 2 months of therapy (Visit 1,V1).

Outcome measure: Numeric Rating Scale (NRS, 0-10) and Neck Disability Index (NDI, 0-50).

Rehabilitation process was performed by two therapists, but the patient assigned to a given therapist was treated by him from the beginning to the end of the study.

Mean values change of NRS, NDI were compared between V0 and V1 endpoints. Percentages of patients achieving clinical response in NRS and NDI were determined according to the Minimal Important Difference (MID) with cut-off points 3/10 for NRS and 10/50 for NDI.

All calculations and graphs were performed in IBM SPSS Statistics.

4. Results

Presented analysis covers retrospective material for single-center, open study. All the patients accomplished 8 sessions of therapy and all of them were checked-up after finishing of therapy (2 months from V0). There were no serious complications during therapy, some post-procedure soreness after manual therapy occurred and lasted several hours but were generally well tolerated.

The demographic data are presented in Table 1.

Table 1. Demographic data

Total number of patients, n	112
Female, n (%)	79 (70,5)
Age, years, mean ± SD (range)	46,17±11,4 (21-74)
Duration of complaints, weeks, range	3-600
Duration of complaints, weeks, mean ± SD (range)	89,24±113,92 (3-600)
WAD phase, n (%):	
Acute phase patients,	30 (26,8)
Subacute phase patients	40 (35,7)
Chronic phase patients	42 (37,5)

Mean NRS at the beginning of therapy was 3,61 (SD=1,55) and after accomplishing therapy 2,14 (SD=1,08). (Figure 7)

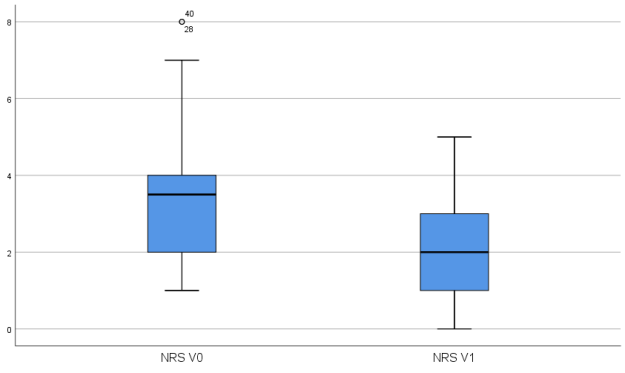


Figure 7. Mean NRS values before and after therapy.

Mean NDI at the beginning of therapy was 21,25 (SD=8,28) and after accomplishing therapy 12,31 (SD=5,93). (Figure 8)

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2668

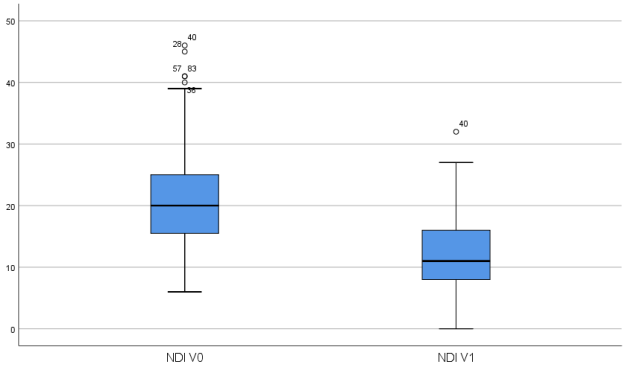


Figure 8. Mean NDI values before and after therapy

Mean NRS and NDI values evolution depending on the phase of complaints are presented in Figure 9 and 10.

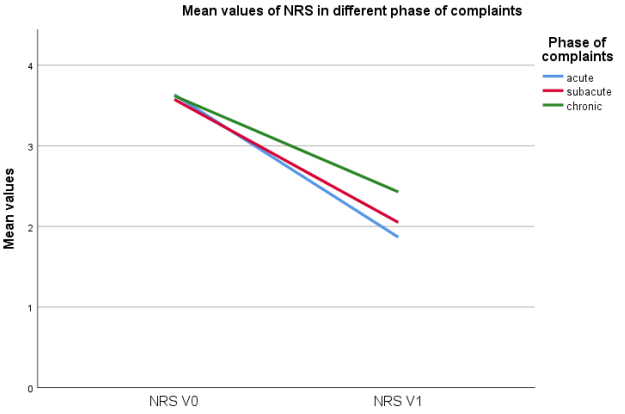


Figure 9. NRS mean values evolution depending on the phase of complaints.

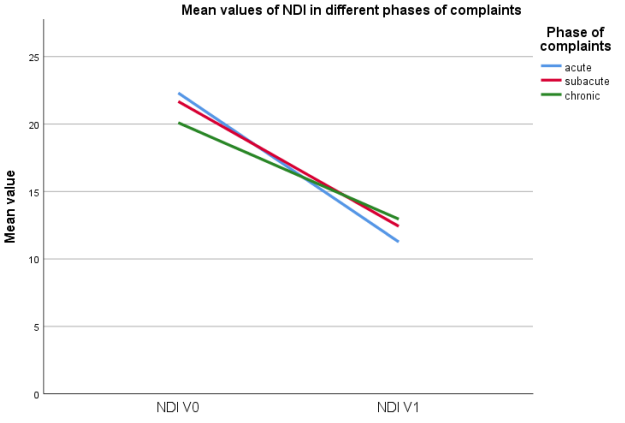


Figure 10. NDI mean values evolution depending on the phase of complaints..

Only 21,4% of patients achieved MID (at least 3 points difference) for NRS, but MID (at least 10 points difference) in NDI achieved 41,9% of patients.

5. Discussion

The population treated was mostly female, middle aged but very inhomogeneous considering duration of complaints (3-600 weeks). Both mean values of NRS and NDI were reduced after treatment with much better dynamics in acute and subacute than chronic cases. Nevertheless no improvement in NRS was noted by 29 patients (25,8%) albeit real worsening of outcomes was found only in 2 cases (1,8%). Three of cases reported worsening of outcomes in NDI (2,7%). Many more patients achieved MID in NDI (41,9%) than in NRS (21,4%). It may suggest that patients are doing better functionally after therapy but the encoded pain especially in the chronic cases need some more time to resolve and to be really noticed by patient.

Presented data should be treated as preliminary and with caution because there is no information about additional e.g. pharmacological or psychological consecutive care. There is also a lack of information and comparison study about various initial treatments which were implemented before admission for rehabilitation process.

Considering outcomes and prognosis of WAD the Québec Task Force (1995), assumed that whiplash injuries have mostly good prognosis, because 87% of patients after 6 months and 97% after 12 months declare the end of the period of insurance benefits due to incapacity for work [1]. Completely different data are provided by Barnsley et al. (1994), where 14 to 42% of patients develop chronic complaints (lasting over 6 months), and 10% remain with chronic, persistent pain [14].

In more recent studies, the percentage of chronic pain developed after whiplash trauma varies widely between 2 and 58%, but the most common range is 20-40% [15,16].

It means that there is much to discover in the area of optimal rehabilitation care after whiplash injuries. Nevertheless, some facts seem to support the theory of HNRP restoration as an effective tool of WAD care.

One of the most popular theories considering whiplash pathomechanics emphasizes eccentric contraction of the neck muscles during inertial movement and assumes a rapid defensive contraction of muscles causing their micro damages and overcorrection of muscle spindles with a looped increased muscle tone [17].

Persistent excessive muscle tension in a patient's specific pattern may lead to malalignment of HNRP.

We know for sure that immobilization in the orthopaedic collar, beyond absolute necessity, delays recovery and does not reduce pain, and may also strengthen kinesiophobia [18].

