Validation of the Aberdeen Varicose Vein Questionnaire in Hungarian and assessment of venous flow velocity during rehabilitation

Ph.D. thesis

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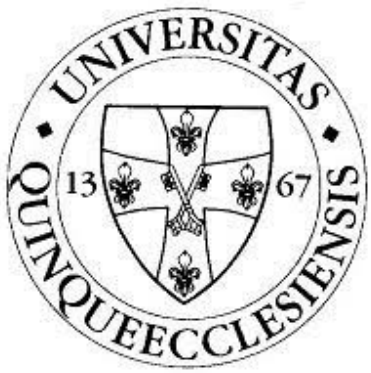

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1. INTRODUCTION

Thromboembolic diseases are prominent in morbidity and mortality statistics. Pulmonary embolization and deep vein thrombosis are the most common causes of in-hospital mortality (Phillippe, 2017). The incidence of thromboembolic diseases is significantly higher in women than in men (Adams et al., 2003; Heit, 2015). In our country, 90-130 people per 100,000 are affected annually. The risk increases exponentially from the age of 45-50 years (Sándor, 2007). Without prophylaxis, thromboembolic complications occur in 30% of general surgery patients and in 50% of patients undergoing orthopaedic surgery (Korcsmár, 2009). The mortality rate of venous thromboembolism in Hungary is 3-10 times higher than the European Union average (Sándor, 2005). This is not only a public health and medical problem, but also an economic and social burden as well.

Out of the combined thromboembolic prophylaxis methods, mechanical methods are of great importance in addition to drug prophylaxis (Edwards et al., 2008). Drug prophylaxis and mechanical methods are more effective when used together, and their combined use is therefore recommended. Few objective studies are available on the efficacy of venous thromboembolism and mechanical thromboembolic methods. Mechanical methods exert their prophylactic effect by eliminating or reducing stasis and increasing venous flow rate. Reduction of venous stasis can be achieved by narrowing the vein, increasing lymphokinesis and regulating muscle tone (Nelson et al., 2014; 2010).

There are passive and active mechanical thromboembolism methods. Passive mechanical methods include limb positioning, massage, compression treatments, electrostimulation, fast-paced passive movement and Trendelenburg positioning, which is contraindicated in haemiparetic patients (Mehta et al., 2010; Stein et al, Active mechanical methods include venous blood flow increasing exercises, where an increase in flow in the injured limb is observed during movement of the intact limb through the consensual effect (Hitos et al., 2007; Kwon et al., 2003). Under the consensual effect, a change is observed in the corresponding segment of the opposite, symmetrical body part when one half of the body is treated.

However, the effect of the complex venous vascular tunnel on flow velocity is not known (Kwon et al., 2003). Neurological patients with paralysis of the lower limb may be a particularly vulnerable group of patients due to the effects of prolonged immobilization and inactivity.

On the other hand, venous disorders of the lower limb represent a major health care expenditure in the western world. According to international research, the prevalence of varicosities is 40% in men and 32% in women, while more than 80% of the general population experience minor venous disorders (Tisi, 2011). Among chronic venous diseases, varicosities are the most common, with a prevalence of nearly 66% in Hungary (Mátyás, 2011). Spider vein varicosities are found in 80% of the population. Advanced venous disease (C3-6) occurs in 5% of the population. The prevalence of C6 disease is 0.1-0.5%. The annual progression of the disease is 3.5-4% (Sudoł-Szopińska et al., 2011). Varicosity affects one quarter of the adult population in Western countries, leading to morbidity and permanent dependence on health services (Rabe et al., 2012).

Several authors have investigated venous flow velocity after resting and physiotherapy interventions in different populations (Espeit et al., 2020; Griffin et al., 2010; Sakai et al., 2021; Stein et al., 2010), but little data are available on the results in some patient groups. The consensus effect has not been investigated and the literature does not include data on the post-intervention period following physiotherapy interventions, with authors only investigating the immediate post-intervention period (Tsuda et al., 2020; Zhuang et al., 2021).

A relatively small number of studies have examined changes in venous flow velocity in

different patient groups. There is currently no data in the international literature on how venous flow velocity changes in the period following physiotherapy intervention (5-10-15 minutes after therapy) or how the consensus effect is affected in stroke patients with paralysis of the lower limb.

