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INTRODUCTION

From the 25th to the 27th of April, 2007, at the Faculty of Physical Culture, Palacký University in Olomouc, the now traditional international student conference in the field of kinanthropology, Full colours conference took place.

It was participated in by 52 colleagues from the Czech Republic (from Olomouc, Prague, Brno) and from Slovakia (Bratislava). All contributions in fulltext format are available on CD ROM (ISBN 978-80-244-1703-5) together with photographs from both the conference itself as well as the accompanying program which interested parties can order at the following address: lucie.spatenkova@upol.cz.

From the 52 presented contributions, experts chose 9 of the best quality texts, deserving of broad popularization, which are therefore being published in this issue of the journal *Acta Universitatis Palackianae Olomucensis. Gymnica.* All contributions have successfully passed through the review process and have been considered by their reviewers to be suitable for publication.

It is with pleasure that I may close this year's student conference with a feeling of having successfully combined its scholarly with its accompanying program. On the following pages we find evidence of the beginnings of newly interested parties as they start down the path of expert scholarly work in the field of kinanthropology. We trust that the results of the kinanthropological research of today's students are something we can look forward to encountering in the future as well.

Ivo Jirásek
The Chairman of the Organizing Committee of the Conference

The international study program of Erasmus Mundus (www.erasmusmundus.be) is a further area in which students can create a profile for themselves in both a scientific as well as a research direction.

The presented study network for Adapted Physical Activity is made up of 4 universities, the coordinating organization of which is the Free Catholic University in Leuven (Belgium), where students, in the course of the autumn (in Czech we call it the "winter") semester become acquainted with a thorough theoretical base. In the spring (in Czech "summer") semester that follows, they then study at selected universities in the towns of Limerick in Ireland, Oslo in Norway or in Olomouc in the Czech Republic. Practice in the field in the environment of people with special needs, leading to research work are the main content of this study phase.

The best final work of the students of the Erasmus Mundus program, specializing in Adapted Physical Activity, are now being published in this journal.

The connection between a student and the supervisor of his or her paper, and in some cases such a relationship extends also to other research workers, contributes to high quality work and in this way leads to further international scientific cooperation in the future.

Hana Válková
Representative of the Palacký University in the Consortium of Erasmus Mundus
Master in Adapted Physical Activity

ÚVOD

Ve dnech 25.–27. 4. 2007 se na půdě Fakulty tělesné kultury Univerzity Palackého v Olomouci uskutečnila již tradiční mezinárodní studentská konference v oboru kinantropologie, Konference plná barev.

Jednání se aktivně účastnilo 52 kolegů z České republiky. Všechny příspěvky jsou k dispozici ve fulltextové podobě na CD (ISBN 978-80-244-1703-5) spolu s fotografiemi z jednání i z doprovodného programu, jež si mohou zájemci objednat na adrese lucie.spatenkova@upol.cz.

Z 52 přednesených příspěvků bylo odborníky vybráno 9 nejkvalitnějších textů, které si zasluhují širší popularity, a proto jsou publikovány v tomto čísle časopisu. Všechny příspěvky prošly úspěšně recenzním řízením a byly recenzenty shledány jako vhodné k publikaci.

S radostí mohu uzavřít letošní studentskou konferenci s pocitem úspěšné kombinace odborného i doprovodného programu. Následující stránky jsou svědectvím o vykročení nových zájemců na cestu odborné práce v oboru kinantropologie. Věřme, že s výsledky kinantropologického bádání dnešních studentů se budeme moci setkávat i v budoucnu.

Ivo Jirásek
předseda organizačního výboru konference

Mezinárodní studijní program Erasmus Mundus (www.erasmusmundus.be) je další oblastí, v níž se studenti mohou profilovat vědeckým a výzkumným směrem.

Prezentovaná studijní síť je tvořena konsorciem universit: koordinujícím pracovištěm je Free Catholic University in Leuven (Belgium), kde studenti v průběhu zimního semestru absolvují hutný teoretický základ. V následujícím letním semestru pak studují na zvolených universitách ve městech Limerick (Irsko), Oslo (Norsko) nebo Olomouc (Česká republika). Praxe v terénu v prostředí s osobami s postižením a navazující výzkumná práce je hlavním obsahem této studijní fáze.

Nejlepší závěrečné práce studentů programu Erasmus Mundus in APA, kteří zvolili Fakultu tělesné kultury v Olomouci, jsou publikovány v tomto časopise.

Spojení studenta a vedoucího práce, případně i dalších účastníků výzkumu, přispívá jak ke zvýšení kvality práce, tak i k další mezinárodní vědecké kooperaci v budoucnu.

Hana Válková
zástupce Univerzity Palackého v konsorciu studijního programu Erasmus Mundus
Master in Adapted Physical Activity

SECTION
FULL COLOURS CONFERENCE

MULTIMODAL EVALUATION OF THE EFFECTS OF PHYSIOTHERAPY ON STROKE PATIENTS WITH UPPERLIMB INVOLVEMENT

Dagmar Bezděková, Petr Hluštík*, Jaroslav Opavský

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** Faculty Hospital, Medical Faculty, Palacký University, Olomouc, Czech Republic*

Submitted in August, 2007

The aim of this paper was to compile an easy testing battery, sensitive enough to register changes in the motor task performance of the paretic hand and disabled upper limb of patients who have had a brain stroke and are in the chronic stage.

We selected tests commonly used in rehabilitation to scan the characteristics and dynamics of test value changes after 10 kinesiotherapy lessons.

Most of our outcome had the same trend of slight improvement, but did not reach statistical significance because of the size of the group.

Only our pilot outcome is presented in this paper. We are going to continue this study.

Keywords: A self rating depression scale, dynamometer, nine hole peg test, tapping test, target test.

INTRODUCTION

Ischemic stroke is one of the most frequent neurological diseases. Thanks to modern medicine, we are able to use better treatment in the acute phase of stroke, to decrease mortality and lengthen life. Chronic stroke patients typically suffer from residual neurological deficit of varying severity and often do not continue therapy in an outpatient setting. There are marked differences in treatment responses in stroke patients because of the type and degree of neurological disease, polymorbidity, psychological changes and restriction of activities of daily living.

In order to evaluate the effectiveness of physical therapy, it is necessary to test patients at the beginning and at the end of therapy.

In our study, we tested chronic stroke patients' fine motor skills of the hand. We included tests commonly used in rehabilitation and additionally compared clinical measurements of two patients with differential motor cortical response to emotional voice auditory stimulation during a functional MRI examination.

OBJECTIVE

The aim of this paper was to compile a simple testing battery, sensitive enough to register changes in motor task performance of the paretic hand and the disabled upper limb in patients who have had a cerebrovascular stroke and are in the chronic stage of recovery.

METHODS

Questionnaires and tests

1) Mini Mental State Examination (MMSE) (Vaňásková, 2004; Anonymous, 2006) – is a widely used method for assessing cognitive mental status. The evaluation – a score of 30–25 points is standard, whereas a score of 0–15 points indicates a serious cognitive disorder.
2) The modified Ashworth scale of muscle spasticity (Bohannon & Smith, 1987; Opavský, 2003) – spasticity examination. Evaluation extremes – 0 – without increasing of muscular tonus/4(5) – affected areas of body are rigid in flexion or extension.
3) Functional Independence Measure (FIM) (Vaňásková, 2004) – this is useful for scoring locomotion abilities, activities of daily living and cognitive status. In evaluation, the score range is 18–126 points (motor task 13–91 points, mental status 5–35 points). A minimum score means full dependence, whereas a maximum score indicates independence (self sufficiency).
4) The Zung self rating depression scale (Zung, 1965) – a form filled in by the patient. Evaluation extremes – less than 50 points – without depression, 70 points and more – serious depression.
5) Hand functional test (Šíbalová, Hlinecká, & Kačírková, 1995; Mikulecká, 2004) – each patient performs the following finger movements and grips – pinch, hooklet, roof, fist, thumb opposition,

cylinder grip, sphere grip and the like. The evaluation – 0 point – impossible, 1 point – incorrect, 2 points – well done. The maximum score is 16 points.

6) The dynamometer test – handgrip force is measured by a dynamometer (NordCoast Company) in kilograms. The measurement is performed three times and the results averaged.
7) Nine hole peg test – a test of fine motor task performance. The evaluation is made following recommendations of the manufacturer Roylan, Smith & Nephew. The outcome is measured in seconds. The maximum timeout is 7 minutes (420 seconds).
8) The tapping test – frequency of the index finger's movement (Vaverka & Hanuš, 2000) – we tested it with the device developed at the department of biomechanics and cybernetics at the Faculty of Physical Culture, Palacký University in Olomouc.
9) The target test – we tested coordination and the visuospatial skill of the hand (see below).
10) The functional MRI examination (fMRI) – performed at the department of radiology of the Faculty Hospital, at the Medical Faculty, Palacký University in Olomouc.

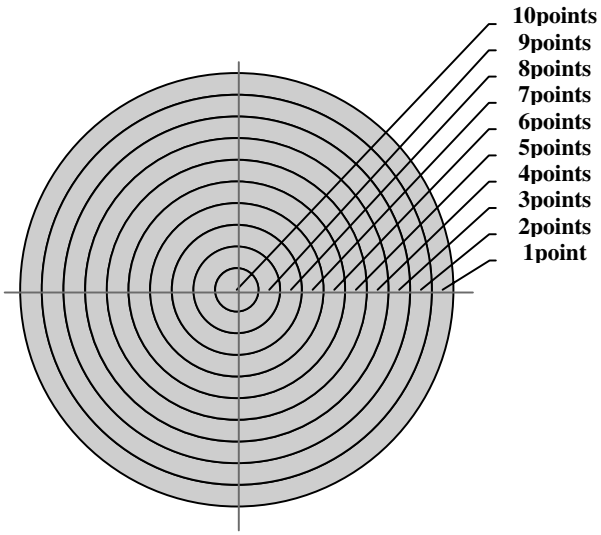
Measurement

Each patient passed an entry investigation, composed of all the described tests and questionnaires. After that, each patient had 10 kinesiotherapeutic lessons (twice a week) and at the end of the therapy process, he/she repeated the testing except for the fMRI investigation.

- The tapping test is done using a special device. The patient performs index finger tapping three times (with breaks) with both hands. One phase of the test takes 15 seconds. The results are processed by the computer. For evaluation we use the average value of three trials with each hand.
- The target test is an original method for the evaluation of the coordination and visuospatial orientation of the arm.

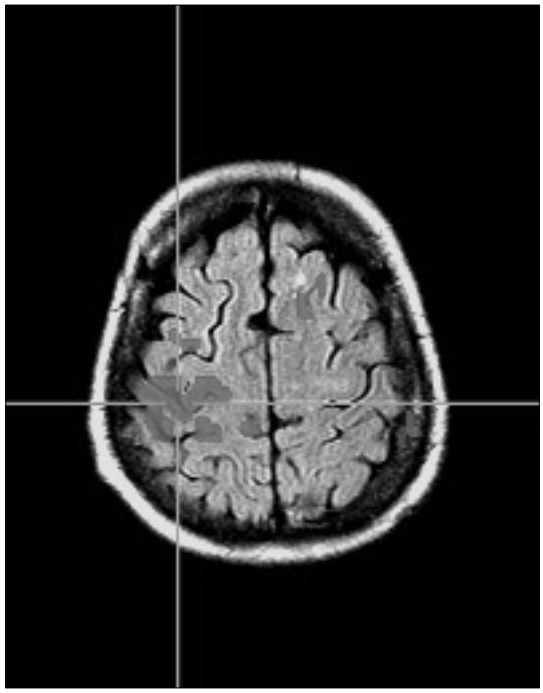
The patient sits in front of a vertical magnetic board within reach of his/her hand. His trunk is fixed to the backrest of the chair to avoid compensatory movements of the trunk. There is a target affixed to the board, which is divided into four equal quadrants (Fig. 1). The patient's task is to put a magnetic dart into the centre of the target. He/she uses his/her right hand and left hand three times each. The sum of points achieved in all trials is recorded and then divided by the number of "hit" quadrants. If the patient hits the same part of the target every time, the total is divided by one, if he hits two different parts, the total is divided by two, etc.

Fig. 1
The target



- The functional MRI examination (fMRI) is performed with Ing. MUDr. P. Hluštík, Ph.D.[1] We present the different findings as an example of fMRI results here, regarding emotive and indifferent voice auditory stimulation on a functional MRI examination during movements of the paretic hand in three patients – Fig. 2, 3, and 4.

Fig. 2



[1] At the department of radiology of the Faculty Hospital, the Medical Faculty, Palacký University in Olomouc. This cooperative effort has been supported by Grant IGA MZ ČR Nr. 8367-3.