Regardless of the dominant mechanism of trauma, the eventful and possibly chronic course of WAD is indeed a

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2668

dysfunctional processing of the pain signal at the level of the spinal cord and upper cerebral centres with peripheral and central sensitization. It was confirmed by numerous experiments showing changes in cerebral regional blood distribution in functional MRI, increased sensitivity to both mechanical and thermal stimuli of patients with WAD similar to those encountered, among others in fibromyalgia and algodystrophy [19,20,21,22].

Unproper balanced CCJ can profoundly change perfusion of the brain when the theory of mechanoreceptors impact on intracranial vascular tonus is still potent. Neglecting of HNRP may be the causative that the results of WAD treatment donated by many authors regardless of the method, are still unsatisfactory for both the acute and chronic phase. Especially in cases of moderate to severe initial symptoms, many patients in these groups experience central pain sensitization and its chronification. Rehabilitation and manual therapy only slightly modify the symptoms in these patients (reduction by 2 points per 10 in NRS which is very similar to our data - 1,47), so efforts are aimed at broadening the spectrum of specialists involved in the care of a patient with WAD by psychologists, psychiatrists, specialists in pain management, occupational therapists, etc.

It has been shown that cerebral hypoperfusion in the parietal-occipital border zone can be responsible for visual disturbances (blurring the contours of objects, accommodation disorders) and certain behavioral disorders in the form of difficulties in the formulation of thoughts, distraction or, on the contrary, the inability to divert attention from one imposed thought, which patients with chronic WAD often complain about [23,24].

Patients with WAD present extensive zones of increased pain sensitivity, covering areas of the body that could in no way have had any injury as a result. It also causes specific characterological changes in these patients very often with an increased level of anxiety, catastrophising, kinesiophobia, withdrawal or sometimes aggression and claim attitude, which makes cooperation with a physician or a physiotherapist very difficult. Kinesiophobia in the chronic phase may be responsible for paravertebral muscle atrophy and fat infiltration observed in MRI - especially in the deep layer. [25,26,27,28].

We know that as a result of whiplash injury, tensions between the superficial and deep muscles of the neck are disorganized. The predominance of SCM tension (confirmed by EMG) and inhibition of the LCoM function causes a change in the curvature of the cervical segment, significant limitation of the range of motion and protraction of the head, which promotes shortening of the middle layer (scalene muscles) and inhibits even more multifidus and LCoM. This, of course, also affects the incorrect timing of neck muscles cooperating with shoulder girdle movements, which means that with repetitive movements of the upper limbs, the pain is intensified [29,30].

On this basis, the concept of "waking up" of the LCoM with the simultaneous relaxation of the SCM was created by specific, precise exercises that selectively activate deep layer muscles without simultaneously involving superficial muscles.

Another supporting HNRP restoration paradigm can be study of Bunketorp et al. who proved that tailor-made therapy, individualized and supervised by a physiotherapist, is a more effective method of muscle re-education after whiplash injuries than instructing home exercises alone, no matter how precise they are [31].

There are even reports that the improvement between muscle balance between LCoM and SCM through precise flexion exercises at the CCJ transition zone lead to a reversal of the fat infiltration process [32,33].

Further intensive research is needed to develop a coherent and scientifically proven optimal strategy for the treatment of acute whiplash injuries, preventing the transition to a chronic form.

6. Conclusions

1) The concept of the HNRP is strongly related to the sensorimotor control of the CCJ.

2) Recovery of the HNRP may facilitate the reprogramming of the dysfunctional sensorimotor control of the CCJ after whiplash injuries and seems to be useful in the process of central desensitisation and individualized rehabilitation.

3) Based on the preliminary clinical experience, the method of HNRP recovering seems to be effective, however, it requires confirmation on a larger number of participants in a study with a control group and a sufficiently long observation period.

References

[1] Spitzer W. O., Skvtn M. L., Salmi L. R., et al. Scientific monograph of the Quebec task force on whiplash-associated disorders: redefining "whiplash „and its management. Spine. 1995; 20:2-235. DOI: 10.1097/00007632-199805010-00015.

[2] Blincoe L, Miller T, Zaloshnja E, Lawrence B. The Economic and Societal Impact of Motor Vehicle Crashes, 2010. (Revised) (Report No. DOT HS 812 013). Washington, DC: National Highway Traffic Safety Administration; 2015.

[3] Yadla S, Ratliff JK, Harrop JS. Whiplash: diagnosis,

treatment, and associated injuries. Curr Rev Musculoskelet Med. 2008 Mar;1(1):65-8.
DOI: 10.1007/s12178-007-9008-x. PMID: 19468901; PMCID: PMC2684148.

[4] van der Velde G, Yu H, Paulden M, Côté P, Varatharajan S, Shearer HM, Wong JJ, Randhawa K, Southerst D, Mior S, Sutton D, Jacobs C, Taylor-Vaisey A. Which interventions are cost-effective for the management of whiplash-associated and neck pain-associated disorders? A systematic review of the health economic literature by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. Spine J. 2016 Dec;16(12):1582-1597.
DOI: 10.1016/j.spinee.2015.08.025. Epub 2015 Nov 26. PMID: 26631759.

[5] Stemper BD, Yoganandan N, Pintar FA, Maiman DJ. Mechanism of injury. In: Sterling M, Kenardy J editors. Whiplash evidence base for clinical practice. Elsevier, 2011, pp. 16-28.

[6] Tisherman R et al. Biomechanical contribution of the alar ligaments to upper cervical stability. J Biomech. 2019 (11) 23:109508.

[7] Bogduk N. On cervical zygapophysial joint pain after whiplash. Spine (Phila Pa 1976). 2011 Dec 1;36(25 Suppl): S194-9. Barnsley L, Lord S, Bogduk N. Whiplash injury: clinical review. Pain 58(3) 1994:283-307.

[8] Verhagen AP, Scholten-Peeters GG, van Wijngaarden S, de Bie RA, Bierma-Zeinstra SM. Conservative treatments for whiplash. Cochrane Database Syst Rev. 2007 Apr 18;(2):CD003338.
DOI: 10.1002/14651858.CD003338.pub3. PMID: 17443525.

[9] Yoganandan N, Pintar FA, Zhang J, Baisden JL. Physical properties of the human head: mass, center of gravity and moment of inertia. J Biomech. 2009 Jun 19;42(9):1177-92.
DOI: 10.1016/j.jbiomech.2009.03.029. Epub 2009 May 9. PMID: 19428013.

[10] Stanton TR, Leake HB, Chalmers KJ, Moseley GL. Evidence of Impaired Proprioception in Chronic, Idiopathic Neck Pain: Systematic Review and Meta-Analysis. Phys Ther. 2016 Jun;96(6):876-87.
DOI: 10.2522/ptj.20150241. Epub 2015 Oct 15. PMID: 26472296; PMCID: PMC4897597.

[11] Kristjansson E, Treleaven J. Sensorimotor function and dizziness in neck pain: implications for assessment and management. J Orthop Sports Phys Ther. 2009 May;39(5):364-77.
DOI: 10.2519/jospt.2009.2834. PMID: 19411769.

[12] Nakamura M, Jang IS. Characterization of dural afferent neurons innervating cranial blood vessels within the dura in rats. Brain Res. 2018 Oct 1;1696:91-102.
DOI: 10.1016/j.brainres.2018.06.007. Epub 2018 Jun 15. PMID: 29886250.

[13] Malmström EM, Karlberg M, Fransson PA, Lindbladh J, Magnusson M. Cervical proprioception is sufficient for head orientation after bilateral vestibular loss. Eur J Appl Physiol. 2009 Sep;107(1):73-81.
DOI: 10.1007/s00421-009-1097-3. Epub 2009 Jun 9. PMID: 19506897.