The assessment of disease-specific quality of life and the ability to measure its changes, and a patient-oriented approach, are becoming increasingly important nowadays (Lattimer et al., 2014; Marsden et al., 2013; Staniszewska et al., 2013).

A validated questionnaire in Hungarian language assessing the quality of life of people with venous disorders is not yet known in the literature.

2. OBJECTIVES

Our specific objectives were:
1. Our objective was to investigate the effect of active (venous blood flow increasing exercises) and passive (fast-paced passive motion) mechanical thromboembolic prophylaxis methods on venous flow velocity in stroke patients.
2 Our aim was to investigate the resting flow velocity in the intact and affected lower limb of hemiparetic patients and the venous flow velocity on the hemiparetic side after venous flow increasing exercises on the intact side, so that a consensus effect could be detected.
3. We also aimed to investigate the flow velocity at rest and after venous blood flow increasing exercises in patients with venous disease.
4. We aimed to investigate the validity and reliability of the Hungarian translated version of the Aberdeen Varicose Vein Questionnaire (AVVQ) and to determine whether the questionnaire is a valid tool for assessing quality of life in patients with varicose veins.

3. MATERIALS AND METHODS

3.1. Assessment of venous flow velocity in stroke patients

We performed a cross-sectional clinical study in hemiparetic patients at the Clinical Center - Neurosurgery Clinic of the University of Pécs, Department of Rehabilitation of Severely Brain Injured Patients. In the study 215 hemiparetic patients (117 men, 98 women) with an average age of 58.0±5.6 years were examined. The mean number of days since the date of stroke diagnosis was 924.5±554.08 days. The mean duration of immobility was 13.55±2.95 days. Inclusion criteria were that the affected limb should be able to move at muscle strength 2 (gravity off) according to the British Medical Research Council 0-5 muscle strength scale, and the healthy limb should be able to move at muscle strength 3 or higher (against gravity but not against resistance). Exclusion criteria included deep vein thrombosis, any thromboembolic event, arterial circulatory disturbance, neuropathy, vascular complications, arteriosclerosis obliterans, malignant tumour, swelling, necrosis, epidermalisation and heart failure. Exclusion criteria also included a systolic blood pressure value of more than 180 mm Hg, a diastolic value of 110 mm Hg in the medical history, internal medicine, musculoskeletal or psychiatric diseases, repeated stroke, neurological diseases other than stroke, and a BMI of more than 35 kg/m2.

The peak venous flow velocity was measured using a HADECO BIDOP ES-100V II Doppler ultrasound device with 8MHz head in the femoral vein. Venous flow velocity was measured at rest in the intact and hemiparetic limb, after complete venous atresia of the intact

side, after passive movement of the hemiparetic side, and the consensus effect was examined after active venous atresia of the intact side in the unmoved limb. In all cases, a resting period of 30 minutes preceded the measurement at rest before the application of passive and active thromboembolic prophylaxis methods, to help the venous return velocity to reach the resting level. During the application of passive exercise and venous flow increasing exercises, venous flow velocity was measured during the first minute after therapy and then measured every minute until 15 minutes after therapy.

Descriptive data are presented as mean ± standard deviation (SD) for continuous variables for normally distributed data and median (interquartile range [IQR]) for non-normally distributed data. Non-parametric tests were used in the statistical analysis according to the results of the normality test (Kolmogorov-Smirnov test): the Wilcoxon test was used to examine the change between resting flow rate and values measured in the first 15 min, the Mann-Whitney test to examine differences between groups, and the Friedman test to assess the change in values during the 15 collection time points of repeated measurements. Our results were considered significant at $p<0.05$.

3.2. Venous flow velocity and quality of life in patients with venous disease

In our study, 16 individuals with varicose veins, 6 men and 10 women (age: 48.06±12.16 years, BMI: 24.99±4.44 kg/m2), all participants had been to a medical professional with varicose veins. The inclusion criteria were that individuals over 18 years of age with at least 2 years of varicosity (CEAP 1-3), with symptoms and a BMI not exceeding 35 kg/m2 were eligible for the therapy. Exclusion criteria included any serious co-morbidities of internal medicine, musculoskeletal and/or neurological disorders, history of deep vein thrombosis, lower limb trauma within 1 year and/or surgical intervention.