Fig. 3

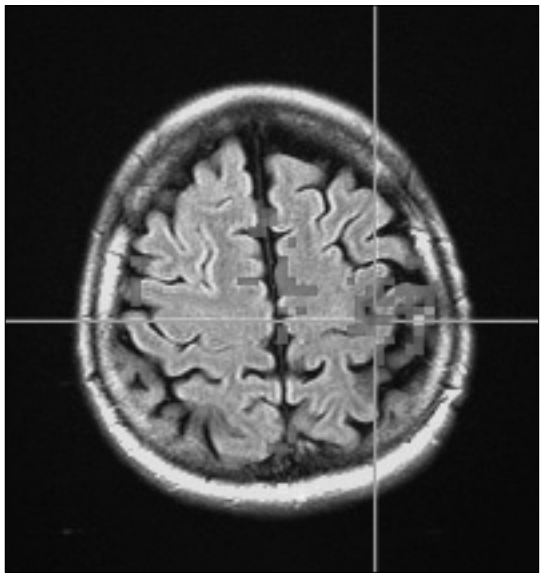
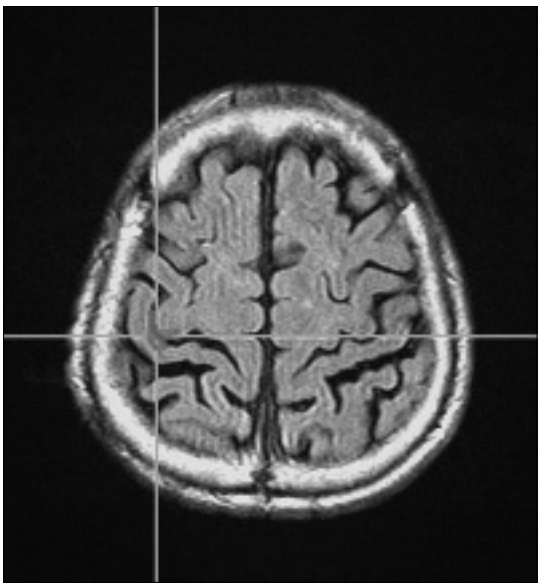


Fig. 4



RESULTS AND DISCUSSION

The group included 7 patients (2 women, 5 men), aged 68 (± 11 years), in the chronic phase of the illness, 2–3 years after having had an ischemic brain stroke which was located in the middle cerebral artery territory.

1) MMSE results – all of the patients reached the range score of 30–24 points. This indicates a normal cognitive mental status, which was also the condition for being included in the group.

2) We tested the elbow and wrist with the modified Ashworth scale for the examination of muscle spasticity. The highest value reached in this test was 3. For the individual scores of muscle spasticity see TABLE 1.

TABLE 1
Examination of muscle spasticity with the modified Ashworth scale

	Elbow				**Wrist**			
	Non paretic hand		Paretic hand		Non paretic hand		Paretic hand	
Patient	before	after	before	after	before	after	before	after
1	0	0	1	1	0	0	3	3
2	0	0	0	0	0	0	0	0
3	0	0	1	0	0	0	0	0
4	0	0	1	1	0	0	1	1
5	0	0	1	1	0	0	0	0
6	0	0	0	0	0	0	1	0
7	0	0	2	1	0	0	3	2

3) FIM results – patients achieved the average value of 85 points in each motor task before and after therapy, and 33 points in mental status. In the overall assessment, they got 117 points from a maximum of 126 possible points. They all were in the zone of self sufficiency. During the 5 weeks, there was no considerable change in the average value.

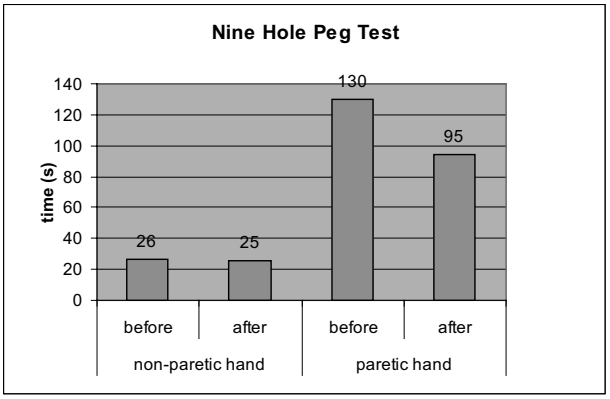
4) The Zung self rating depression scale – before the therapy, 5 patients scored within the range of moderate depression and only 2 patients were without depression. After the therapy, 4 patients were without depression and this happened without using antidepressant drugs. Another 3 patients stayed in the range of moderate depression, but their scores shifted towards the normal range.

5) Hand functional test – we used the percentage from the overall assessment of the healthy hand (referential) for estimation of the condition of the paretic hand. The average score of the paretic hand rose after the therapy from 48% (7.6 points) to 54% (8.6 points) for a maximum of 16 possible points.

6) The dynamometer test – in the representation of the percentage of the maximal force relative to the healthy hand, the average value before the therapy was 52% (15.3 kilograms) and 56% after the therapy (16.5 kilograms).

7) Nine hole peg test – the average results are depicted in Fig. 5. You can see the improvement in this test, but this change did not reach statistical significance due to the small size of the group.

Fig. 5
Nine hole peg test



8) The tapping test – the frequency of the index finger movement – results (the average value from three trials for each person) are showed in TABLE 2. Zero means that the patient could not manage the task. In TABLE 2 we also show the change of duration differences (in seconds) in the nine hole peg test.

TABLE 2
Tapping test

	Number of beats		Frequency (Hz)		9 hole peg test duration change (s)
Patient	before	after	before	after	
1	0	0	0	0	55
4	0	19	0	1.240	65
5	48	60	3.220	4.022	5
6	53	54	3.530	3.580	0
7	10	12	0.644	0.780	120

9) The target test: the results are showed in TABLE 3.

10) The functional MRI examination (fMRI) – we show only 2 findings here for illustration – person A – a right hander with ischemic brain stroke, Fig. 6, 7, person B – a left hander with ischemic brain stroke, Fig. 8, 9. Statistically significant brain activation during movement of the paretic hand is displayed (in red) against a background morphological MR image of the same slice (grey coloured scale). Movement was guided by auditory instructions given with alternatively an emotional (E) tone of voice alternating with an indifferent (I) tone of voice.

Fig. 6
Person A – E

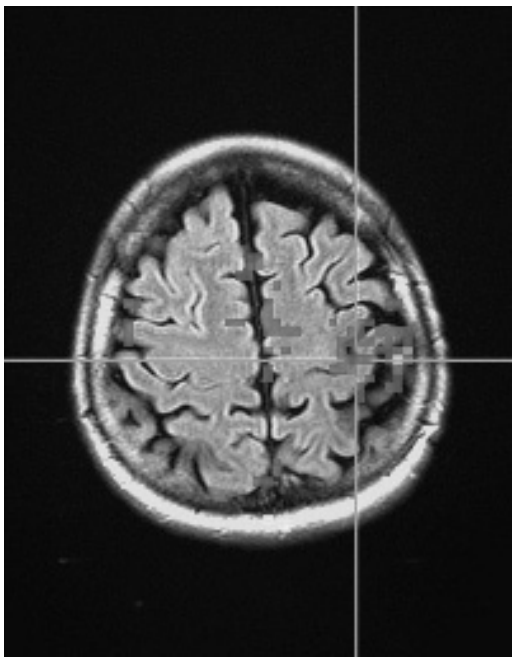


TABLE 3
The target test

	Non paretic hand				Paretic hand			
	Before		**After**		**Before**		**After**	
Patient	Sum of points	Score	Sum of points	Score	Sum of points	Score	Sum of points	Score
1	30	30	30	30	30	30	28.5	28.5
2	30	30	29	29	29.5	29.5	30	30
3	29.5	29.5	30	30	30	30	30	30
4	30	30	30	30	24	12	28	14
5	30	30	30	30	30	30	30	30
6	28.5	28.5	28.5	28.5	29.5	29.5	29	14.5
7	30	30	30	30	0	0	4.5	2.25

Fig. 7
Person A – I

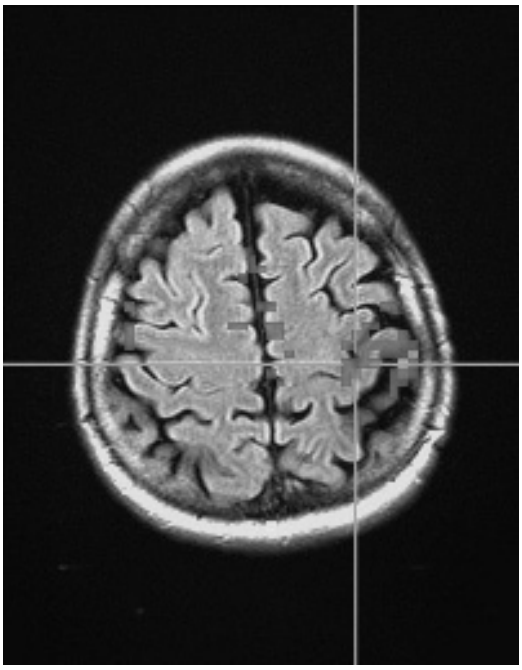
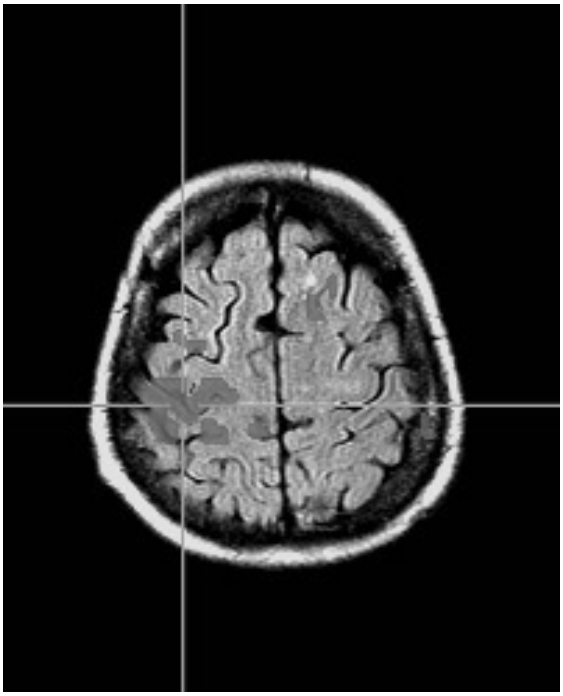


Fig. 8
Person B – E

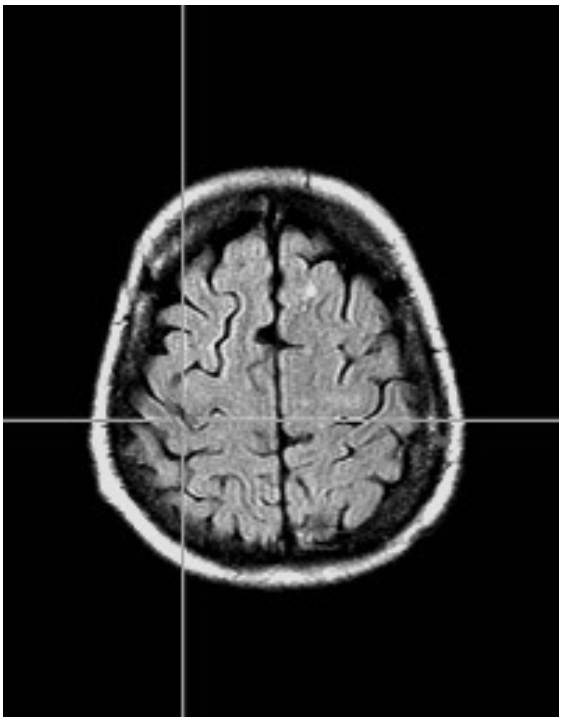


In TABLE 4, we present the changes of differences in the other tests for the persons A and B before and after the therapy. The fMRI findings and the clinical measurement revealed no relationship.

TABLE 4
The changes of differences before and after the therapy by persons A and B

	A	B
FIM	0	0
Hand functional test	0	1
The dynamometer test changes (kgs)	–1.33	–0.34
Nine hole peg test duration change (s)	55	120
Tapping test (number of beats/frequency Hz)	0 / 0	2 / 0.136
The target test	0	2.25

Fig. 9
Person B – I



CONCLUSION

The most significant change after the therapy was registered in the shortening of the time required in order to perform the nine hole peg test. The smallest change occurred in the FIM. The score on the Zung self rating depression scale decreased in all patients, two of them shifted from the range of depression to the normal range (without depression). Changes in the other tests had the same trend of slight improvement, but they did not reach statistical significance. In the dynamometer test, there was paradoxical moderate worsening in some patients.