[14] Barnsley L, Lord S, Bogduk N. Whiplash injury. Pain. 1994 Sep;58(3):283-307.
DOI: 10.1016/0304-3959(94)90123-6. PMID: 7838578.

[15] Côté P, Cassidy JD, Carroll L, Frank JW, Bombardier C. A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. Spine (Phila Pa 1976). 2001(10)1;26(19): E445-58.

[16] Scholten-Peeters GG et.al. Prognostic factors of whiplash-associated disorders: a systematic review of prospective cohort studies. Pain. 2003 (7);104(1-2):303-22.

[17] Yoganandan N, Brian D, Stemper BD, Rao RD. Patient Mechanisms of Injury in Whiplash-Associated Disorders, Seminars in Spine Surgery Volume 25, Issue 1, (3) 2013, pp. 67-74.

[18] Ricciardi L, Stifano V, D'Arrigo S, Polli FM, Olivi A, Sturiale CL. The role of non-rigid cervical collar in pain relief and functional restoration after whiplash injury: a systematic review and a pooled analysis of randomized controlled trials. Eur Spine J. 2019 Aug;28(8):1821-1828.
DOI: 10.1007/s00586-019-06035-9. Epub 2019 Jun 18. PMID: 31214856.

[19] Vállez García D, Doorduin J, Willemsen AT, Dierckx RA, Otte A. Altered Regional Cerebral Blood Flow in Chronic Whiplash Associated Disorders. EBioMedicine. 2016 Aug; 10:249-57.
DOI: 10.1016/j.ebiom.2016.07.008. Epub 2016 Jul 14. PMID: 27444853; PMCID: PMC5006659.

[20] Freitag P, Greenlee MW, Wachter K, Ettlin TM, Radue EW. fMRI response during visual motion stimulation in patients with late whiplash syndrome. Neurorehabil Neural Repair. 2001;15(1):31-7.
DOI: 10.1177/154596830101500105. PMID: 11527277.

[21] Häggman-Henrikson B, Lampa E, Nordh E. Altered thermal sensitivity in facial skin in chronic whiplash-associated disorders. Int J Oral Sci. 2013 Sep;5(3):150-4.
DOI: 10.1038/ijos.2013.42. Epub 2013 Jul 19.

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2668

PMID: 23867844; PMCID: PMC3967328.

[22] Myrtveit SM, Skogen JC, Sivertsen B, Steingrímsdóttir ÓA, Stubhaug A, Nielsen CS. Pain and pain tolerance in whiplash-associated disorders: A population-based study. Eur J Pain. 2016 Jul;20(6):949-58. DOI: 10.1002/ejp.819. Epub 2015 Nov 16. PMID: 26568528; PMCID: PMC5063105.

[23] Biendara J, Otte A. Whiplash Syndrome- a disorder of the brain? Hell J Nucl Med. 2017 May-Aug;20(2):110-112. DOI: 10.1967/s002449910550. Epub 2017 Jul 12. PMID: 28697186.

[24] Otte A. Pathophysiological interrelated deactivation/activation processes in the exhausted brain after whiplash injury. Hell J Nucl Med. 2019 May-Aug;22(2):92-95. DOI: 10.1967/s002449911000. Epub 2019 Jul 7. PMID: 31273349.

[25] Elliott JM, O'Leary S, Sterling M, Hendrikz J, Pedler A, Jull G. Magnetic resonance imaging findings of fatty infiltrate in the cervical flexors in chronic whiplash. Spine (Phila Pa 1976). 2010 Apr 20;35(9):948-54. DOI: 10.1097/BRS.0b013e3181bb0e55. PMID: 20118837.

[26] Elliott J, Pedler A, Kenardy J, Galloway G, Jull G, Sterling M. The temporal development of fatty infiltrates in the neck muscles following whiplash injury: an association with pain and posttraumatic stress. PLoS One. 2011;6(6): e21194. DOI: 10.1371/journal.pone.0021194. Epub 2011 Jun 16. PMID: 21698170; PMCID: PMC3116885.

[27] Elliott JM, Courtney DM, Rademaker A, Pinto D, Sterling MM, Parrish TB. The Rapid and Progressive Degeneration of the Cervical Multifidus in Whiplash: An MRI Study of Fatty Infiltration. Spine (Phila Pa 1976). 2015 Jun 15;40(12): E694-700. DOI: 10.1097/BRS.0000000000000891. PMID: 25785961; PMCID: PMC4466088.

[28] Pedler A, McMahon K, Galloway G, Durbridge G, Sterling M. Intramuscular fat is present in cervical multifidus but not soleus in patients with chronic whiplash associated disorders. PLoS One. 2018 May 24;13(5): e0197438. DOI: 10.1371/journal.pone.0197438. PMID: 29795590; PMCID: PMC5967697.

[29] Jull G, Kristjansson E, Dall'Alba P. Impairment in the cervical flexors: a comparison of whiplash and insidious onset neck pain patients. Man Ther. 2004 May;9(2):89-94. DOI: 10.1016/S1356-689X(03)00086-9. PMID: 15040968.

[30] Falla DL, Jull GA, Hodges PW. Patients with neck pain demonstrate reduced electromyographic activity of the deep cervical flexor muscles during performance of the craniocervical flexion test. Spine (Phila Pa 1976). 2004 Oct 1;29(19):2108-14. DOI: 10.1097/01.brs.0000141170.89317.0e. PMID: 15454700.

[31] Bunketorp L, Lindh M, Carlsson J, Stener-Victorin E. The effectiveness of a supervised physical training model tailored to the individual needs of patients with whiplash-associated disorders--a randomized controlled trial. Clin Rehabil. 2006 Mar;20(3):201-17. DOI: 10.1191/0269215506cr934oa. PMID: 16634339.

[32] O'leary S, Jull G, Van Wyk L, Pedler A, Elliott J. Morphological changes in the cervical muscles of women with chronic whiplash can be modified with exercise-A pilot study. Muscle Nerve. 2015 Nov;52(5):772-9. DOI: 10.1002/mus.24612. Epub 2015 Sep 3. PMID: 25702919; PMCID: PMC4545448.

[33] Jull GA, Falla D, Vicenzino B, Hodges PW. The effect of therapeutic exercise on activation of the deep cervical flexor muscles in people with chronic neck pain. Man Ther. 2009 Dec;14(6):696-701. DOI: 10.1016/j.math.2009.05.004. Epub 2009 Jul 25. PMID: 19632880.

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2668

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology
https://ojs.bilpublishing.com/index.php/jhp

ARTICLE

Maintaining the Health of Professional Folk Dancers in Conditions of Physical Recreation

Aftimichuk Olga*

State University of Physical Education and Sports of the Republic of Moldova, Moldova

ARTICLE INFO

Article history
Received: 7 December 2020
Accepted: 13 January 2021
Published Online: 18 June 2021

Keywords:
Folken-dancers
Health
Physical recreation

ABSTRACT

Research on the health issues of folk dancers has not been sufficiently developed. A sociological survey of the artists of the National Academic Ensemble of Folk Dance "Joc" from Moldova on the problems of a healthy lifestyle, diet, rest regime, physical and mental state, the attitude of respondents to physical activity in fitness clubs, readiness to engage in physical recreation to improve their condition, prevention diseases, allowed to determine the types of physical recreation and fitness programs recommended for dancers.

1. Introduction

Preservation, maintenance, dissemination of cultural heritage is, as it is known, one of the most important goals of cultural policy. Among the central tasks arising from this - relying on this heritage, to create conditions for the development of the cultural potential of the nation, while simultaneously integrating national culture into the world cultural process.