The quality of life of patients with varicose veins was assessed using the AVVQ questionnaire translated into Hungarian (AVVQ-H). Peak venous flow velocity was measured with a Hadeco BIDOP ES-100V3 Doppler ultrasound device with 8MHz head in the femoral vein. Venous flow velocity was measured at rest and immediately after total venous flow increasing exercises.

According to the results of the normality test (Shapiro-Wilk test), parametric tests were used for statistical analysis: one-sample, paired sample t-tests and linear regression analysis. Our results were considered significant at $p<0.05$.

3.3. Validation of the Aberdeen Varicose Vein Questionnaire in Hungarian

Our cross-sectional study included 374 participants (age: 39.54 ± 16.48 years). Two groups were distinguished in the survey. One group consisted of patients with varicose veins, who were patients of the Vascular Surgery Clinic of the University of Pécs University Clinical Centre (n=168 persons, 50.96 ± 11.73 years). The other group consisted of the healthy population (n=206 persons, 30.22 ± 14.48 years). The inclusion criteria for patients with varicose veins included age between 18-65 years, with voluntary participation. For the healthy target group, inclusion criteria included no venous disease in the medical records. Patients with varicose veins were excluded if they were non-Hungarian speakers, had other pulmonary or cardiological co-morbidities, reading or speech impairment, or were less than six months post deep vein thrombosis and pulmonary embolism. For the healthy target group, we excluded non-Hungarian speakers, patients with other serious musculoskeletal, internal medicine, neurological and venous diseases.

The internal consistency of the questionnaire was assessed using Cronbach's alpha. Convergent validation of the questionnaire was analysed using The 36- Item Short Form Survey. Repeatability was assessed using a test-retest method with intraclass correlation

coefficients. Discriminant validity was used to examine the AVVQ-H scores in patients with varicose veins and a healthy population, using the Mann-Whitney U test to examine the difference. Our results were considered significant at $p<0.05$.

4. RESULTS

4.1. Study of venous flow velocity in stroke patients

In patients with stroke, the average venous flow velocity in the femoral vein of the intact limb was measured at 7.0 cm/s in the supine position at rest. In the hemiparetic side, an average venous flow velocity of 2.7 cm/s was measured in the supine position, also at rest. The resting flow rate on the hemiparetic side was 42.1% lower than the resting flow rate on the intact side. The resting flow velocity on the hemiparetic side was significantly lower ($Z = - 4.8$; $p <0.001$) than the resting venous flow velocity on the intact side.

Passive motion was used on the paralysed side of patients when muscle strength on the hemiparetic side was 2 or below. If a muscle strength value higher than this (maximum 3 occurred), active exercise was performed.

On the hemiparetic side, there was a significant increase in venous flow velocity following passive exercise compared to resting values at all time points. The resting venous flow rate on the hemiparetic side increased by 4.5 cm/s immediately after passive exercise. The venous flow velocity decreased gradually after treatment, but even 15 min later the value was significantly higher than the resting value on the hemiparetic side. At 15 minutes after treatment, the value measured on the hemiparetic side was similar to the resting value on the healthy side.

After active venous flow increasing exercises on the intact side, the venous flow rate increased significantly compared to the resting value. The rate of change decreased in the minutes after the intervention, but even 15 minutes later the value was significantly higher than the resting venous flow rate.

The study examined the extent of the consensus effect, which means that by treating one side we can also have an effect on the other side. After active venous vasodilation exercises on the intact side, we measured the venous flow velocity on the hemiparetic side, which was significantly higher than the resting value on the hemiparetic side. Thus, the patient can increase venous flow velocity to an adequate level on the non-mobile hemiparetic side using the active intact limb independently several times a day. Due to the consensus effect, the venous flow rate on the hemiparetic side was significantly higher in the first minute than the peak venous flow rate on the hemiparetic side in the first minute after passive movement.

4.2. Venous flow velocity and quality of life in patients with venous disease

Our study found a significant association between the time since the onset of venous disease and the health-related quality of life of patients with varicose veins. Our results show that the longer the duration of varicose veins, the worse the quality of life of patients. We found a significant association ($R= 0.521$; $p= 0.039$) between BMI values and health-related quality of life of patients with varicose veins, with patients with higher BMI values having a worse quality of life.