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MULTIMODÁLNÍ HODNOCENÍ FYZIOTERAPEUTICKÉHO ÚČINKU U PACIENTŮ S POSTIŽENÍM HORNÍ KONČETINY PO CÉVNÍ MOZKOVÉ PŘÍHODĚ

(Souhrn anglického textu)

Úkolem této práce bylo sestavení jednoduché testové baterie, která by citlivě registrovala změny motoriky paretické ruky a postižené horní končetiny u pacientů po cévní mozkové příhodě v chronickém stádiu.

Vycházeli jsme z běžně dostupných testů (Nine hole peg test, dynamometrie apod.), které jsou pro tyto účely v praxi nejvíce využívány, a sledovali jsme charakter a dynamiku jejich změn po 10 rehabilitačních procedurách.

Většina výsledků u vybraných testů měla obdobnou tendenci k mírnému zlepšení, ale vzhledem k rozsahu souboru nedosáhly tyto změny hladiny statistické významnosti. Prezentované nálezy předkládáme pouze jako výsledky pilotní studie. Studie bude pokračovat a soubor bude dále rozšiřován.

Klíčová slova: Zungova sebeposuzovací stupnice deprese, dynamometrie, nine hole peg test, tapping test, test terče.

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AUTONOMIC NERVOUS SYSTEM OBSERVATION THROUGH TO USE OF SPECTRAL ANALYSIS OF HEART RATE VARIABILITY IN ICE HOCKEY PLAYERS

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The aim of our study was to investigate the influence of regular sport training on the activity of the autonomic nervous system (ANS) and to disclose patterns of interrelations between them. The activity of the ANS was evaluated by means of the spectral analysis of heart rate variability (SA HRV). We used complex indices (total score – TS, vagal activity – VA, sympathovagal balance – SVB) and age standardized values of total spectral power (P_T) for SA HRV results evaluation (Stejskal et al., 2002). The study group consisted of four ice hockey players, of whom all were 17 years old. The SA HRV was monitored by using VarCor PF7 hardware and VarCorMulti computer software, which enables four individuals to be measured at the same time. The examination of heart rate variability took place once a week in the morning. Information about the previous day's training load, the duration and quality of sleep, and their self-reported health status (SRH) was also obtained by completing a questionnaire before the SA HRV examination. Overall sports performance was evaluated by the team's coach on a scale of 1 (very poor) to 10 (excellent). The results demonstrated that the player with the highest average TS (0.8) and the highest average P_T (3.22) also showed the most consistent results (SD of TS = 0.74; SD of P_T = 1.02) and objectively the best performance in sport. On the other hand, the player with the lowest average TS (–2.15; SD = 1.42) and the lowest average P_T (–2.52; SD = 1.4) also obtained the lowest average mark in the coach's evaluation of his sports performance. The tendency to progression of the ANS activity was different for each subject. The SRH, which was given before measurements were taken, did not correspond with the results of the SA HRV measurement. We came to the following conclusion: training quality influences the ANS activity and according to changes in the ANS activity we can deduce the athlete's changes in adaptability.

Keywords: Spectral analysis of heart rate variability, sport, ice hockey, training.

INTRODUCTION

Sports performance is determined, among other factors, by the autonomic nervous system's (ANS) activity. A high and balanced level of activity of the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS) results in better training adaptability and thus also in better sports performance. If both branches of the ANS are out of balance or their activity is reduced for a long time, then the ability to train becomes worse and the sports performance decreases (Aubert et al., 2003; Carter et al., 2003; Stejskal, 2004).

Some studies have concluded that heart rate variability (HRV) can be positively influenced by sports training. Endurance training in particular has a positive effect on an increase in HRV and PNS activity, as well as the accompanying bradycardia (Aubert et al., 2003; Carter et al., 2003). Regular sports training modulates the balance between SNS and PNS (Task Force, 1996). Trained athletes have a higher level of HRV than non trained subjects. The HRV can also play an important role in predicting and detecting overtraining, which can be characterized by an impaired autonomic balance (Achten & Jeukendrup, 2003; Aubert et al., 2003).

Thus, the ANS activity is an important factor influencing sports performance. This is particularly valid in individual sports events in which the result could directly depend on the ANS activity and the balance between both branches. In team sports games, an interpretation of interrelationships between sports performance and the ANS activity is far more complicated. The sports result is not usually based only upon the performance of the individual athlete but also on the very important role played by the interference of many factors (e.g. skill level, teamwork in teammates and opponents, decisions of referees, etc.). However, individual sports training in team games is increasingly emphasized. In addition, the ANS activity evaluation could be used not only in sports training but also in the selection of promising players and the choice of which positions they will play.

The HRV can be evaluated by means of many methods (Task Force, 1996). Spectral analysis of heart rate variability (SA HRV), which can be classified as frequency domain analysis, enables researchers to quantify

the activity of the ANS quickly and easily (Stejskal & Salinger, 1996). Three main spectral components are distinguished in a spectrum calculated from short term recordings: very low frequency (VLF), low frequency (LF), and high frequency (HF). All these components are influenced by particular physiological mechanisms, which enable researchers to determine directly or indirectly the activity and balance of the SNS and PNS (Stejskal & Salinger, 1996; Task Force, 1996). The results of the SA HRV can be interpreted more sensitively by means of complex indices (Stejskal et al., 2002). In sports practice, the changes in complex indices allow researchers to appropriately adjust a training load to the athlete's actual readiness for practice and also restrict the risk of overtraining. The result should be the maximal development of abilities and the improvement of sport performance. This way of optimizing the training load is based on repeated SA HRV measurements through which the optimal range of the total score (TS) is determined. All following SA HRV examinations are related to this range and the training load is recommended. The changes in sympathetic and parasympathetic activity are evaluated in the crosswise graph, where the complex indices VA (vagal activity) and SVB (sympathovagal balance) are projected (Stejskal et al., 2002; Stejskal, 2004).

This study is the first step towards using longitudinal measurements of the HRV in ice hockey. The aim of the study is to assess development of the ANS activity during the sports season and its possible relationship to sports performance.

METHODS

The study group comprised four ice hockey players, all were 17 years old. We obtained the values of the complex indices (total score – TS, vagal activity – VA, sympathovagal balance – SVB) and age standardized values of total spectral power (P_T) (Stejskal et al., 2002) by examining the SA HRV. For the measurement of the SA HRV and the data evaluation of the SA HRV we used the VarCor PF7 (Salinger et al., 2006) and VarCorMulti computer software (unpublished), which enables four subjects to be measured at the same time. We used orthoclinostatic stimulation (supine – standing – supine), which was described in a previous study (Šlachta et al., 2002). Each measurement took place in the morning, undisturbed in a quiet room. The condition of the ANS was monitored mostly once a week. Three players were measured for a period of five months, one player for three months. For each examination of the SA HRV, the subjects completed a questionnaire about their previous day's training load (RPE scale; Borg, 1970; Borg & Kaijser, 2006), the duration and quality of sleep, and their self-reported health status (SRH) (on a scale 1 = very poor, 10 = excellent). This state was characterized by complete physical and mental well being. The team coach evaluated game performance every week in which the team played a match, and the SA HRV was also measured. We used a simple scale from 1 to 10 (1 = very bad, 10 = excellent).

The data was statistically evaluated by Microsoft® Office Excel 2003 computer software.

RESULTS

A total of 72 measurements of the SA HRV were obtained: 21 from player A, 19 from player B, 20 from player C, and 11 from player D. Average values of the TS and the P_T are shown on TABLE 1. Players A, B, and C were measured in the period from 09/26/2006 to 02/27/2007 and player D in the period from 11/21/2006 to 02/27/2007. The head coach also evaluated actual game performance (scale 1 = very bad, 10 = excellent). The average values are also shown on TABLE 1.

TABLE 1
Total score (TS), total spectral power (P_T), and average mark of game performance

	Number of measuring	TS		P_T		GP
		$\bar{x}$	SD	$\bar{x}$	SD	
Player A	21	–1.41	1.42	–0.81	2.56	7.0
Player B	19	0.80	0.74	3.22	1.02	6.1
Player C	20	–2.15	1.42	–2.52	1.40	5.9
Player D	11	–0.75	0.95	1.69	1.38	6.3

Legend
$\bar{x}$ – average
SD – standard deviation
GP – average mark of game performance by coach

The ANS activity developed differently for each player during the study. TS and P_T increased significantly from the 11th SA HRV measurement for player A. His game performance, as evaluated by the coach, decreased slightly and reached an average score of 7.0. Player B achieved the highest values of TS and P_T in the long term. These values were also the most consistent. The coach evaluated this player with an average score of 6.1, which was the 3rd highest. For the player C, the progression of the TS and P_T formed a wave pattern. From around the 14th or 15th SA HRV measurement, the values of the TS and P_T increased gradually, and this was accompanied by increased evaluation scores for game performance. The progression of P_T for player D had a tendency to increase constantly, but

the value of TS was stable at the beginning. The evaluation of game performance was between a score of 6 and 8. Between the 8th and 9th SA HRV measurement, the value of P_T decreased significantly but temporarily. At the same time, the score for game performance became distinctively worse. After that, the value of P_T increased again, but the value of TS and game performance decreased. All the TS and P_T values are shown on TABLE 2.

TABLE 2
Total score (TS) and total spectral power (P_T) for each player

Player A		Player B		Player C		Player D	
TS	**P_T**	**TS**	**P_T**	**TS**	**P_T**	**TS**	**P_T**
−2.15	−3.46	1.34	3.84	−1.70	−3.90	−1.50	−1.34
−4.41	−4.41	0.47	2.03	−4.47	−4.47	−1.45	−0.66
−1.46	0.02	−0.49	3.84	−2.95	−3.08	−0.82	1.61
−0.65	0.66	0.38	3.40	−0.76	−0.60	−1.19	1.89
−2.21	−0.30	0.51	3.39	−1.41	−3.08	−0.62	0.21
−3.27	−3.14	1.64	3.62	−1.42	−1.68	−1.56	2.34
−1.58	−1.34	−0.38	4.74	−0.41	−0.01	−1.18	3.00
−4.07	−4.07	0.93	3.98	−2.31	−2.79	−1.17	3.95
−1.63	−3.52	1.26	2.82	−4.62	−4.62	1.59	1.26
−3.47	−2.40	1.32	3.14	0.01	−1.86	0.61	2.77
−2.21	−3.92	−0.19	0.31	−2.73	−3.09	−0.96	3.56
−0.01	1.15	2.35	2.57	−1.26	−0.03		
0.13	−0.18	1.58	2.91	−4.41	−4.41		
−0.30	3.24	0.60	3.47	−3.66	−2.61		
−0.92	1.82	1.02	3.26	−1.66	−3.25		
0.21	1.77	1.06	4.59	−3.33	−2.99		
−0.13	3.87	1.39	2.81	−0.37	−2.91		
−0.72	2.21	0.41	2.10	−2.92	−2.56		
−0.30	−3.19	0.05	4.34	−1.58	−2.52		
−0.14	−2.97			−1.05	−0.01		
−0.29	1.26						

Part of the questionnaire completed by the players before every SA HRV measurement, was the SRH. The correlation of this evaluation and the results of the SA HRV showed that the subjective evaluation and the ANS activity did not relate to one another.

TABLE 3
Dependence of the total score for the SRH before SA HRV measurement

Correlation coefficient ($p < 0.05$)	
Player A	−0.063
Player B	0.049
Player C	0.015
Player D	−0.005

Legend
p – significant level

DISCUSSION

The results of our study confirm that the ANS activity is an important factor which influences sports performance. Player B, who achieved the highest values of TS and P_T, was in a line up for nine games with the Czech ice hockey team U18 during the period in which the SA HRV measurements were taken. Although his average mark for game performance was only 6.1, we can say that this player achieved the best sports success. Repeatedly, his SA HRV results were above average and also relatively stable. This means that his ANS is able to respond to training loads very effectively. Thus, this player has the potential to succeed in professional sports.

Player D achieved the second best SA HRV results. He was also in the line up for two games with the Czech ice hockey team U18 during the period of the SA HRV measurements. The progression of TS and P_T values was similar to the progression of game performance. TS did not noticeably change at the beginning and P_T increased gradually. TS and P_T changed notably from the 8th SA HRV measurement onwards. These differences were followed by changes in game performance. Objective information about the current condition of the ANS obtained by SA HRV measurement was supported by the coach's opinion about the player's game performance.

Player A achieved the best average score for game performance. His SA HRV results were below average until the 11th SA HRV measurement and were mostly in the lower left quadrant of the crosswise graph (Stejskal, 2004). This indicates a relevant decrease in the ANS activity and an imbalance between both subsystems. A position in the lower left quadrant can be a marker of overreaching due to high training intensity and insufficient recovery. TS and P_T values increased significantly from the 11th SA HRV measurement. Since then the appraisals for game performance had started to become relatively high. P_T decreased meaningfully at the 19th and 20th SA HRV measurements, and this fact was noticed by the coach as a decline in game performance. This variation in P_T value and game performance was only temporary.