One of the areas, in which the process of interaction of the national cultural heritage with modernity is clearly manifested, is the sphere of artistic culture. The most important place, among other components of this space, is occupied by everything that is associated with the national choreographic culture and, in particular, with folk dance. It represents undoubtedly a fundamentally significant component of the cultural heritage of Moldova, without which it is impossible to understand and present the entire wealth of national cultural traditions. It should be noted that this component is not only the folk dance itself as a material unit, but also its social existence, its social and functional load, its symbolic meanings and interpretations.

Comprehension of practical and theoretical issues of modern folk dance and those disciplines where dance is closely related to art is one of the most pressing problems, which is expressed in the absence of a clearly expressed semantic content of the requirements for the artistic and aesthetic side of the artists' performance [1]. Along with this, the problem of health of dancers (performers) is also among the current problems. And although the age of professional dancers is short-lived, the negative consequences of this profession are manifested even in the process of their vigorous activity [2].

Thus, the relevance of this study is due to the need for a scientific understanding of the health-saving aspects of folk dance.

**Corresponding Author:*
Aftimichuk Olga;
State University of Physical Education and Sports of the Republic of Moldova, Moldova;
Email: aftolig@mail.ru

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2667

In the specialized literature available to us, a scientifically grounded approach to solving the problem of dancers' health in conditions of physical recreation and determining the appropriate means has not been revealed.

2. Methodology

The purpose of our research was to identify the means of physical recreation that contribute to the maintenance of the health of professional folk dancers.

The set up goal was resolved using the following research methods: theoretical analysis and generalization of specialized literature data, analysis of the rehearsal process of folk dancers, pedagogical observations, sociological survey, mathematical processing and interpretation of statistical data.

The research was carried out at the bases of the State University of Physical Education and Sports of the Republic of Moldova and the National Academic Ensemble of Folk Dance "Joc".

To determine the main and secondary factors, one way or another, contributing to the development of diseases in dancers, a survey of the artists of the National Academic Ensemble of Folk Dance "Joc" was conducted.

The questionnaire included 34 questions, within which 5 additional questions were asked. The questions given identified the following issues:

– lifestyle;
– food style;
– rest mode;
– the level of employment;
– physical and mental condition;
– the presence of diseases;
– the attitude of respondents to physical activity in fitness clubs;
– willingness to engage in physical recreation to improve their condition and prevent diseases.

The sociological survey was conducted in order to determine the optimal fitness programs for the prevention of diseases of professional dancers.

3. Results and Discussion

The survey involved 30 respondents aged 16-45 years. Of these, 15 are men and 15 are women. The questions of the questionnaire at the age of 16-18 years old were answered by 3 men and 3 women, at the age of 19-29 years – 7 men and 6 women, at the age of 30-45 years – 5 men and 6 women. Thus, in percentage terms, the presented ages were (Figure 1): adolescence – 20%, where 50% were men and 50% – women; youth age – 43.33%, of which 53.85% are men and 46.15% are women; mature age – 36.67% – men – 45.45%, women – 54.55%.

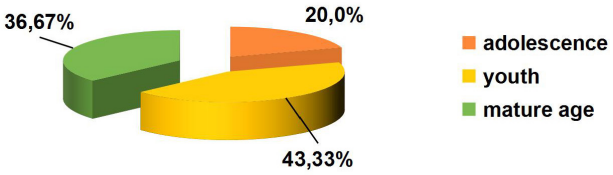


Figure 1. Composition of respondents

Analyzing the answers of the respondents, it can be noted that among the dancers who maintain an improper diet (frequent snacks, fast food, sugary carbonated drinks, eating food that does not contain a sufficient amount of protein, complex carbohydrates, vitamins and microelements) make up 86.67% (Figure 2). This can be compared with the percentage of dancers who prefer passive rest – 83.33%. As you can see, the data for these items are almost identical, which indicates their interdependence. At the same time, among the dancers who prefer passive rest, near the TV and at the computer spend: 3-5 hours – 47.6%; less than 5 hours – 52.4% of respondents.

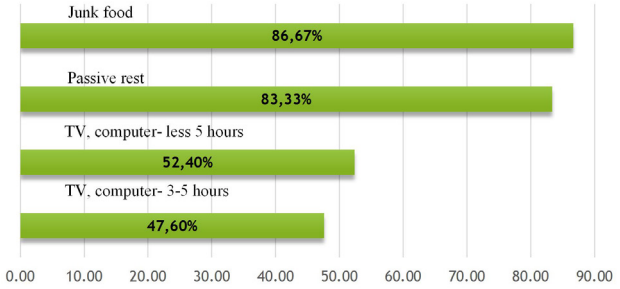


Figure 2. Diet and rest of the respondents

It should be noted that most of the respondents (75%) spend 5-7 hours on sleep, while 18.33% sleep 4-5 hours or have insomnia, and only 6.67% get enough sleep, in 7-9 hours (Figure 3).

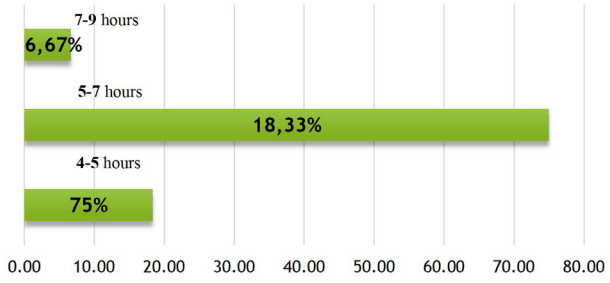


Figure 3. Sleep patterns

Although the profession of dancers reveals a lot of physical activity, which implies the absence of bad habits, still 9.7% of respondents does not exclude smoking, of which 6.37% are men, 3.33% are women.

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2667

The survey revealed 86.67% of respondents with diseases (osteochondrosis, migraine, varicose veins, arthralgia, etc.).

As it was expected, 100% of the dancers surveyed believe that health is important in a person's life. However, to the question about engaging in physical activity, the distribution of answers is as follows: 3.33% – exercise regularly (exercise, walking), 19.98% – periodically (go to the vacation home during the season, sometimes to the forest and the beach), 70.02% – episodically (extremely rarely) and 6.67% – answered "no" referring to the lack of time, increased fatigue, illness (Figure 4).

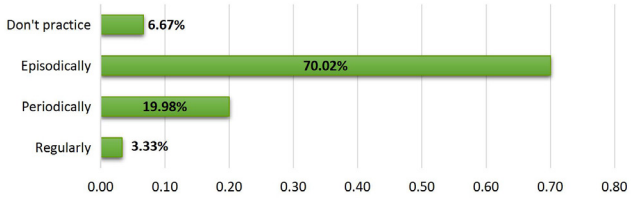


Figure 4. Respondents' answers to the question about physical exercise

To the question: "If you were offered a free subscription to a fitness club, would you find time to visit?", only 63.33% answered "yes", and from the entire composition of the ensemble these are respondents of adolescence and youth. This suggests that the level of income can influence a person's choice of a healthy lifestyle. In addition, among the choice of fitness programs, it was noted that for women, activities that have a restorative orientation not only in the physical aspect, but also in the psychological one were more attractive. Men, on the other hand, preferred power types in order to form a muscular constitution. These answers served as a starting point for the selection of fitness programs for dancers.

In general, when conducting a sociological study, the set goals have been achieved. It was revealed that such factors as promoting a healthy lifestyle, proper nutrition and fitness activity are of great importance in the fight against diseases.

Analysis of the results of the sociological survey of folk dancers "Joc" made it possible to reveal that along with the so-called "professional" diseases (diseases of the joints and blood vessels of the lower extremities, flat feet, varicose veins), problems of the psycho-emotional state (depression, aggression), dancers acquire this or another illness due to an improper lifestyle, which implies insufficient sleep, improper regimen and nutrition itself, there is no change in physical activity (physical culture and recreational activities).