The physiological peak venous flow velocity is 10 cm/s in the great veins (Bérczi et al., 2005), which is in agreement with the results of the present study. Our results indicate that the resting venous flow velocity was significantly lower than the physiological peak venous flow velocity.

After active venous aneurysm in the lower limb, venous flow velocity was significantly increased compared to the resting value ($p < 0.001$).

4.3. Validation of the Aberdeen Varicose Vein Questionnaire in Hungarian

The reliability of the questionnaire was assessed using Cronbach's alpha values. Here, the figures obtained show that the internal consistency of the questionnaire is adequate (Cronbach's alpha = 0.890).

Furthermore, the reliability of the questionnaire was tested by means of a test-retest method, calculated by determining an intraclass correlation coefficient. The results of the first and second measures of the AVVQ-H were identical, so that the correlation coefficient was R = 1.000, which confirms that the results of the two measures are related and not different.

The correlations between the AVVQ-H and the SF-36 were analysed using Spearman's rank correlation test to assess the validity of the AVVQ-H. Our results showed that the two questionnaires showed a significant correlation of moderate strength. The scores of the two dimensions of the SF-36 (emotional well-being, social activity) did not correlate with any of the scores of the AVVQ-H subscales. The AVVQ-H total score was significantly correlated with some SF-36 subscales (physical activity, role limitations due to physical problems, vitality, physical pain, general sense of health).

In the convergent validation test, significant correlations were found between pain and dysfunction scores (AVVQ-H subscale) and some domains of the SF-36 (physical activity, role limitation due to physical problems, role limitation due to emotional problems, physical pain, general sense of health). The cosmetic appearance score (subscale AVVQ-H) is significantly correlated with the SF-36 dimensions of physical activity, role limitations due to physical problems, physical pain and general health perception.

Significant associations were found between the venous segmentation score (AVVQ-H subscale) and SF-36 scores (physical activity, role limitation due to physical problems, physical pain and general health perception). A significant association was found between the complication score (AVVQ-H subscale) and the SF-36 scores (physical activity, role limitation due to physical problems, physical pain and general perception of health). The score on the vitality dimension of the SF-36 was correlated with the two subscales of the AVVQ-H (vein extension, complication).

Discriminant tests measure and can detect the difference in AVVQ-H scores and subscales between patients with varicose veins and healthy controls. The discriminant validity test found significant differences in AVVQ-H total scores ($p < 0.001$) and AVVQ-H subscale scores (pain and dysfunction, cosmetic appearance, vein extension, complications) between patients with varicose veins and the healthy target group. The statistical test used in the study was the Mann-Whitney U test. In all cases, the healthy target group scored better on the AVVQ-H total score and the subscale scores.

5. DISKUSSION

5.1. Study of venous flow velocity in stroke patients

Hemiparetic patients are a particularly vulnerable group of patients due to prolonged immobilization and inactivity. One of the main active mechanical thromboembolic prophylaxis used by physiotherapists is venous flow increasing exercises, in addition to passive methods (positioning, elastic compression). The effect of complex venous flow increasing exercises on flow rate is not known in hemiparetic patients.

In the present study, the venous flow increasing exercises plus the consensual effect significantly increased venous flow velocity in both the intact and hemiparetic sides. Thus, venous vasodilation may be an effective method of thromboembolic prophylaxis, as it reduces venous stasis by increasing venous flow velocity, which may be a cause of thromboembolic complications according to the Virchow triad.

During venous vasodilation, exercises are also performed with the intact limb to test the consensus effect. However, so far the literature has not investigated the effectiveness of this in terms of venous flow to the side affected by hemiparesis. Our results suggest that the consensus effect is particularly important in the case of lower limbs that are paralysed or immobilised due to other complications. During venous anaesthesia, the consensual effect of intact lower limb movements significantly increased the venous flow rate of the lower limb of the hemiparetic side. Active movement of the intact limb is therefore an important component of mechanical thromboembolic prophylaxis.