From the long term aspect, the lowest ANS activity has been shown in player C. Occasional positive changes in TS and P_T values were rather short term and came only after several days without training or reduction in a training load. Thus, we presume that the recovery of player C is considerably slower and his ability to cope with the training load is lower than in players A, B, and D. He also obtained the lowest average mark of game performance by the coach, and he was not always in the line up for league games. The P_T values increased slightly from the 14th SA HRV measurement and the TS

also had a tendency to increase. We claim that these changes were accompanied by an improvement in game performance.

SA HRV measurement is used to optimize the training load in individual athletes. In team games, where athletes practice in large groups, the use of the SA HRV measurement is limited. Sports performance in games depends on a great number of abilities, which fade into one another and compensate for each other. We can find significant differences in abilities among players at the same performance level, because these abilities influence the sports performance of each player differently. From this point of view, the measurement of the ANS activity can not lead to the sports performance prediction or training program modification, because the ANS activity is a result of effects of many factors. Because the SA HRV indicates the immediate ANS activity and also its progression during long term measurement, we can use the SA HRV for the assessment of the athlete's adaptability on the dominating influences. Since the permanent decline of the ANS activity practically negates a good sports performance (it is expression of reduced athlete's adaptability), it is possible to include the SA HRV measurement in training control even in ice hockey or other games.

Results of SA HRV measurement, namely the TS, did not relate to the SRH before examination. Subjective feelings about readiness for training load may not correspond with the current ANS activity. Therefore, objective information about the ANS activity can be a very effective instrument in the optimizing of a training program.

CONCLUSION

Training quality influences the ANS activity and according to these changes we can judge changes to an athlete's adaptability, which can significantly influence sports performance. Thus, the optimizing of the adaptation process via control of training load based on the SA HRV measurement may bring some new aspects to sports training.

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POZOROVÁNÍ AKTIVITY AUTONOMNÍHO NERVOVÉHO SYSTÉMU PROSTŘEDNICTVÍM SPEKTRÁLNÍ ANALÝZY VARIABILITY SRDEČNÍ FREKVENCE U HRÁČŮ LEDNÍHO HOKEJE

(Souhrn anglického textu)

Cílem studie bylo poodhalit vliv pravidelného sportovního tréninku na aktivitu autonomního nervového systému (ANS), která byla hodnocena pomocí spektrální analýzy variability srdeční frekvence (SA HRV). K vyhodnocení výsledků SA HRV byly použity komplexní

indexy (celkové skóre – TS, aktivita vagu – VA, sympatovagová balance – SVB) a věkově standardizovaná hodnota celkového spektrálního výkonu (P_T) (Stejskal et al., 2002). Výzkumný soubor tvořili čtyři hráči ledního hokeje.

Na základě získaných výsledků jsme došli k závěru, že kvalita sportovního tréninku ovlivňuje aktivitu ANS. Změny aktivity ANS, a tím velikosti adaptability sportovce, mohou významně ovlivnit sportovní výkon. Optimalizace adaptačních procesů prostřednictvím kontroly tréninkového zatížení na základě měření SA HRV může přinést nové aspekty řízení sportovního tréninku.

Klíčová slova: spektrální analýza variability srdeční frekvence, sport, lední hokej, trénink.

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KINEMATIC ANALYSIS OF POSTURAL CHANGES IN BIPEDAL STANCE AT APPLICATION OF STIMULUS FROM EXTERNAL ENVIRONMENT AND MODIFICATION OF VISUAL SCENE IN PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Tears and rupture of the anterior cruciate ligament (ACL), which has an important function in knee joint stability, are very common and more so in sports. ACL injury can be managed in two ways. One alternative pertains to conservative therapy whereas the second variant is surgical intervention (reconstruction). The number of ACL reconstructions has risen recently. The purpose of this study was to analyze the postural changes in bipedal stance at application of a stimulus from external environment and the resultant modification in the visual scene in patients with ACL reconstruction. The examined group consisted of 25 subjects – 11 patients with ACL reconstruction and 14 healthy adults. The external stimulus was realized by striking a flying ball; the modification of visual scene was obtained using special glasses. The 3D videography method was applied to evaluate postural changes. The most differences during three various monitored measurements were found for kinematic parameters of the lower limbs and the trunk in each group (both patients and healthy subjects). Statistically significant differences between the group of patients and healthy subjects (between both groups) were obtained for comparison of measurements with an unmodified visual scene and measurements with a modified visual scene, especially for the elbow and shoulder joints.

Keywords: Anterior cruciate ligament (ACL), proprioception, visual modified scene, 3D videography.

INTRODUCTION

The anterior cruciate ligament (ACL) plays a key role in assuring stability of the knee joint. Afferent information from ACL mechanoreceptors significantly participates in facilitating dynamic stability of the knee joint. This somatosensory information, as well as information from the visual and vestibular receptors, contributes to the maintenance and control of bipedal stance, posture and balance in a particular position during movement. A considerable modification of the sensory information, disturbance of the functional stability of the knee and impairment of postural control can occur due to traumatic ACL injury or ACL reconstruction (Harrison et al., 1994; Hoffman et al., 1999; Bonfirm et al., 2003; Liu-Ambrose et al., 2003). Impaired postural control measured by balance in the case of single limb stance has been reported after acute and chronic ACL injuries, as well as after ACL reconstructions (Lysholm et al., 1998; Hoffman et al., 1999; Denti et al., 2000; Henriksson et al., 2001).

Vision is particularly important in stabilizing posture under more challenging conditions or if the proprioceptive information from the lower limbs is reduced (ankle, knee injuries, amputees, etc.) (Lord & Menz, 2000). Okuda et al. (2005) investigated the type of role played by vision in patients with LCA insufficiency during maintenance of postural stability. Notably, there was no significant difference between the injured and uninjured legs regarding postural sway during one leg standing with the eyes open, but the amount of postural sway increased significantly with the eyes closed. Pursuant to these results it can be inferred that vision appears to be dominant in compensating for reduced and/or compromised contribution by the injured (or reconstructed) ACL especially under more challenging conditions.

Modification of the visual scene and contemporary application of stimulus from an external environment can culminate in higher demands on balancing ability, especially as regards the lower limbs and the trunk. Our interest was focused on the question of whether the potential deficit in proprioception is manifested by postural changes under simple motor test conditions (hitting of a ball on arms raised forward) and how the visual system reacts in order to compensate for this deficit.

The purpose of this study was to analyze, by means of kinematic analysis, the postural changes in the bipedal stance at the application of a stimulus from the external environment and the resultant modification of the visual scene in patients with ACL reconstruction.

SUBJECTS

A total of 25 individuals agreed to participate in this study. Fourteen healthy individuals who reported no history of significant orthopaedic knee injury or balance related disorders served as the control group. The control group comprised 7 females and 7 males (age 24.9 ± 3.5 years, body weight 70.6 ± 9.4 kg, height 174.4 ± 10.3 cm). For the ACL reconstructed group, the mean age was 25.4 ± 6.9 years, weight was 70.5 ± 10.7 kg and the height was 174.2 ± 9.5 cm. The 4 females and 7 males had undergone reconstruction of the ACL with patellar tendon graft (7 patients) or hamstring tendon graft (4 patients). The average post surgery period was 51 days.

METHODS

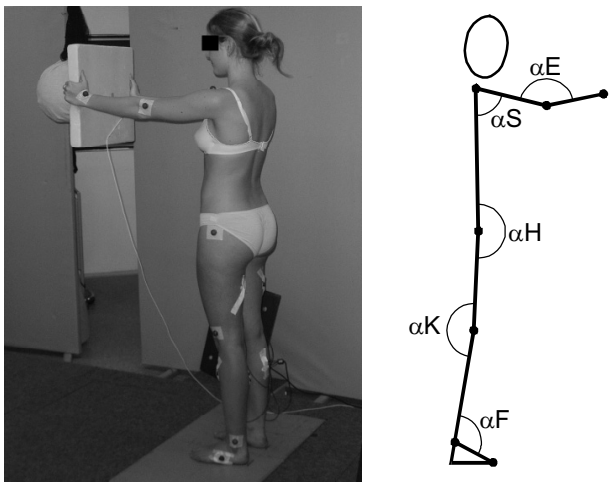
Special hardware Olympus Eye trek FMD-700 (Fig. 1) was applied to modify the visual scene in our research. This optic system has OSR (Optical Super Resolution) for high quality on screen display equivalent to 720 000 pixels. The advantage of this special optical lens system is the possibility of connecting to various external devices (for example connection with a personal computer, television, DVD player, etc.). Connection to the video camera was also incorporated during our measurement.

Fig. 1
Special hardware Olympus Eye trek FMD-700

The experiment used two different visual conditions (scenes) with respect to the form of visual perception. The first part of the measurement took place with full visual control, without any restriction as to special hardware and with real visual perception. This was followed by the next phase where we modified visual perception by using special optical glasses, Eye trek FMD-700. Stimulus from the external environment was applied by reason of major "dynamization" of the situation (by reason of creating a more complicated situation). The impulse was applied by a basketball of variable weight depending on the weight of the subject and from different heights. The weight of the ball was set up so that its momentum at the moment of striking the board conformed to 7% of the weight of the subject. To determine the solid weight (ball + weight) for the given proband we applied the law of conservation of mechanical energy. In the event of zero level potential energy at the bump site applies $m_t gh = ½m_t l^2 \omega^2$, where m_t is the weight of the hanging body/sphere, $g = 9.81\ \mathrm{m \cdot s^{-2}}$, h determines the sphere height before activation with respect to the sphere height after the bump, ω its angular speed and a l is the suspension length. If $v = \omega l = \sqrt{2gh}$ applies, then the conditions for the dynamic of the solid at the moment of the bump is $m_t v = 0.07 m_p$ (where m_p is the proband's weight) we gain for $h = 0.5$ m the relation $m_t = 0.0220 m_p$.

The main task of each subject was to cushion the striking ball with the aid of a light board made of laminated polystyrene, which was held by the subject's raised arms (Fig. 2). A total of 7 attempts were made. The first three measurements were without any visual modification. The other four measurements were conducted with special glasses, whereas the flying ball was caught by the experimenter near the impact site (already out of the visual field of the subject) during third trials with simulated stimulus.

Fig. 2
An illustration of measurement without modification to the visual scene and the evaluated angle parameters



The 3D videographic method was used to evaluate the basic kinematic parameters. Special marks indicating projection of the specific anatomic structures on the body were assigned on the left side of the body of

each subject. These eight structures comprised: the tragus, the acromion, the lateral humerus epicondyl, the capitatum, the major femoral trochanter, the lateral femoral epicondyle, the lateral malleolus, and the capitulum ossis metatarsi quinti. Each subject was filmed by two video cameras, followed by processing of the video record, resulting in kinematic parameters of 3D movement evaluation.

The changes in angle magnitude in the sagittal plane at intervals 0–1600 ms were analyzed. The time 0 ms was characterized as the moment when the experimenter let go of the ball and 600 ms as the impact of the ball on the board. Later, we evaluated the interval 1000 ms following impact. We noted the time run of changes of these angles: metatarsus – shank, shank – thigh, thigh – trunk, trunk – arm, and arm – forearm (Fig. 2).

STATISTICAL ANALYSIS

Data obtained by kinematic analysis were statistically processed by the programme Statistica, version 6.0. The non parametric unpaired test (Mann-Whitney) was used for comparing the two different groups (patients and healthy subjects). Specification of differences between the angles in a single group during various measurements was performed by using the non parametric sign test.

RESULTS AND DISCUSSION

Comparison of the kinematic parameters of a single group of healthy subjects

Significant differences in single kinematic parameters (excepting the angle shank – thigh of healthy subjects) when comparing measurement results with an unmodified visual scene and measurements taken at a modified visual scene with real stimulus were not found for healthy subjects not even after ACL reconstruction (TABLE 1).