In order to be able to extend their professional career, professional dancers must include in their daily routine physical and recreational activities aimed at relieving psychological stress, stretching muscles and joints, strengthening large muscle groups, using breathing practices, concentration, centering and relaxation practices.

From this point of view, we have identified the types of physical recreation for all folk dancers [3]: *Health Walking, Running, Swimming, Rowing, Cycling, Rollerblading, Sports* and *Outdoor Games*; as well as fitness programs recommended for women: *Callanetics, Pilates, Fitball, Stretching, Yoga*, and *Bodybuilding* recommended for men.

4. Folk Dancers Recommendations for Physical Exercise

When using strength exercises, light weights with multiple repetitions are recommended, in order to avoid unnecessary stress on the joints and ligaments [4].

As part of the rehabilitation process, it is proposed to use a program consisting in alternating sub-tolerant, mixed and tolerant load regimes. The method of establishing tolerance to physical activity (on a treadmill or ergometer bicycle) with the identification of a "critical" heart rate and determination of the optimal one, makes it possible to more efficiently program physical activities.

In order to do this, it is recommended to set the limiting heart rate at which unfavourable shifts in dancers begin, both from the cardiovascular system and autonomic reactions, that is, find a "critical" pulse, calculate the optimal pulse and, focusing on it, build a physiological curve classes. To control and regulate a given program, it is recommended to use heart rate monitors, which make it possible to complete pedagogical control over group exercises, individualize physical activity in conditions of group exercises, and change the nature of the load without changing the set heart rate. All sets of exercises should be tailored to the individual characteristics of each dancer.

A general approach to the aerobic physical activity (walking, running, cycling, swimming, playing, etc.) is to exercise it in the fresh air. However, in some cases, you can exercise not only in the fresh air, but also in a room that is equipped with cardiovascular equipment [5].

5. Conclusions

As a result of studying specialized literature in the field of physical recreation, health-improving training, we have noted that research on the problems of maintaining health in people whose profession involves significant physical activity (athletes, ballet dancers, pop and folk dancers) have not been sufficiently developed. Basically, they are

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.2667

of an informational nature, which does not allow determining the details of the correctional and health-improving method.

The sociological survey of the artists of the folk dance ensemble "Joc" on the problems of a healthy lifestyle, eating style, rest regime, physical and mental state, the attitude of respondents to physical activity in fitness clubs, readiness to engage in physical recreation to improve their condition, prevent diseases, allowed to determine types of physical recreation and fitness programs recommended for dancers.

References

[1] Gusev GP (2004) Folk dance teaching methodology (dance moves and combinations in the middle of the hall). Moscow: VLADOS.

[2] Endaltsev BV (2008) Physical culture, human health and performance in extreme environmental conditions. Monograph. St. Petersburg: Ministry of Defense of the Russian Federation.

[3] Aftimichuk OE (2009) Theory and methodology of fitness: (Theory and methodology of recreational and health-improving physical culture): A course of lectures for special. "Recreational physical culture". Chisinau: "Valinex" SA.

[4] Aftimichuk OE (2018) Theory and methodology of strength fitness: Textbook. Chisinau: Valinex.

[5] Aftimichuk OE (2011) Wellness aerobics. Theory and methodology: [textbook]; State un-t physical education and sports. Chisinau: "Valinex" SRL.

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.2667

BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Human Physiology
https://ojs.bilpublishing.com/index.php/jhp

ARTICLE

Improvement of Regular Exercise on Diabetes Condition of Type II Diabetes Mellitus Elderly Patients

Jiaming Fei* **Hua Gao**

Zhejiang Guangsha Vocational and Technical University of Construction, Jinhua, Zhejiang, China

ARTICLE INFO

Article history
Received: 17 May 2021
Accepted: 22 June 2021
Published Online: 25 June 2021

Keywords:
Regular exercise
T2DM
Elderly patients
Improvement

ABSTRACT

To investigate the effects of 12-week old aerobics and brisk walking exercise on type II diabetes in elderly patients with illness condition, at the same time, after intervention 12 months later, the subsequent movement of patients in the intervention group were followed up, in order to provide a simple and effective, scientific and reasonable exercise prescription for elderly patients. Subjects were selected according to the standard, the sex ratio of 1:1 from 28 over the age of 60 elderly patients with type II diabetes (male and female 14 each), and divided them into intervention group and control group, the control group lived a normal life (without regularity, fitness behavior during the experimental period), the intervention group did aerobics plus walking exercise intervention, two groups of patients were assessed indexes of diabetes before and after the intervention. After 12-week exercise intervention, blood glucose and cholesterol of intervention group decreased significantly, the illness condition of them had improved effectively, while the control group had no obvious change before and after the experiment, after intervention 12 months later, over 85% elderly patients of the intervention group had been in good behavior habits of fitness. Aerobics and walking exercise can improve the illness condition of elderly patients with type II diabetes to a certain extent, think that the old aerobics and rope skipping is a kind of effective and simple fitness behavior, should be targeted according to the condition of patients and health promotion.

1. Introduction

With the acceleration of population aging process, diabetes has been widely prevalent in the world. According to the WHO, the number of diabetic patients increased from 125 million in 1995 to 171 million in 2000, and it is predicted that the number will reach 366 million in 2030 [1]. Currently, China has 113.9 million diabetics. Due to the significant decline in the level of physical activity in the elderly population, the incidence rate is increasing year by year, and the trend is gradually becoming younger and younger. Account for 80 to 90 percent of the total number of diabetes patients belongs to Type Ⅱ diabetes (T2DM) patients, the vast majority of which occur in adults. Diabetes mellitus is characterized by a long course of disease, complex treatment methods, numerous complications and serious health hazards, which seriously has affected the quality of life of patients greatly [2]. Elevated blood

**Corresponding Author:*
Jiaming Fei,
Zhejiang Guangsha Vocational and Technical University of Construction, Jinhua, Zhejiang, China;
Email: feijiaming@163.com

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.3244

glucose is the main basis for the diagnosis of diabetes mellitus, and its core index is HbA1c. The occurrence, development and recurrence of T2DM mellitus are highly related to emotion, living environment, obesity, lack of exercise, diet and heredity. The etiology of T2DM is unknown. Heredity is a major factor, but a more important factor is living environment.

A large number of studies have proved that regular exercise has a positive effect on the prevention and improvement of T2DM [3]. Long-term aerobic exercise as an effective means of T2DM intervention has been widely recognized [4-5]. Experts have believed that such a high prevalence of diabetes and such a rapid growth rate are mainly caused by the improvement of material levels and lifestyle changes, especially with the excessive intake of foods such as high fat, high sugar and high salt and lack of physical activity. In this study, the combination of geriatric aerobics and brisk walking exercise was used to conduct exercise intervention for the elderly patients with T2DM, in order to effectively improve the condition of the patients and improve the quality of life.

2. Materials and Methods

2.1 Subjects

The method of recruitment was adopted among the elderly in the urban community, and the unqualified elderly were eliminated. Finally, 28 elderly (T2DM) patients were selected. Inclusion criteria: (1) Urban community residents, aged 60-80, who are required to have no fitness habits. (2) Fasting blood glucose is stable in the range of 7.0-16.7 mmol/L, and the course of disease is 5-10 years. (3) have certain listening, speaking, reading and writing ability; (4) dietary control (such as low salt, low fat and low sugar diet) or oral hypoglycemic drugs; (5) No serious diabetes complications, no liver, kidney and other organ function damage, blood pressure is less than 180-105mmHg, ECG examination is normal; (6) Can adhere to 12 weeks of moderate intensity fitness exercise, volunteer to participate in the intervention experiment project. According to the inclusion criteria, a total of 28 elderly patients with T2DM were enrolled, including 14 males and 14 females. The subjects were randomly divided into intervention group and control group. A medical examination should be performed before exercise to rule out contraindications. To ensure that their physical health status can complete the experiment, screening exercise intervention objects. Understand the living habits, daily diet, medication and exercise habits of the subjects. Explain the purpose of the study, the duration of the study, the content of the study, the matters needing attention for exercise and the requirements for patients' cooperation to the study subjects, and obtain their informed consent and signature.