5.2. Venous flow velocity and quality of life in patients with venous disease

This part of our study involved 16 patients with varicosity. We looked at patients' venous flow rates and their overall health-related quality of life, which was used as a measurement of their condition. Our aim was to stimulate venous flow velocity in the lower extremity with venous vasodilatation, which improves calf muscle pump function. Breathing helps venous return through the suction effect of the chest. Consistent with the international literature (Kiss et al., 2019; Kwon et al., 2003; Toya et al., 2016; Tsuda et al., 2020), venous flow increasing exercises as an active technique in the present study also significantly increased venous flow velocity after the intervention, but our study was the first to describe this phenomenon in patients with varicose veins.

In our study, we measured the quality of life of patients with varicose veins using the AVVQ questionnaire translated into Hungarian (Kiss et al., 2022). We assessed quality of life in relation to general health, showing that patients with a longer history of varicose vein disease scored worse on quality of life than those who had been diagnosed with the disease for a shorter period of time.

Active thromboembolism prophylaxis methods such as venous flow increasing exercises are aimed at reducing venous stenosis and increasing venous circulation. Similar results were obtained to those reported in the literature. In our study, venous flow velocity was significantly increased after venous vascular stenting compared to the values obtained at rest.

It should be emphasised that we could not find any study that measured the effect of venous flow increasing exercises as a function of peak venous flow velocity in patients with varicose veins.

5.3. Validation of the Aberdeen Varicose Vein Questionnaire in Hungarian

Based on the results of the survey, the AVVQ-H was found to be a reliable and valid measure of health-related quality of life. The internal consistency of the questionnaire is good (Cronbach's alpha = 0.890) and in line with the international literature. When validating the questionnaire in other languages, several international authors obtained similar Cronbach's alpha values: Garratt et al. (1993, Cronbach's alpha = 0.72), Smith et al. (1999, Cronbach's alpha = 0.74), Klem et al. (2009, Cronbach's alpha = 0.76), and Neamatshahi et al. (2019, Cronbach's alpha = 0.71), Ibarra et al. (2023, Cronbach's alpha = 0.71). They conclude that the questionnaire is a well-correlated, valid tool for assessing quality of life in patients with chronic venous disease.

The reliability of the questionnaire was assessed using a test-retest method, determined by intraclass correlation coefficients. The results of the first and second measurements of the

AVVQ-H were identical, with a correlation coefficient of R = 1.000, indicating identical results at both test time points. The majority of the questions ask about the two-week time interval prior to the study, and the second measurement was asked one week later. Asking for a drawing in the first question of the questionnaire was unusual for Hungarian patients, so this was specifically emphasized in the questionnaire, which was not a problem afterwards.

The Hungarian population showed higher AVVQ-H intraclass correlation coefficients than subjects in the Spanish (Ibarra et al., 2023) and Dutch (Klem et al., 2009) or UK (Smith et al., 1999) studies.

The results suggest that the AVVQ-H test is a reliable instrument for quality of life assessments.

The results of Spearman's rank correlation test indicate that the AVVQ-H scales and the SF-36 scales were often moderately correlated, except for the SF-36 scores on the emotional well-being and social activity scales. In contrast, Leal and colleagues (2019) found a correlation between these two SF-36 scales and some subscales of the Brazilian AVVQ. The lack of differential correlations between the AVVQ-H subscales and the SF-36 scales can be explained by the fact that the SF-36 is a questionnaire assessing general health-related quality of life, not a disease-specific quality of life questionnaire.

Overall, the AVVQ-H total score and all its subscales (pain and dysfunction, cosmetic appearance, vein expansion, complications) show significant correlations with the SF-36 dimensions of physical activity, role limitations due to physical problems, physical pain, and general health perception. The total AVVQ-H score correlates with the SF-36 vitality scale.

There is a difference in health-related quality of life between patients with varicose veins and the healthy target group, with the healthy target group always showing better scores.

6. SUMMARY OF OUR NEW RESULTS

Our investigations also yielded new results, which are summarised in the following points:

1. Our study was the first to determine the venous flow velocity at rest and after venous vascularization in the hemiparetic lower limb of stroke patients. Resting venous flow velocity was lower in the hemiparetic lower limb than in the intact side. After venous aneurysm on the hemiparetic side, a significant increase in venous flow velocity as a function of venous flow velocity was observed compared to resting flow velocity.