TABLE 1
Comparison of kinematic parameters on the lower limbs of the group of healthy subjects

	Aver N		Aver I		Aver II		Comparison of differences		
Metatarsus – shank α_F	**AV**	**SD**	**AV**	**SD**	**AV**	**SD**	**N × I**	**N × II**	**I × II**
Max. (°)	138.50	1.78	138.01	1.73	137.82	1.72	6/8	8/6	9/5
Min. (°)	136.68	1.81	135.62	1.73	134.14	1.74	9/5	13/1 **	12/2 *
Dif. (°)	1.83	0.15	2.39	0.22	3.69	0.25	3/11	1/13 **	1/13 **
Time max. (ms)	0.36	0.11	0.18	0.14	0.38	0.12	7/7	8/6	6/8
Time min. (ms)	0.03	0.09	0.15	0.10	0.36	0.11	4/10	3/11	4/10
Aver 1 (°)	137.40	1.80	136.91	1.76	135.92	1.71	9/5	11/3	11/2 *
Aver 2 (°)	137.64	1.79	136.94	1.72	135.81	1.74	8/6	11/3	12/1 **
Shank – thigh α_K	**AV**	**SD**	**AV**	**SD**	**AV**	**SD**	**N × I**	**N × II**	**I × II**
Max. (°)	171.24	1.34	170.91	1.35	172.47	1.34	7/7	4/10	0/14 **
Min. (°)	168.73	1.28	166.87	1.37	170.13	1.34	13/1 **	3/11	0/14 **
Dif. (°)	2.52	0.35	4.04	0.34	2.34	0.23	2/12 *	6/8	13/1 **
Time max. (ms)	-0.12	0.12	-0.06	0.10	0.45	0.07	6/8	1/12 **	3/11
Time min. (ms)	0.28	0.05	0.30	0.03	0.00	0.13	2/10 *	11/3	11/3
Aver 1 (°)	170.88	1.33	170.62	1.36	170.68	1.35	6/8	6/8	6/7
Aver 2 (°)	169.85	1.30	168.91	1.37	171.56	1.34	11/3	2/12 *	0/13 **

Legend to TABLE 1, 2, 3 and Fig. 3, 4, 5
AV = average
SD = standard deviation
* = $p < 0.05$
** = $p < 0.01$
N = measurements without any modification of the visual scene (non-modification)
I = measurements with modification of the visual scene with a real stimulus
II = measurements with modification of the visual scene with a simulated stimulus
Max. = maximal amplitude of angle in time period 0–1600 ms
Min. = minimal amplitude of angle in time period 0–1600 ms
Dif. = difference between maximal and minimal amplitude of angle in time period 0–1600 ms
Time max. = time of achievement of maximal amplitude of angle in time period 0–1600 ms
Time min. = time of achievement of minimal amplitude of angle in time period 0–1600 ms
Aver 1 = verage magnitude of angle in time period 0–600 ms (before the stroke of a ball)
Aver 2 = average magnitude of angle in time period 600–1600 ms (after the stroke of a ball)
Aver N = average magnitude of angle of three measurements without any modification to the visual scene
Aver I = average magnitude of angle of three measurements with modification to visual scene with real stimulus
Aver II = average magnitude of angle during modified visual scene with simulated stimulus

The number of significant differences increased when a simulated stimulus was applied. Perhaps the best illustration of these changes is provided by the difference between the maximum and minimum degrees of angle. Most of the differences were ascertained for kinematic parameters of the lower limbs and trunk at particular measurements (Fig. 3, TABLE 2). On the other hand, minimum differences for a single angle were obtained for the upper limbs.

Fig. 3
Graphic comparison of the difference between the maximal and minimal degrees of the metatarsus-shank angle (α_F) at single measurements (modification)

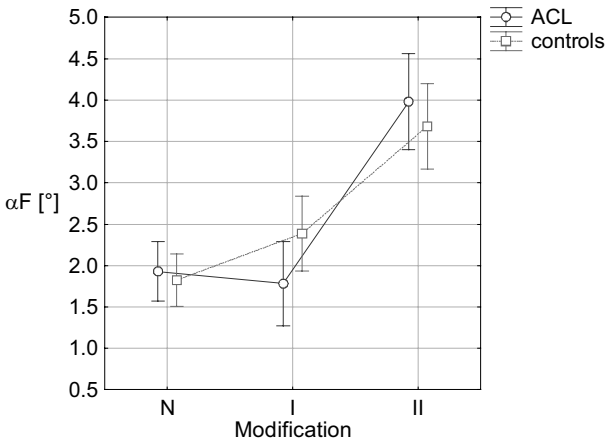


Fig. 4
Graphic comparison of the time of achievement of the maximal value of the arm – forearm angle (α_E) in single measurements (time of stroke – 0 ms on Y-axis)

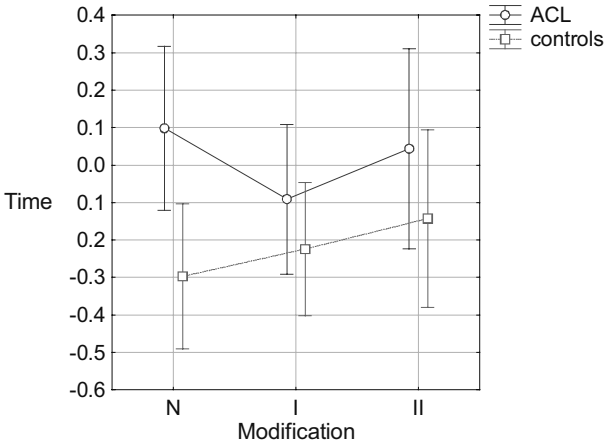


TABLE 2
Comparison of kinematic parameters on the lower limbs of the group of patients

	Aver N		Aver I		Aver II		Comparison of differences		
Metatarsus – shank α_F	**AV**	**SD**	**AV**	**SD**	**AV**	**SD**	**N × I**	**N × II**	**I × II**
Max. (°)	138.83	2.01	138.82	1.95	138.36	1.94	7/4	6/5	9/2
Min. (°)	136.90	2.04	137.04	1.95	134.38	1.96	4/7	10/1 *	11/0 **
Dif. (°)	1.93	0.17	1.78	0.25	3.98	0.28	5/6	0/11 **	0/11 **
Time max. (ms)	0.34	0.13	0.37	0.16	0.27	0.13	4/7	6/5	4/6
Time min. (ms)	–0.02	0.10	0.15	0.12	0.29	0.13	5/6	5/6	4/7
Aver 1 (°)	137.68	2.03	137.20	1.98	136.55	1.93	4/7	10/1 *	10/1 *
Aver 2 (°)	138.03	2.02	137.10	1.94	136.28	1.97	7/4	10/1 *	9/2
Shank – thigh α_K	**AV**	**SD**	**AV**	**SD**	**AV**	**SD**	**N × I**	**N × II**	**I × II**
Max. (°)	172.57	1.51	173.30	1.52	174.80	1.51	3/8	0/11 **	0/11 **
Min. (°)	170.55	1.44	169.67	1.55	172.91	1.52	9/2	0/11 **	0/11 **
Dif. (°)	2.02	0.39	3.63	0.38	1.88	0.26	2/9	6/5	10/1 *
Time max. (ms)	0.10	0.13	–0.20	0.11	0.53	0.08	7/4	2/9	0/11 **
Time min. (ms)	0.22	0.05	0.27	0.03	0.17	0.15	2/8	7/4	7/4
Aver 1 (°)	172.16	1.50	173.08	1.53	173.42	1.52	1/10 *	1/10 *	3/8
Aver 2 (°)	171.63	1.47	171.52	1.55	173.97	1.51	7/4	0/11 **	0/11 **

TABLE 3
The values of test standards for kinematic parameters of the upper limbs during comparison between healthy subjects and patients

ANGLE	Attemp	Max.	Min.	Dif.	Time max.	Time min.	Aver 1	Aver 2
Trunk – arm α_S	N	0.602	0.985	0.164	0.712	0.137	0.876	0.766
Arm – forearm α_E	N	1.478	1.916	–1.642	2.600 **	–0.082	1.369	2.026 *
Trunk – arm	I	1.095	1.204	–0.493	1.724	–2.546 *	0.931	1.040
Arm – forearm	I	2.245 *	2.573 **	–1.752	0.684	–1.177	2.190 *	2.464 *
Trunk – arm	II	1.916	2.245 *	–1.040	1.013	–0.438	1.861	2.245 *
Arm – forearm	II	1.861	2.464 *	–1.150	0.164	–1.177	2.080 *	2.683 **

Comparison of kinematic parameters and measurements between both groups

a) Measurements without modification to visual scene

Statistically significant differences were found at the only angle (arm – forearm) during measurement without any modification to the visual scene between patients and healthy subjects (TABLE 3). The time of achievement of maximal magnitude of the arm – forearm angle and the average magnitude of this angle in the time period 600–1600 ms (after the stroke of a ball) were mentioned as observed parameters. As is illustrated in Fig. 4, it can be inferred that the value of the maximum angle at the elbow is achieved in patients after striking the ball, whereas in healthy subjects this is seen before such a hit. The value of the angle at the elbow in time period 600–1600 ms is greater in the group of patients.

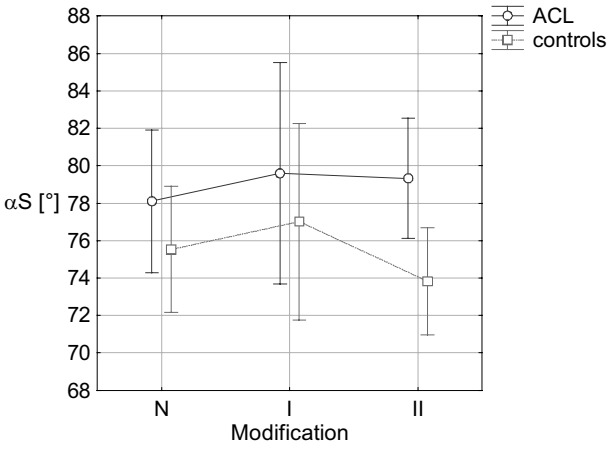
b) Measurements with modification to the visual scene with a real stimulus

More statistically significant differences were found during measurement with a modified visual scene and at the application of a real stimulus in comparison to measurements without special glasses. A possible interpretation thus could be that maintaining postural stability is rather more difficult when the visual scene is changed. Additionally, altered visual function means higher demands on proprioception and vestibular information. More marked differences were evidenced with the arm – forearm angle. Differences at the level of statistically significant $p < 0.05$ were shown for the minimal magnitude of the shank – thigh angle and the time of achievement of the minimal magnitude of the trunk – arm angle.

c) Measurements during a modified visual scene with a simulated stimulus

Measurements carried out during a modified visual scene and a simulated stimulus represented an unexpected situation for each subject. In comparison with the other two measurements mentioned above, where the arm – forearm angle manifested itself as a significant difference, the trunk – arm angle parameters (Fig. 5) showed similar significance. The reaction of subjects to simulated stimuli was more complex (global) as far as the particular segments of body and their connections are concerned, and also more individual – from the strategical aspect.

Fig. 5
Graphic comparison of the minimal magnitude of the trunk – arm angle (α_S) at single measurements (modification)



According to the results mentioned above it is evident that applying special glasses did not have a strong influence on the motor task. Major differences occurred during changes between real and expected situations. It should then be generally true that measurements without any modification to the visual scene be regarded as "posturally simplest" rather than "more challenging" following modification of a visual scene with a real stimulus, and the attempt with a simulated stimulus was relatively specific.

The higher average values of most angles were registered for patients in contrast to healthy subjects. However, the question is how we can interpret and judge

these findings with regard to postural stability. Greater tendencies to extension in almost the majority of the tested joints demonstrated a higher value of the magnitude of particular joints in patients. Many of the joints (knee, elbow) are locked in extension. The stability of the knee joint is highest at full extension (Kapandji, 1991). Therefore, it is rather easier to stabilize the joints only in these extension positions and total proprioception control is thus not indicated. It also manifests itself in the form of smaller demands being made on muscle coordination.

It is, however, possible that proprioceptive changes following ACL injury can occur without affecting any control of standing balance, as suggested by Birmingham et al. (2001) – possibly through compensation by means of visual, vestibular and somatosensory input from receptors in other structures and joints. Corrections of postural sway rendered at the hip and trunk can play a compensatory role intended for maintaining balance, too (Allum et al., 1998).

We supposed that disturbed interpretation as well as the processing of proprioceptive information will be shown in patients with ACL reconstruction, which will manifest in postural changes. Our hypothesis was proven to be true only partially.

One of the reasons here can be the fact that a small group of 25 subjects was investigated. The applied external stimulus could be insufficient and nither was the power of stroke strong. Therefore, the subjects were able to cushion the strike of the ball at the upper part of the body, eventually balancing some postural sways by using ankle strategy. The tested task was not as demanding since not only healthy subjects but also the patients were able to compensate their potential proprioceptive deficit very well. Alternation of knee joint proprioception wasn't manifested and didn't influence essentially the postural control of the lower limbs.

Generally, good health, muscle power and motor abilities could play a substantial role in patients as well. However, the possibility of minimal proprioceptive deficit cannot be excluded in instances such as in cases of its measurement following optimally selected rehabilitation.