2.2 Main Test Indexes and Instruments

Main test indexes: Main evaluation indexes of diabetes mellitus: blood glucose, serum triglyceride, serum total cholesterol, serum low density lipoprotein, serum high density lipoprotein, glycosylated hemoglobin, etc. Professional testing equipment: Blood glucose was determined by glucose oxidase (GOD) method, TC, TG, HDL-C and LDL-C were determined by Beckman matching reagent, and the automatic biochemical analyzer of Beckman CX4CE was performed.

2.3 Implementation Method of Exercise Prescription

According to the test results, the disease status and physical function status of the intervention objects were mastered, and individualized exercise prescription was given in combination with the personal lifestyle to implement the exercise intervention program. (1) Sports: geriatric aerobics and brisk walking; (2) Exercise intensity: warm-up activities for 10 minutes are conducted first, followed by self-made aerobics for about 25 minutes. During exercise, the subjects' heart rate is maintained between 110 times /min and 130 times /min. During exercise, the subjects' heart rate changes are monitored regularly, and the intensity can be controlled according to their physical conditions during brisk walking. (3) Exercise time: exercise for about 1 hour and 20 minutes each time, namely 10 minutes of warm-up activities, 30 minutes of geriatric aerobics exercises, 20 minutes of brisk walking after 10 minutes of rest, and the finishing activities for the last 10 minutes. (4) Exercise frequency: three times a week. Actually speaking on Monday, Wednesday and Friday, one hour after breakfast. The intervention experiment lasted for 12 weeks in total. (5) Exercise location: it is located in a rented activity room of nearly 200 square meters to ensure the safety and effectiveness of subjects' exercise. In addition, according to the research results of Zhou Yurong et al., patients in group A suffered from 7.0 mmol/L≤FPG<10.0 mmol/L, patients in group B 10.0 mmol/L≤FPG<14.0 mmol/L, and group A reached the peak of insulin 2 hours later. The peak of insulin in group B was 3 h postprandial [3]. According to the American Physical Fitness Association's recommendation of "not exercising during insulin peak", this study decided to start intensive exercise 1 hour after breakfast to avoid hypoglycemia.

2.4 Statistical Methods

SPSS23.0 software package and Microsoft Excel2003

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.3244

software were used for statistical processing. The significance test of mean ± standard deviation was used as Independent-Sample t test, and the numerical variables were expressed as M±SD. The analysis methods included repeated measurement analysis of variance and simple effect analysis. The significant level was P<0.05, and the very significant level was P<0.01.

3. Results

The results have shown that exercise intervention stimulated the decrease of blood glucose, blood lipid, cholesterol and other indexes in the elderly urban patients with T2DM mellitus to varying degrees, and played a positive role in improving the condition of the elderly patients.

3.1 Changes of Blood Glucose Before, at Week 4 and at Week 12 in the Two Groups

A 2×3 repeated measure ANOVA was performed on the blood glucose of the patients. Intergroup factors were groups, i.e., the intervention group and the control group; intra-group factors were time, i.e., before intervention, the fourth week of the experiment, and the twelfth week of the experiment; interaction was group × time. The results showed that the group main effect was significant (F value (1,26) =4.89, P<0.05), the group main effect was significant (F value (2,52) =12.38, P<0.001), the interaction between the two was significant (F value (2,52) =11.09, P<0.001). Further simple effect analysis showed that no significant difference was found between the experimental group and the control group (P>0.05) when tested before and after the fourth week of the experiment, but after the twelfth week, the intervention group (M±SD) blood glucose index was significantly lower than the control group (F value (1,26) =21.03, P<0.001; With the passage of test time, the blood glucose of the intervention group was gradually decreased, and the difference was very significant (P<0.001). In contrast, blood glucose in the control group did not change over time (P>0.05) (Table 1).

Table 1. Changes of blood glucose, triglyceride, cholesterol, high density lipoprotein and low density lipoprotein in two groups at different test time (M±SD)

3.2 Changes of Triglyceride before, at week 4 and at week 12 in the Two Groups

A 2×3 repeated measure ANOVA for triglycerides showed that the main effect and interaction between group and test time were not significant (P>0.05) (see Table 1). The experiment results show that the intervention group of triglyceride levels at the time of intervention in the 4th week fell slightly, but with the experiment before there is no significant difference (P>0.05), perhaps because not enough exercise, shorter reasons of intervention, and to intervene in 12 weeks, before and after the experiment compared with significant difference (P<0.05), the deeper reason remains to be further explored. There was no significant difference in the control group before and after intervention (P>0.05).

3.3 Cholesterol Changes in the Two Groups at Different Test Time

A 2×3 repeated measure ANOVA for cholesterol showed significant group main effect (F value (1,26) =8.93, P<0.01), significant intra-group main effect (Fvalue (2,52) =48.92, P<0.001), significant interaction between the two (Fvalue (2,52) =56.05, P<0.001). Further simple effect analysis showed that there were significant differences between the intervention groups before, in the 4th week, and in the 12th week (P<0.001). Cholesterol levels

index	group	Before the experiment	The fourth week	The twelfth week
Blood glucose	intervention group(n=14)	8.54±1.98	8.20±1.64	6.86±1.04**
	Control group(n=14)	9.21±1.87	9.10±1.53	9.13±1.53
Triglyceride	intervention group(n=14)	2.44±1.08	2.36± .94	2.01± .72*
	Control group(n=14)	2.28±1.10	2.34±1.14	2.31±1.18
Cholesterol	intervention group(n=14)	6.52± .47	6.01± .49	4.80± .69**
	Control group(n=14)	6.38±.80	6.46±.72	6.32± .76
High density lipoprotein	intervention group(n=14)	2.09± .61	2.01± .49	2.05± .24
	Control group(n=14)	1.98± .68	1.96± .62	1.90± .68
Low density lipoprotein	intervention group(n=14)	3.32±.85	2.95±.76	2.18±.75**
	Control group(n=14)	3.30±.68	3.04±.67	3.07±.68

*Notes: the experimental data of this study, * indicates significant difference P< 0.05; * * indicates significant difference (P<0.01)*

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.3244

in the intervention group were significantly lower than those in the control group in the 12th week (F (1,26) =8.32, P<0.001). As the test time went on, the cholesterol of the intervention group was gradually decreased, and the difference was significant (P<0.001). In contrast, cholesterol in the control group did not change over time (P>0.05) (Table 1).

3.4 HDL Changes in the Two Groups at Different Test Time

However, a 2×3 repeated measure analysis of variance on HDL showed that the group main effect, the intra-group main effect and their interaction were not significant, P>0.05 (Table 1). The reason remains to be further studied.

3.5 Changes of LDL in Two Groups at Different Test Time

A 2×3 repeated measure analysis of variance for low-density lipoprotein showed that the group main effect was not significant (F value (1,26) =3.35, P> 0.05), the group main effect was significant (F value (2,52) =17.30, P< 0.001), the interaction between the two was significant (F value (2,52) =18.57, P< 0.001). Further simple effect analysis found that the intervention group showed a downward trend in the indicators before, in the 4th week, and in the 12th week, and all reached very significant differences (P< 0.001). At the twelfth week of the experiment, low density lipoprotein index of the intervention group (M±SE) was significantly lower than that of the control group, F value (1,26) =16.22, P< 0.001; However, the control group did not show a decreasing trend over time (P> 0.05) (Table 1).