2. We first investigated and determined the extent of the consensus effect in the lower limb of hemiparetic patients with paralysis. After venous anaesthesia on the intact side, the venous flow rate on the hemiparetic side increased significantly, and a consensus effect was demonstrated, showing that by treating one side of the lower limb we can also have an effect on the other side. Accordingly, the patient can also increase the venous flow rate on the non-mobile hemiparetic side to an adequate level by using the active, intact limb independently, several times a day.

3. We first examined and determined the resting venous flow velocity in patients with varicose veins. Our results showed that the resting venous flow velocity was significantly lower than the peak physiological venous flow velocity.

4. New results: translation and validation of the Aberdeen Varicose Vein Questionnaire into Hungarian. No validated questionnaire in Hungarian is known in the literature to assess the quality of life of patients with varicose veins. Our results show that the questionnaire is a well-correlated, valid tool for assessing the quality of life of patients with varicose veins and its use helps to guide surgical intervention and adjunctive therapies.

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8. OWN PUBLICATIONS, LIST OF CONFERENCE PRESENTATIONS

8.1. Scientific publications on which the thesis is based

Kiss G, Szabó D, Tékus É, Fekete J, Makai A, Járomi M, Mintál T. Véna betegek életminőségének és a vénás áramlási csúcssebességének vizsgálata egy egyszeri vénás értorna után. *Sport- és Egészségtudományi füzetek*. **Under approval.**

Kiss G, Szabó D, Tékus É, Makai A, Járomi M, Mintál T. A véna betegek életminőségét felmérő nemzetközi kérdőív magyar nyelvű validálása. *Magyar Sporttudományi Szemle*. 2023/2;24(102):67-68.

Kiss G, Szabó D, Tékus É, Jancsó G, Arató E, Makai A, Járomi M, Mintál T. Validity and Reliability of the Hungarian Version of Aberdeen Varicose Vein Questionnaire. *Int J Environ Res Public Health*. 2022;19(3):1639. **Q2; IF:3.390, Number of independent citations: 2**

Kiss G, Faludi B, Szilágyi B, Makai A, Velényi A, Ács P, Tardi P, Pallag A, Bors V, Sekk P, Járomi M. Effect of Active and Passive Mechanical Thromboprophylaxis and Consensual Effect on the Venous Blood Flow Velocity Among Hemiparetic Patients. *Clin Appl Thromb Hemost*. 2019;25:1-11. **Q2; IF: 1.374, Number of independent citations: 2**

Cumulative impact factor of the publications on which the thesis is based: **4,764**

Total impact factor of other publications: **1,615**

Cumulative impact factor: **6,379**

Total number of independent citations: **27**

8.2. Conference presentations and posters related to the topic of the thesis

Kiss G, Szabó D, Tékus É, Makai A, Járomi M, Mintál T. A véna betegek életminőségét felmérő nemzetközi kérdőív magyar nyelvű validálása. *XX Országos Sprorttudományi Kongresszus*. 2023. Pannon Egyetem, Veszprém, Hungary. /ORAL PRESENTATIONS/

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8.3. Other scientific publications

Szabó D, **Kiss G**, Tékus É, Mintál T. Testtartási paraméterek jelentősége utánpótláskorú úszók vállfájdalma esetén. *Magyar Sporttudományi Szemle*. 2023/2;24(102):107-108.

Tékus É, Cselkó A, **Kiss G**, Szabó D, Garai K, Világos B, Tar S, Sándor B, Horváth-Szalai Z, Kőszegi T, Wilhelm M, Mintál T. A nyál kortizol változása jelezheti előre a felsőlégúti infekciókat sportolóknál? *Magyar Sporttudományi Szemle*. 2023/2;24(102):118.

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Szabó D, **Kiss G**, Tékus É, Nemes V, Gőcze K, Mintál T. Sportágspecifikus jóga alkalmazása felnőtt labdarugók agilitási képességének fejlesztésére. *Mozgásszervi Továbbképző Szemle*. 2021;4(2):29-32.

Telek L, **Kiss G**, Bors V, Hock M. A testtartásért felelős izmok állapotának felmérése és az egyensúlyozó képességre kifejtett hatásuknak vizsgálata kisiskolás gyermekeknél. *Magyar Sporttudományi Szemle*. 2021;22(91):116-161.

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8.4. Other conference presentations and posters

Szabó D, **Kiss G**, Tékus É, Mintál T. Testtartási paraméterek jelentősége utánpótláskorú úszók vállfájdalma esetén. *XX. Országos Sporttudományi Kongresszus*. 2023. Pannon Egyetem, Veszprém, Hungary.