CONCLUSIONS

From the stated results it follows that postural demands in a given situation change with modification to the visual scene. Similar tendencies of (in) postural changes were noted in both groups. The most statistically significant differences between both groups (between the group of patients and healthy subjects) were obtained for comparison of measurements with the modified visual scenes, especially for the elbow and shoulder joints. It is not so apparent that the changes observed by us are related to a potential proprioception deficit at the knee joint. The supposed varied postural strategies were not confirmed for the lower limbs.

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KINEMATICKÁ ANALÝZA POSTURÁLNÍCH ZMĚN V BIPEDÁLNÍM STOJI PŘI APLIKACI PODNĚTU ZE ZEVNÍHO PROSTŘEDÍ A MODIFIKACI VIZUÁLNÍ SCÉNY U PACIENTŮ PO PLASTICE PŘEDNÍHO ZKŘÍŽENÉHO VAZU

(Souhrn anglického textu)

Tato studie se zabývá změnami postury při modifikované zrakové scéně a při aplikaci podnětu ze zevního prostředí u zdravých jedinců a u pacientů po plastice předního zkříženého vazu (LCA) za nezměněné a modifikované vizuální scény. Do vyšetřovaného souboru bylo zahrnuto 11 pacientů po plastice LCA a 14 zdravých jedinců. Modifikace vizuální scény bylo dosaženo prostřednictvím speciálního optického systému Olympus – Eye trek FMD-700. Zevní podnět byl realizován pomocí nárazu letícího míče. K hodnocení posturálních změn jsme využili kinematickou analýzu. U pacientů po rekonstrukci LCA i u zdravých jedinců jsme nejvíce diferencí v jednotlivých způsobech provedení nalezli pro kinematické parametry na dolních končetinách a trupu. U obou skupin probandů jsme zaznamenali podobné tendence k posturálním změnám. Při porovnávání kinematických parametrů mezi skupinou pacientů a zdravých jedinců jsme nalezli rozdíly v poloze horních končetin. Pro dolní končetiny a trup (s výjimkou minimální velikosti úhlu bérec – stehno při modifikované scéně s reálným podnětem) nejsou rozdíly mezi oběma skupinami statisticky významné.

Klíčová slova: přední zkřížený vaz (LCA), propriocepce, modifikace vizuální scény, 3D videografická metoda.

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STUDENT TEACHER ABILITY TO APPLY PROGRESSIVE INTERVENTION IN BOTH THEIR MAJORS DURING TEACHING PRACTICE

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It has not been identified yet how prospective teachers perceive the reform of the education system and progressive teaching approaches. The aim of the study was to assess whether students of teaching are adequately prepared to apply the proposed approaches and to what extent they are able to carry them out in physical education and the other majors they study. During their teaching practice in 2002–2005, these students of teaching carried out two types of lessons (habitual and progressive) that were assessed with standardized questionnaires immediately upon the end of the lessons. We analyzed 314 questionnaires completed by students of teaching and 4350 questionnaires completed by pupils in physical education lessons; and 152 questionnaires completed by students of teaching and 3352 completed by pupils in other subjects. The students of teaching have assessed more positively the progressive lessons of physical education than the habitual ones ($p < 0.001$) as they also did in other subjects ($p < 0.001$). More than half of the students of teaching were able to increase the students' role in the lessons in both subjects they taught.

Keywords: Reform, education system, interdisciplinary integration, professional preparation, assessment, student's role, physical education.

INTRODUCTION

The reform of the education system, which is based on goals set by the Ministry of Education, Youth and Sports (2001) and the Výzkumný ústav pedagogický v Praze (The Research Institute of Teaching in Prague) (2005), is to react to the changing conditions in society. In compliance with Pasch, Gardner, Langer, Stark and Moody (1998) we can denote this as a transition from the essentialist concept of education to a progressivist one.

The reform of the education system needs to be reflected in the professional preparation of students of teaching so that they are well prepared for practice. Therefore, practice teaching is important since teacher education students can confront their theoretical knowledge and ideas with reality there.

A progressive teaching approach is considered to be "...a specific management of the education process that emphasizes creativity, individuality, cooperation, and open and active teaching so that independence, creativity, inner activity, self-realization, openness, emotionality and experience are enhanced in students" (Svozil, 2005). Francis and Grindle (1998) have identified the following major characteristics of progressive education: interdisciplinary integration; the teacher as a guide in the education process; an active students' role; student participation in the creation of the curriculum; learning mainly through discovery; inner motivation, external rewards and punishments are not necessary; there is not much emphasis on traditional academic standards; limited testing; emphasis on cooperative group work; learning and teaching inside and outside classrooms; creative expression by students is stressed.

Students of teaching should become acquainted with the changes that the reform of the education system brings. Moreover, it is advisable that student teachers are educated in the proposed way themselves. A curriculum oriented at problem based learning, self-control and self-management can enhance the application of such approaches in students' future practice (Mayer-Smith & Mitchell, 1997). During practice teaching, student teachers should be given the opportunity to apply teaching approaches suggested by the reform. Student teachers need the opportunity to test various teaching approaches (Loughran & Russell, 1997). They need to be provided conditions that support discussion on and comparison of these approaches. Students of teaching are then more responsible when choosing and applying various teaching approaches during practice teaching (MacKinnon & Scarff-Seatter, 1997).

Due to the emphasis that the education reform puts on interdisciplinary integration, this topic needs to be addressed already in teachers' professional preparation. Frömel, Górna and Bartoszewicz (2003) point out the high level of the atomization of didactics of each major in the curricula for students of teaching. The integrating role of the curricula is not sufficiently fostered. Moreover, they argue for the important integrating role of

students' practice teaching, where the student teachers have the opportunity to solve the same teaching task in both their majors.

It has not been properly described yet how the student teachers undergoing the teaching practice perceive the education reform and the requirement to shift to progressive teaching approaches. We need to verify whether students of teaching are, within the framework of their professional preparation, adequately prepared to apply progressive teaching approaches and to what extent they are able to carry these out in physical education lessons and lessons of their other major.

RESEARCH QUESTIONS

- How do the student teachers assess progressive physical education lessons and lessons in the other subjects they are majoring in which they have carried out during their teaching practice periods?
- Are the student teachers successful in applying progressive teaching approaches in physical education lessons and lessons in the other subjects they are majoring in according to students' assessment of these lessons?
- How do the student teachers manage to increase students' role in physical education lessons and in lessons of the other subjects they study?

METHODS

The sample consisted of student teachers studying physical education at the Faculty of Physical Culture at Palacký University and students of elementary and secondary schools, where the PE student teachers carried out their teaching practice. We used data obtained from teaching practice carried out in 2002–2005. To collect the data, we applied the Assessment of physical education lesson questionnaire (Frömel, Novosad, & Svozil, 1999); a version for students and a version for student teachers. Furthermore, we applied a modified version of the former questionnaire for the other subjects – A lesson diagnostic questionnaire. In total, we have analyzed 314 questionnaires filled in by student teachers and 4350 questionnaires filled in by students in physical education; and 152 questionnaires for student teachers and 3352 questionnaires for students in lessons of other subjects.

Student teachers carried out one habitual and one progressive lesson of physical education and one habitual and one progressive lesson of the other major they studied. At the end of these lessons, both the student teachers and students filled in the relevant questionnaires.

The term *"habitual lesson"* (HL) was understood both by student teachers and students to indicate a lesson led intentionally in the most convenient way and as usual, in a lesson verified in practice.

A *"progressive lesson"* (PL) had a similar content and structure as its habitual counterpart, but involved more frequent participation of students in lesson management; increased students' role in the education process, giving them a bigger choice of exercise alternatives; encouraging a higher level of decision making role in students; a higher level of student independence, self-assessment, creativity and a higher level of students' responsibility for their own education.

Before the onset of their teaching practice, the student teachers obtained instructions on how to carry out this experiment, modifications of the commonly taught games and exercises, and model examples of lesson plans.

RESULTS AND DISCUSSION

Assessment of physical education lessons by student teachers

The student teachers assessed the progressive physical education lessons more positively than the habitual ones (TABLE 1). In some dimensions (social, creative, and the students' role), the student teachers assessed the progressive lessons more positively than habitual ones, too. The identified differences were both statistically and practically significant; the size effect was also significant.

Assessment of other lessons by student teachers

In the other subjects taught, the student teachers assessed the progressive lessons more positively than the habitual ones (TABLE 2). In the creative and student role dimensions, the student teachers assessed the progressive lessons of the other subject more positively than the habitual ones, too. The identified differences were both statistically and practically significant; the size effect was also significant.

The impact of progressive intervention carried out by student teachers on the total students' assessment of lessons and students' assessment of the student role dimension

In the experiment, only 67 student teachers (38%) managed to carry out the pair of habitual and progressive physical education lessons and the habitual and progressive lessons in the other subject they major in.

Based on the comparison of mean evaluation in each class for each student teacher, the students assessed both the progressive physical education lessons and progres-

TABLE 1
Assessment of physical education lessons by student teachers in relation to the lesson type

Dimension	HL				PL				p^a	*d*
	M	*SD*	*Mdn*	*IQR*	*M*	*SD*	*Mdn*	*IQR*		
Cognitive	3.49	0.74	4.0	1.0	3.51	0.69	4.0	1.0	0.786	0.031
Emotional	3.76	0.50	4.0	0.0	3.76	0.57	4.0	0.0	0.871	0.018
Health	2.43	0.85	2.0	1.0	2.57	0.87	3.0	1.0	0.137	0.168
Social	**2.67**	0.76	3.0	1.0	**3.02**	0.77	3.0	1.0	0.001*	0.467[x]
Relational	2.62	0.63	3.0	1.0	2.62	0.64	3.0	1.0	0.979	0.003
Creative	**2.31**	1.15	2.0	2.0	**3.45**	0.67	4.0	1.0	0.001*	0.933[x]
Student role	**5.33**	1.50	5.0	3.0	**6.80**	1.15	7.0	2.0	0.001*	0.897[x]
Total 1–6	**17.29**	2.52	17.0	3.0	**18.93**	2.19	19.0	3.0	0.001*	0.728[x]

Legend
HL = habitual lesson
PL = progressive lesson
M = mean
SD = standard deviation
Mdn = median
IQR = inter quartile range
[a] = Wilcoxon match pair test
d = coefficient effect size
*p < 0.05
[x] = significant effect size, practically significant differences in bold

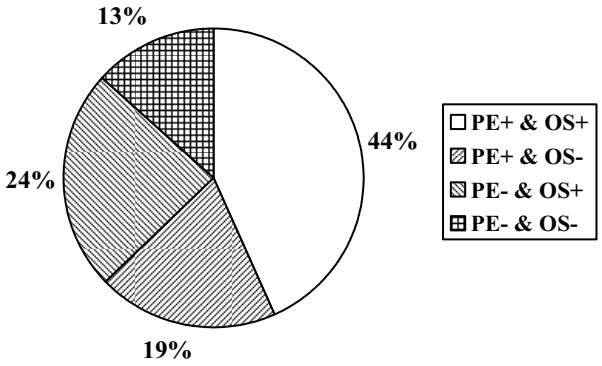
TABLE 2
Assessment of other lessons by student teachers in relation to the lesson type

Dimension	HL				PL				p^a	*d*
	M	*SD*	*Mdn*	*IQR*	*M*	*SD*	*Mdn*	*IQR*		
Cognitive	3.37	0.73	3.5	1.0	3.47	0.74	4.0	1.0	0.264	0.182
Emotional	3.58	0.66	4.0	1.0	3.63	0.81	4.0	0.0	0.050	0.102
Health	1.50	1.05	1.5	1.0	1.67	1.08	2.0	1.0	0.111	0.259[x]
Social	2.84	0.75	3.0	1.0	3.03	0.73	3.0	1.5	0.083	0.283[x]
Relational	2.63	0.69	3.0	1.0	2.75	0.49	3.0	0.0	0.172	0.223[x]
Creative	**2.43**	1.09	2.5	1.0	**3.38**	0.82	4.0	1.0	0.001*	0.787[x]
Student role	**5.71**	1.51	6.0	2.0	**6.72**	1.24	7.0	2.0	0.001*	0.693[x]
Total 1–6	**16.36**	2.86	16.0	3.0	**17.93**	2.60	18.0	3.0	0.001*	0.756[x]

Legend
HL = habitual lesson
PL = progressive lesson
M = mean
SD = standard deviation
Mdn = median
IQR = inter quartile range
[a] = Wilcoxon match pair test
d = coefficient effect size
*p < 0.05
[x] = significant effect size, practically significant differences in bold

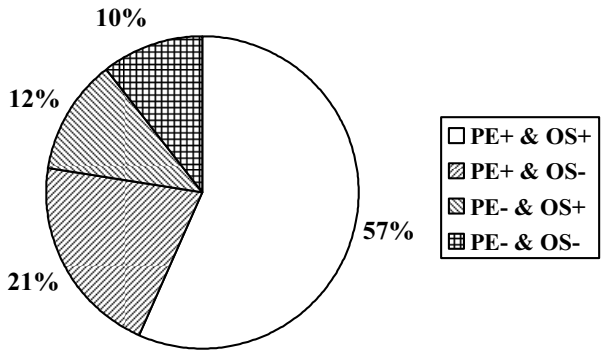
sive lessons of the other subjects more positively than the habitual counterparts in 29 student teachers. The habitual physical education lessons and habitual lessons of the other subjects were assessed more positively than progressive ones in 9 student teachers. In 13 student teachers, progressive physical education lessons and habitual lessons of the other subjects were assessed more positively by students than their respective counterparts. In 16 student teachers, the students assessed more positively the progressive lessons of the other subjects than the habitual ones and habitual physical education lessons than the progressive ones. The results in percentage are shown in a graph (Fig. 1).