4. Analysis and Discussion

T2DM is a chronic disease that cannot be cured totally with medicine. Once diagnosed, it is necessary to take drugs or inject insulin for long-term blood sugar control. Not only to the patient's body damage, but also more heavy psychological pressure. However, after regular physical exercise, the blood sugar of patients decreases and their condition improves. Such favorable results can greatly enhance the confidence of patients to overcome the disease and improve their sense of self-efficacy. Meng En (2014) pointed out that T2DM patients should keep fit 4-5 times a week, with 30-120 min of exercise for at least 30 min of effective intensity for each exercise, and the best effect would be achieved 1 hour after meal [4]. Now exercise therapy has been proved to be a scientific and effective treatment for T2DM diabetes. Patients with appropriate intensity aerobic exercise can effectively reduce weight, improve the organism of insulin sensitivity, promote the body metabolism, improve the function of the respiratory and circulatory system, enhanced physique, vital capacity increases, the prevention of diabetes complications, and can also cultivate life interest, edify sentiment, reduce stress, improve the quality of life [5].

When a person is convinced that he or she is capable of performing a certain activity and gains a certain amount of income, he or she will develop a high sense of self-efficacy and take the initiative to carry out the activity, in order to achieve effective control of the development of disease, improve the quality of life. Research in related fields at home and abroad also shows that in the course of treatment of various chronic diseases, patients' self-management ability can be enhanced by enhancing their confidence and self-efficacy, patients actively engage in an activity when they see that the behavior is beneficial to the body and the disease. The experimental results are in good agreement with those of collar [6] et al. More than 12 weeks of moderate intensity aerobic exercise has been proven to be effective in improving glucose metabolism. However, other studies [7] have shown that younger age diabetics under the age of 55 are more sensitive to exercise, and aerobic exercise is less effective in lowering blood sugar in older age patients. Wang Zhengrong [8]believes that nearly 90 percent of diabetic patients have a significant drop in fasting blood glucose after one year of exercise intervention, suggesting that as long as people develop good fitness and exercise habits and exercise more than three times a week or every day, it would have a better effect. The control group had no significant changes in blood glucose and other indicators before and after the experiment, which showed that without regular aerobic exercise intervention, only control of Diet and medication, lack of better effect on the decline of Blood Glucose and other indicators of diabetes, [9] the research of Tao lingling and others has similar results. Exercise intervention therapy is as important in the treatment of Type II diabetes as Diet Control and drug therapy, exercise therapy plays an irreplaceable role in clinical practice, which should be paid more attention to by the medical field and patients [9].

Duan Yanping (2012) believes that the subject can actively adhere to at least three times a week or engage in moderate intensity fitness behavior every day for more than 12 months, and to some extent has formed good habits and lifestyle of regular fitness behavior [10]. When the elderly have participated in fitness activities, their physical and mental self-perception is very important, that is to say, the so-called self-efficacy. The theory of self-efficacy refers to an individual's expectation of whether he or she

Distributed under creative commons license 4.0 DOI: https://doi.org/10.30564/jhp.v3i1.3244

has the ability to implement a certain behavior, which is people's cognition and evaluation of their own behavioral ability. High levels of "self-efficacy" occur when people believe they are capable of performing an activity, and self-efficacy is at the heart of the self-regulatory system. According to this theory, human behavior is affected by external reinforcement and self-reinforcement, but no matter which reinforcement affects behavior through affecting self-efficacy. Therefore, in the process of exercise, when the old master certain exercise skills, after a period of time after fitness law, to see their physical and mental status changes, will generate more intense internal training motivation, fitness behavior internalizes for own life habits and way of life, to form a long-term mechanism for fitness, regular exercise and self-efficacy form benign interaction each other, promote each other. Regular exercise has a good effect on regulating the endocrine cycle of the elderly, improving physical function, reducing loneliness and depression, making the elderly feel comfortable, increasing communication, enhancing the awareness and ability of social participation, and thus effectively improving the quality of life of the elderly " [11]. At the end of the campaign experiment after 12 months, has carried on the track to intervention group respectively, there are 12 people in the middle of the 14 people have still insisted to do elderly in setting-up exercise and brisk walking exercise, regular exercise behavior accounted for 85.7%, some old people in addition to do these movements, walks fast and physical exercise, tai chi or other projects to exercise time also increased a lot than during the experiment, basically exercise every day, time in 1-2 hours, more than clinical recommendations weekly exercise time, fully demonstrated the exercise intervention experiments good follow-up effect, It has also shown that the music aerobics created by the elderly patients has a strong entertainment, brisk walking also stimulated the patients' interest in exercise, these two exercises are simple and easy to do, scientific and effective, and also play an important role in promoting the elderly T2DM patients' adherence to fitness behavior [12].

4. Conclusions

Applying 12 weeks' old-age geriatric aerobics and brisk walking intervention to the elderly patients with T2DM can effectively stimulate the patients' body, make their blood sugar, blood lipid, cholesterol and other indicators decline to varying degrees, and play a positive role in improving the condition of the elderly patients. Therefore, the research conclusion has shown that under the premise of clinical treatment, applying regular and scientific exercise intervention to elderly patients with T2DM has a very good adjuvant treatment effect on improving their condition, and can effectively improve their quality of life, so it is recommended to promote it vigorously.

References

[1] Wild S, Rogers G, Green A, et al. Global GT Analysis of Diabetes: Estimates for the Year 2000 and Projections for 2030[J].Diabetes Care, 2004,27 (5): 1047-53.

[2] Hervs A, Zabaleta A, De Miguel G, et al. Health related quality of life with diabetes mellitus type 2 in patients with diabetes mellitus type 2[J].An Sist Sanitnavar2007, 30 (1) : 45-52.

[3] Zhou YR, Xiao JQ. Clinical study of serum insulin and C-peptide levels in patients with type 2 diabetes mellitus [J]. Laboratory Medicine and Clinical Practice 2013,10 (18) : 2413.

[4] MENG E. The effect of Taijiquan on serum lipid composition and insulin resistance in patients with type 2 diabetes [J]. Chinese Journal of Gerontology, 201,34 (19) : 5360.

[5] Kawamura M, Kawamura M, Kawamura M, et al. The role of diabetes mellitus in the diagnosis and treatment of diabetes mellitus [J]. Int J Diabetologia, 2012, 24 (1) : 69-72.

[6] Colberg SR, Hagberg JM, McCOLE SD. Utilization of plasma glucose is reduced in individuals with NIDDM during mild intensity exercise[J].J Physiol,1996,81(5):35-35.

[7] Tan JZ. Exercise intervention in type 2 diabetes mellitus [J]. Journal of Tien Jin Sport University, 2001,16 (3) : 53-53.

[8] Wang ZR. Evaluation of the effect of exercise intervention on type 2 diabetes mellitus in community [J]. Chin J Clinical Rehabilitation, 2002,6 (15) : 2214.

[9] Tao L L, Fan X B, Deng Y B, et al. Effect of exercise intervention on 36 patients with type 2 diabetes [J]. Clinical Meta, 2004,19 (15) : 867-867.

[10] DUAN Yanping, WALTER Brehm Helmut Strobl, HUANG Zhijian, et al. Physical activity changes in adults: a theoretical construction, questionnaire development and empirical research [J]. Journal of Tianjin Institute of Physical Education, 2012,27 (3) : 204.

[11] Fergamin. Effects of exercise intervention on quality of life in elderly patients with type 2 diabetes mellitus [J]. Sports Science and Technology, 2014,35 (6) : 11.

[12] Colberg S R, Sigal R J, Yardley J E, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association [J]. Diabetes Care, 2016, 39(11): 2065-2079.