Tékus É, Cselkó A, **Kiss G**, Szabó D, Garai K, Világos B, Tar S, Sándor B, Horváth-Szalai Z, Kőszegi T, Wilhelm M, Mintál T. A nyál kortizol változása jelezheti előre a felsőlégúti infekciókat sportolóknál? *XX. Országos Sporttudományi Kongresszus*. 2023. Pannon Egyetem, Veszprém, Hungary.

Szabó D, **Kiss G**, Tékus É, Mintál T. Gyermek labdarugók idegrendszeri fejlettségének feltérképezése, azaz - Ügyetlen vagy éretlen? *Magyar Gyógytornász-Fizioterapeuták Társasága XIII. Kongresszusa*. 2022. Nemzeti Színház, Budapest, Hungary.

Kiss G, Szabó D, Schlégl Á, Mintál T. Achilles tendinopathia sceletalis okainak vizsgálata az EOS 3D segítségével. *20 éves a pécsi gyógytornász képzés: Jubileumi emlékülés és szakmai továbbképzési konferencia*. 2019. Pécs, Hungary.

Szilágyi B, Makai A, Tardi P, Hock M, Kovácsné Bobály V, **Kiss G**, Ács P, Járomi M. Testtartás, törzsizomerő és lumbális motoros kontroll vizsgálata 6-7 éves gyermekek körében. *20 éves a pécsi gyógytornász képzés: Jubileumi emlékülés és szakmai továbbképzési konferencia*. 2019. Pécs, Hungary.

Kiss G, Járomi M, Makai A, Ács P. Habituális és helyesnek vélt testtartás vizsgálat utánpótláskorú kajak-kenu sportolóknál. *Magyar Sporttudományi Társaság Fiatal Sporttudósok IV. Országos Konferenciája*. 2016. Budapest, Hungary.

Kiss G, Járomi M. Lumbális motoros kontroll vizsgálat és fejlesztés kajak-kenu sportolóknál. *Magyar Sporttudományi Társaság XII. Országos Sporttudományi Kongresszus*. 2015. Eger, Hungary.

Járomi M, Molics B, Hock M, Leidecker E, Thanné Tari J, Bobály V, **Kiss G**, Fonai A, Makai A, Kránicz J, Ács P. A fizikai aktivitás szerepe az aspecifikus low back pain szindróma rehabilitációjában. *XII. Országos Sporttudományi Kongresszus*. 2015. Eger, Hungary.

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Kiss G, Járomi M. Lumbális motoros kontroll fejlesztés az utánpótlás kajak-kenu sportolók körében (poszter). *Magyar Sporttudományi Társaság X. Országos Sporttudományi Kongresszus*. 2013. Nyíregyháza, Hungary.

Kiss G, Járomi M. Lumbális motoros kontroll fejlesztés az utánpótlás kajak-kenu sportolók körében. *Pécsi Tudományegyetem Egészségtudományi Kar XIX. Kari Tudományos Diákköri Konferencia Sporttudományi Szekció*. 2013. Pécs, Hungary. **(1st place)**

8.5. Book chapters

Vass L, Bohner-Beke A, Járomi M, **Kiss G**, Molics B. Osztálytermi tartáskorrekciók: Gyakorlatgyűjtemény (ISBN 978-963-642-904-1). *Pécsi Tudományegyetem Egészségtudományi Kar.* Pécs, Hungary. 2015;29-44.

Laczkó T, Melczer Cs, Cselik B, Kovácsné Bobály V, **Kiss G**. Egészségsport alapjai (ISBN 978-963-642-960-7). *Pécsi Tudományegyetem Egészségtudományi Kar*. Pécs, Hungary.2015;162-175.

Tóthné Steinhausz V, Tóth K, Járomi M, **Kiss G**, Makai A, Molics B. Tudatos ülés gerinciskolája általános iskolásoknak (Az iskolai testnevelésben rendszeresen végzendő tartáskorrekciót kiegészítő gerinciskola) (ISBN 978-963-642-957-7). *Pécsi Tudományegyetem Egészségtudományi Kar*. Pécs, Hungary. 2015;149-154.