Fig. 1
Student teachers according to the total assessment of lessons by students



Legend
The statistical significance of differences in the assessment was not considered.
PE+ & OS+ = students assessed more positively the progressive physical education lessons and simultaneously, progressive lessons of the other subjects than their habitual counterparts.
PE+ & OS– = students assessed more positively the progressive physical education lessons than the habitual ones, and simultaneously, habitual lessons of the other subjects than the progressive ones.
PE– & OS+ = students assessed more positively habitual physical education lessons than progressive ones and simultaneously progressive lessons of the other subjects than habitual ones.
PE– & OS– = students assessed more positively habitual physical education lessons than progressive ones and simultaneously habitual lessons of the other subjects than progressive ones.

Fig. 2
Student teachers according to students' assessment in student role dimension



Legend
The statistical significance of differences in the assessment was not considered.
PE+ & OS+ = students assessed more positively the progressive physical education lessons and simultaneously, progressive lessons of the other subjects than their habitual counterparts.
PE+ & OS– = students assessed more positively the progressive physical education lessons than the habitual ones, and simultaneously, habitual lessons of the other subjects than the progressive ones.
PE– & OS+ = students assessed more positively habitual physical education lessons than progressive ones and simultaneously progressive lessons of the other subjects than habitual ones.
PE– & OS– = students assessed more positively habitual physical education lessons than progressive ones and simultaneously habitual lessons of the other subjects than progressive ones.

All the differences in the total assessment of lessons were considered without regarding their statistical significance.

Out of the total of 67, thirty-eight student teachers managed to carry out progressive lessons both in physical education and the other subject in such a way that students assessed them more positively in the student role dimension than the habitual ones. In 7 student teachers, the students assessed both the habitual physical education lesson and the habitual lesson of the other subject more positively in the student role dimension than in the progressive ones. In 14 student teachers, the students assessed the progressive physical education lesson and the habitual lesson of the other subject more positively in the student role dimension than their respective counterparts. Simultaneously, students assessed the progressive lessons of the other subject and habitual physical education lessons in the student role dimension more positively than their respective counterparts in 8 student teachers (Fig. 2).

The differences in the student role dimension were considered without regarding their statistical significance.

We have found that student teachers assessed progressive lessons more positively than habitual ones both in the total and in the student role dimension. The assessment was positive for both physical education and the other major they taught, which confirms the results of previous studies (Svozil et al., 2004).

Based on the total assessment of lessons by students, the student teachers managed to carry out progressive teaching approaches and to increase students' role in the education process and hence to positively influence students' assessment in at least one of the subjects they taught. However, in 13% of student teachers the progressive intervention was reflected negatively in students' assessment in both subjects they taught and 10% of student teachers did not manage to increase students' role in either of the subjects. It was not possible to explain the negative reflection exactly due to the fact that only the shift in the assessment of the student role dimension was evaluated; not the objective level of the student role in the educational process. Hence the negative reflection in some student teachers could be interpreted as their incapacity to apply the progressive approach as well as the result of an excessive application of such an approach.

Although the instructions for student teachers on how to carry out the progressive intervention were mainly applicable to physical education, most of the student teachers (69%) managed to carry out the intervention successfully and increase the assessment of student role dimension by students also in other subjects they taught. It indicates that student teachers are able to apply knowledge gained in one major also in their other major and it confirms the effectiveness and advantages of double major study programs for teachers.

The impact of progressive intervention carried out by student teachers on the total students' assessment of lessons and students' assessment of the student role dimension needs to be verified on a larger sample in the future. In that case, the differences in students' assessment of lessons should be considered regarding their statistical significance.

CONCLUSIONS

- Student teachers assessed in total more positively progressive lessons than habitual ones in both physical education and their other major.
- More than half of the student teachers were able to increase their students' role in the education process in both subjects they taught.
- The reason why some student teachers were able to increase students' role in the education process and the students' assessment by applying progressive intervention only in one subject needs to be further examined. We recommend doing a comparative analysis of study programs focusing on didactics.

Acknowledgments

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ÚSPĚŠNOST PRAKTIKANTŮ NA PEDAGOGICKÉ PRAXI PŘI APLIKACI PROGRESIVNÍHO PŘÍSTUPU V OBOU APROBAČNÍCH PŘEDMĚTECH

(Souhrn anglického textu)

V současnosti není dostatečně známo, jak problematiku reformy edukačního systému a z ní vyplývající směřování k progresivnímu pojetí vzdělávání vnímají praktikanti na pedagogických praxích. Cílem studie bylo ověřit, zda jsou studenti učitelství v rámci profesní přípravy adekvátně připravováni na aplikaci prosazovaného progresivního přístupu a do jaké míry jsou schopni jej realizovat v tělesné výchově i v druhém předmětu své studijní aprobace.

Praktikanti dle instrukcí a modelových příkladů realizovali mezi roky 2002 a 2005 dvojice habituálních a progresivních vyučovacích jednotek, které byly

bezprostředně hodnoceny pomocí standardizovaných dotazníků.

Analyzováno bylo 314 dotazníků praktikantů a 4350 dotazníků žáků z vyučovacích jednotek tělesné výchovy a 152 dotazníků praktikantů a 3352 dotazníků žáků z vyučovacích jednotek jiných vyučovacích předmětů.

Praktikanti celkově hodnotili pozitivněji progresivní vyučovací jednotky než habituální v tělesné výchově (p <0,001) i v jiných vyučovacích předmětech (p < 0,001). Více než polovina praktikantů (57 %) byla schopna zvýšit roli žáka v edukačním procesu v obou aprobačních předmětech. V dalších studiích bude třeba ověřit příčiny toho, proč je velká část praktikantů schopna progresivní intervencí zvýšit roli žáka v edukačním procesu a zvýšit žákovské hodnocení vyučovacích jednotek pouze v jednom z předmětů své aprobace.

Klíčová slova: reforma, edukační systém, mezipředmětová integrace, profesní příprava, hodnocení, role žáka, tělesná výchova.

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THE INFLUENCE OF PROSTHESES AND PROSTHETIC FOOT ALIGNMENT ON POSTURAL BEHAVIOR IN TRANSTIBIAL AMPUTEES

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Submitted in August, 2007

Lower limb amputation presents a kinesiological problem. The type and alignment of each prosthetic component in transtibial amputees is determinative for postural stability and bipedal locomotion to a great extent. The aim of this study was to qualify the influence of variation in prostheses and prosthetic foot alignment in transtibial amputees on postural behaviour. Postural behaviour was analyzed in a group of 13 males (age 56 ± 13 years) with five different prostheses and prosthetic foot alignment. The results of the study show that change in prostheses alignment has an influence on muscle activity and on selected posturographic parameters. As the kinesiologically most optimal we have identified the extension of the prostheses by 1 cm with regard to normal prosthesis alignment.

Keywords: Transtibial amputation, postural stability, prostheses, posturography, surface EMG.

INTRODUCTION

Lower limb amputation presents a kinesiological problem due to the alteration of postural behaviour. Transtibial amputations result in compensatory and adaptative mechanisms. Further understanding of pathokinesiological relations between postural stability and limb loss could serve the optimalization of postural behaviour in transtibial amputees in both prosthetic component alignment and prosthetic component selection.

Postural stability in transtibial amputees

Postural stability is a basic precondition of all activities in a close kinematic chain. Postural stability is dependent on the integration of feedback information about inner and outer human space, on the position of segments, on sufficient muscle tone, and on the direction and magnitude of destabilizing forces (Shumway-Cook & Woollacott, 2001). Transtibial amputation leads to postural stability impairment because of biomechanical and neurophysiologic changes. These changes result in an absence of dynamic muscle co-activation in the ankle, of mechanical support, and in the absence of afferent input from proprioreceptors and foot pressure receptors. There are also other factors which limit each prosthetics user, such as painful and uncomfortable feelings in the residual limb and secondarily developed musculoskeletal problems such as low back pain, non amputated limb pain, etc. as well as psychological problems and increased energy costs in bipedal locomotion with prosthesis (Ehde & Smith, 2004; Ries & Brewer, 2000; Seymour, 2002).

Compensatory and adaptative postural mechanisms

Compensatory and adaptative postural mechanisms which follow after lower limb amputation are determined by the length of the residual limb (a longer residual limb involves better physiological and functional abilities), by a sense of the quality of feeling, by nociceptive afferent inflow, and by both type and alignment of prosthetic components (Gauthier-Gagnon et al., 2000; Sabolich & Ortega, 1994). The centre of mass position is displaced slightly upwards, backwards and above the non amputated leg (Gauthier-Gagnon et al., 2000). Ankle strategy is replaced by less effective hip strategy on the amputated side and more strain on the non amputated leg's ankle (Aruin et al., 1997; Geurts et al., 1991; Ries & Brewer, 2000). Elimination of neural input from the distally amputated lower limb's receptors leads to an alteration of both afferent and efferent sensory pathways which results in a reorganization of the cortical projection distribution of segmental structures (Aruin et al., 1997; Latash, 1998). Afferent inflow absence is first compensated for by increased visual dependence, which decreases over time (Gauthier-Cagnon et al., 2000; Geurts, 1991; Kovounoudias et al., 2005). After a few months of common prosthetic usage, sensory adaptation in amputation consists of equalization at the sensory level. Besides changed neural and biomechanical relations after transtibial amputation, adequate pos-

tural reactions and postural stability must be achieved (Aruin et al., 1997).

The influence of prosthetic alignment on postural stability

In lower limb amputees the prostheses – its construction, choice of prosthetic components, and their alignment, participate in postural stability to a great extant. Prostheses compensate for a missing lower limb because of the functionally enlarged base of support and therefore represent a necessary component in the foot's postural stabilization during both standing and bipedal locomotion (Gauthier-Gagnon, 2000). There are wide varieties of prosthetic components, materials and production technologies with specific advantages and disadvantages, which have to provide sufficient comfort to the particular prostheses user. Individuals who have been through lower limb amputation are able to adapt to a wide variety of prosthetic component configurations, but only an optimal prosthetic alignment minimizes asymmetries during standing and gait (Fridman et al., 2003).

OBJECTIVES

The aim of this study was to measure changes in the transtibial amputee's postural behaviour by means of surface electromyography and posturography in dependence on a prosthetic foot alignment.

MATERIAL AND METHODS

SUBJECTS

The experimental group included 13 transtibially amputated males (7 right leg amputated and 6 left leg amputated). The subject's average age at the time of measurement was 56 ± 13.1 years and they had been prosthetics users on the average, for 11.5 ± 13.2 years. The average height of the probands was 1.79 ± 0.1 m and average body weight was 88.46 ± 12.3 kg. The average length of each residual limb in the group was 18.12 ± 5.6 cm. The prosthetic foot type SACH was the standard used by 3 of the probands, whereas the type Sure-Flex was used by 5 subjects, the Vari-Flex type by 1 proband and the Dynamic type by 4 subjects. There wasn't any subject in the group who used a support device for common everyday activities. Tactile, algic, discriminative and vibratory sensations were examined in all subjects.

METHODS

Prior to the measurement itself, each subject underwent a kinesiological examination and filled out a questionnaire and in this way provided both information about their personal medical history and also current information about the state of their musculoskeletal system. The measurements and examinations which took place were done in the Kinesiological laboratory at the Department of sports and exercise medicine in the University hospital in Olomouc and in the Department of biomechanics and cybernetics engineering at the Faculty of Physical Culture, Palacký University, Olomouc.