Distributed under creative commons license 4.0
DOI: https://doi.org/10.30564/jhp.v3i1.3244

Author Guidelines

This document provides some guidelines to authors for submission in order to work towards a seamless submission process. While complete adherence to the following guidelines is not enforced, authors should note that following through with the guidelines will be helpful in expediting the copyediting and proofreading processes, and allow for improved readability during the review process.

Ⅰ. Format

- Program: Microsoft Word (preferred)
- Font: Times New Roman
- Size: 12
- Style: Normal
- Paragraph: Justified
- Required Documents

Ⅱ. Cover Letter

All articles should include a cover letter as a separate document.

The cover letter should include:

- Names and affiliation of author(s)

The corresponding author should be identified.

Eg. Department, University, Province/City/State, Postal Code, Country

- A brief description of the novelty and importance of the findings detailed in the paper

Declaration

v Conflict of Interest

Examples of conflicts of interest include (but are not limited to):

- Research grants
- Honoria
- Employment or consultation
- Project sponsors
- Author’s position on advisory boards or board of directors/management relationships
- Multiple affiliation
- Other financial relationships/support
- Informed Consent

This section confirms that written consent was obtained from all participants prior to the study.

- Ethical Approval

Eg. The paper received the ethical approval of XXX Ethics Committee.

- Trial Registration

Eg. Name of Trial Registry: Trial Registration Number

- Contributorship

The role(s) that each author undertook should be reflected in this section. This section affirms that each credited author has had a significant contribution to the article.

1. Main Manuscript
2. Reference List
3. Supplementary Data/Information

Supplementary figures, small tables, text etc.

As supplementary data/information is not copyedited/proofread, kindly ensure that the section is free from errors, and is presented clearly.

Ⅲ. Abstract

A general introduction to the research topic of the paper should be provided, along with a brief summary of its main results and implications. Kindly ensure the abstract is self-contained and remains readable to a wider audience. The abstract should also be kept to a maximum of 200 words.

Authors should also include 5-8 keywords after the abstract, separated by a semi-colon, avoiding the words already used in the title of the article.

Abstract and keywords should be reflected as font size 14.

Ⅳ. Title

The title should not exceed 50 words. Authors are encouraged to keep their titles succinct and relevant.

Titles should be reflected as font size 26, and in bold type.

Ⅳ. Section Headings

Section headings, sub-headings, and sub-subheadings should be differentiated by font size.

Section Headings: Font size 22, bold type

Sub-Headings: Font size 16, bold type

Sub-Subheadings: Font size 14, bold type

Main Manuscript Outline

Ⅴ. Introduction

The introduction should highlight the significance of the research conducted, in particular, in relation to current state of research in the field. A clear research objective should be conveyed within a single sentence.

Ⅵ. Methodology/Methods

In this section, the methods used to obtain the results in the paper should be clearly elucidated. This allows readers to be able to replicate the study in the future. Authors should ensure that any references made to other research or experiments should be clearly cited.

Ⅶ. Results

In this section, the results of experiments conducted should be detailed. The results should not be discussed at length in

this section. Alternatively, Results and Discussion can also be combined to a single section.

Ⅷ. Discussion

In this section, the results of the experiments conducted can be discussed in detail. Authors should discuss the direct and indirect implications of their findings, and also discuss if the results obtain reflect the current state of research in the field. Applications for the research should be discussed in this section. Suggestions for future research can also be discussed in this section.

Ⅸ. Conclusion

This section offers closure for the paper. An effective conclusion will need to sum up the principal findings of the papers, and its implications for further research.

Ⅹ. References

References should be included as a separate page from the main manuscript. For parts of the manuscript that have referenced a particular source, a superscript (ie. [x]) should be included next to the referenced text.

[x] refers to the allocated number of the source under the Reference List (eg. [1], [2], [3])

In the References section, the corresponding source should be referenced as:

[x] Author(s). Article Title [Publication Type]. Journal Name, Vol. No., Issue No.: Page numbers. (DOI number)

Ⅺ. Glossary of Publication Type

J = Journal/Magazine

M = Monograph/Book

C = (Article) Collection

D = Dissertation/Thesis

P = Patent

S = Standards

N = Newspapers

R = Reports

Kindly note that the order of appearance of the referenced source should follow its order of appearance in the main manuscript.

Graphs, Figures, Tables, and Equations

Graphs, figures and tables should be labelled closely below it and aligned to the center. Each data presentation type should be labelled as Graph, Figure, or Table, and its sequence should be in running order, separate from each other.

Equations should be aligned to the left, and numbered with in running order with its number in parenthesis (aligned right).

Ⅻ. Others

Conflicts of interest, acknowledgements, and publication ethics should also be declared in the final version of the manuscript. Instructions have been provided as its counterpart under Cover Letter.

About the Publisher

Bilingual Publishing Co. (BPC) is an international publisher of online, open access and scholarly peer-reviewed journals covering a wide range of academic disciplines including science, technology, medicine, engineering, education and social science. Reflecting the latest research from a broad sweep of subjects, our content is accessible world-wide——both in print and online.

BPC aims to provide an analytics as well as platform for information exchange and discussion that help organizations and professionals in advancing society for the betterment of mankind. BPC hopes to be indexed by well-known databases in order to expand its reach to the science community, and eventually grow to be a reputable publisher recognized by scholars and researchers around the world.

BPC adopts the Open Journal Systems, see on ojs.bilpublishing.com

Database Inclusion

Asia & Pacific Science Citation Index

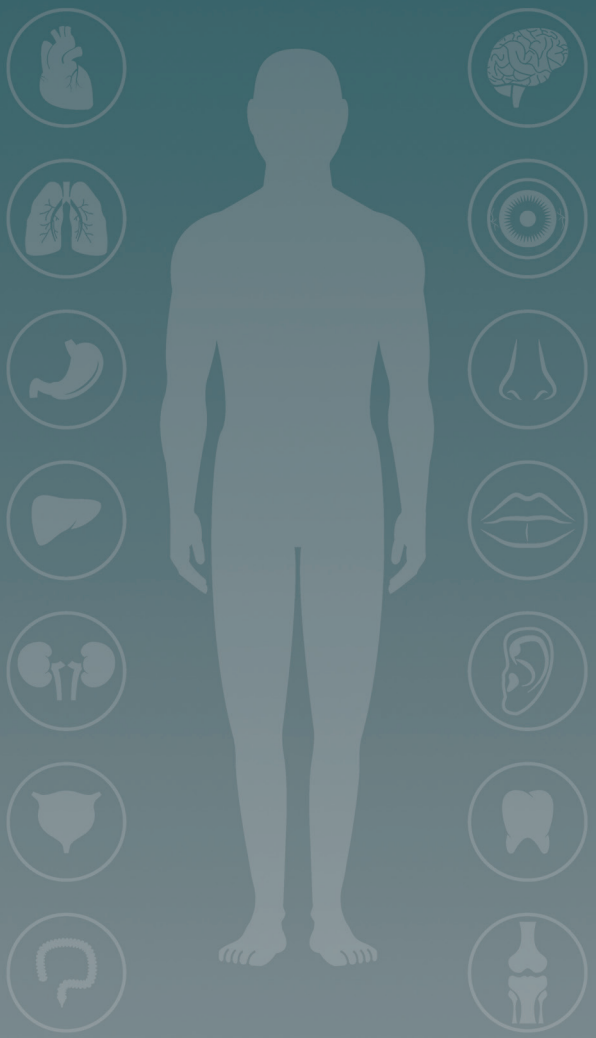
Creative Commons

China National Knowledge Infrastructure

Google Scholar

Crossref

MyScienceWork



BILINGUAL
PUBLISHING CO.
Pioneer of Global Academics Since 1984

Tel:+65 65881289
E-mail: contact@bilpublishing.com
Website:ojs.bilpublishing.com

ISSN 2661-3859
01