In transtibial amputated subjects postural behaviour was tested in five different alignments of the prosthesis and prosthetic foot. All tested alignments are commonly present during everyday life. We evaluated postural behaviour within the framework of normal prosthetic foot alignment (with the prosthetic foot being set up in a way that the subject was used to), within the framework of a 1 cm shorter and a 1 cm longer prosthesis than would be the case for normal alignment and within the framework of a prosthetic foot set up at 5° dorsal flexion and 5° plantar flexion as compared to normal alignment. Postural behaviour was evaluated by the posturographic Motor Control Test (MCT) using the SmartEquitets system of NeuroCom®. This test is based on platform translations at three different speeds (small, medium, and large in that order). These speeds result from the individual subject's height. The translations were always in both a backwards and a forwards direction. We evaluated weight symmetry within each subtest [%] and the latency of the reaction to translation in each subtest [ms]. Within the Motor Control Test activity of the following muscles was measured bilaterally: m. erector spinae, m. tensor fasciae latae, m. biceps femoris, and m. rectus femoris, then just on the non amputated leg, including m. gastrocnemius medialis and m. tibialis anterior. The electromyographic signal was rectified and smoothed (RMS 25 ms), signal normalization was done with respect to 20 s of rest activity, particularly for each prosthesis and prosthetic foot alignment. For the purpose of this study reactive muscle activity was evaluated (at 500 ms intervals) and muscle reaction proceeded as an answer to platform translations of different intensities. We considered muscle to be active in cases when its measured activity (MEAN) was higher than the value of its rest activity plus two standard deviations.

For the statistical analysis of the examined data the programme Statistica version 6.0 (Anova, Fischer LSD post hoc test) was used.

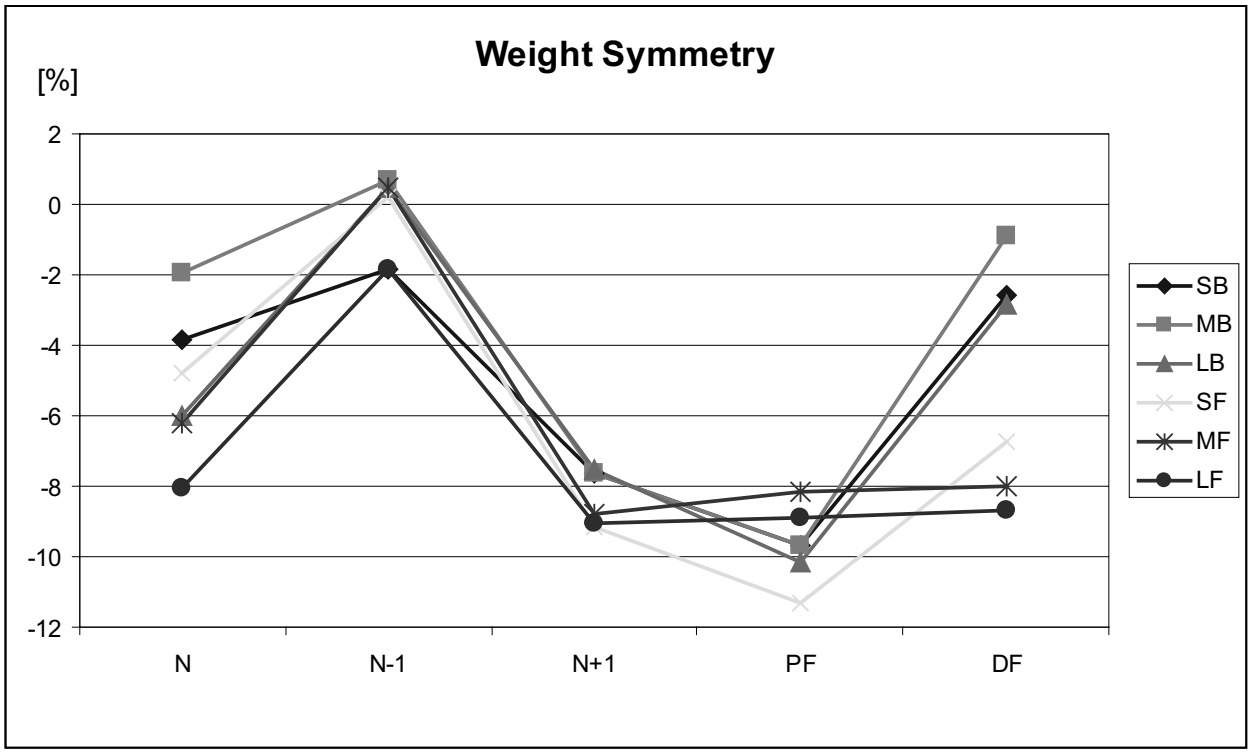
RESULTS

Posturographic parameters

Minimal differences in weight symmetry between the amputated and non amputated leg (parameter weight symmetry) were found (results from measured data) when the prosthesis was 1 cm shorter compared to normal alignment (Fig. 1).

In the latency of postural reactions (latency parameter) there was a statistically significant difference (in all tested situations) between the prosthetic foot in dorsal flexion and when the prosthesis was extended by 1 cm in comparison with normal alignment in large forward platform translations. Just in normal prosthesis alignment the latency gradually decreased with every tested situation independently of the direction or magnitude of the platform translation. For other tested prosthetic alignments, this trend was insignificant, because there was always an increase in latency time in the four tested situations (with changed direction of the platform translation) (Fig. 2).

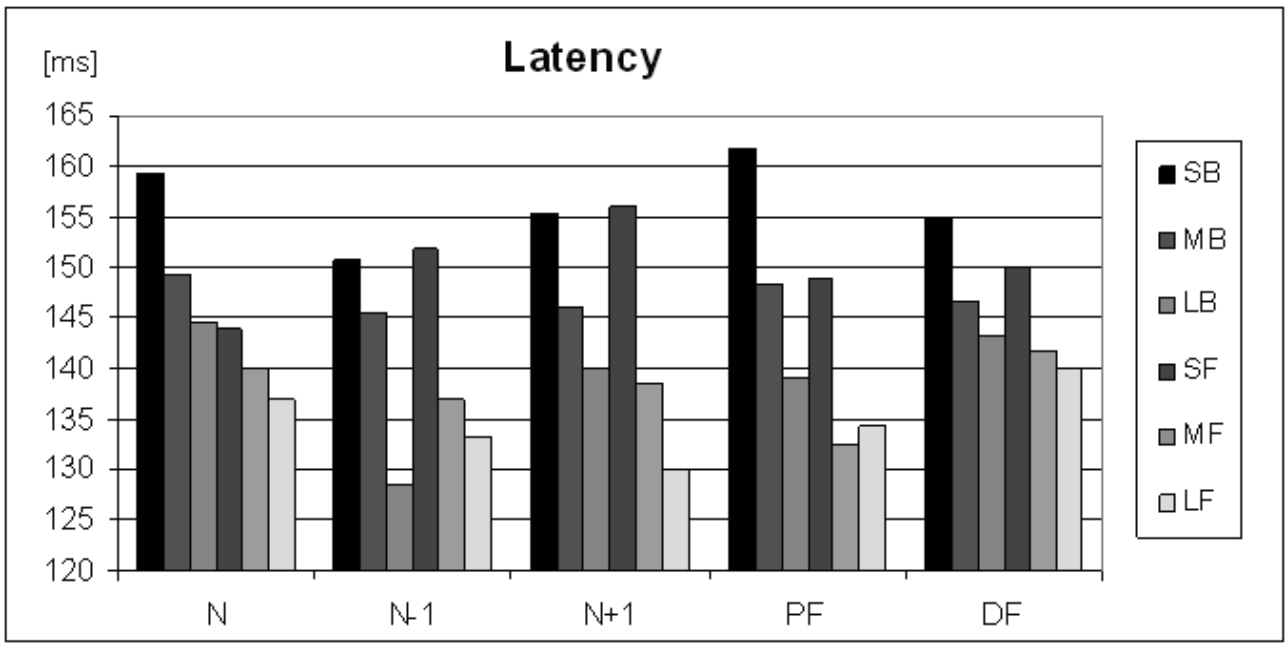
Fig. 1
Weight symmetry in terms of the interdependence of prostheses and prosthetic foot alignment during the Motor Control Test



Legend
N – normal prosthesis alignment
N–1 – prosthesis 1 cm shorter
N+1 – prosthesis 1 cm longer
PF – prosthetic foot in 5° plantar flexion
DF – prosthetic foot in 5° dorsal flexion
SB – small backwards shifts
MB – medium backwards shifts
LB – large backwards shifts
SF – small forward shifts
MF – medium forward shifts
LF – large forward shifts

Note
If the measured value is on axis Y < 0, then the weight is on the non amputated lower limb. If the measured value is on axis Y > 0, then the weight is on the amputated lower limb.

Fig. 2
Latency of motor reactions on platform shifts with regard to dependence on direction and speed and on prosthetic and prosthetic foot alignment



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N – normal prosthesis alignment
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SB – small backwards shifts
MB – medium backwards shifts
LB – large backwards shifts
SF – small forward shifts
MF – medium forward shifts
LF – large forward shifts

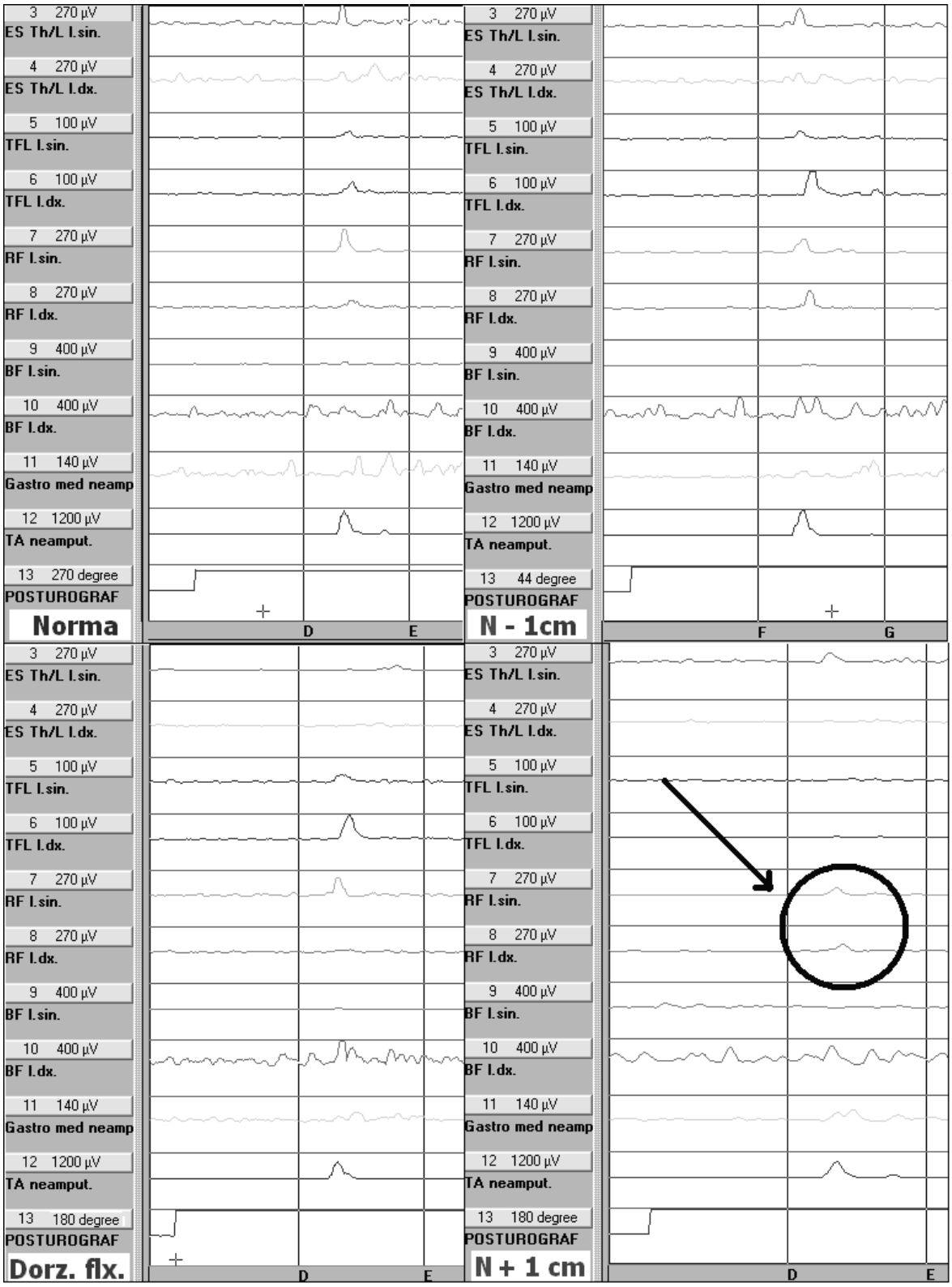
Reactive activity of the muscles

In cases of the mean of the reaction activity in every tested muscle we can see changes in muscle activity, depending on its directions and the speed of these translations within the framework of the Motor Control Test. There is also an evident change in muscle activity in every tested situation depending on prosthetic alignment and foot alignment. A statistically significant difference ($p < 0.05$) in muscle reaction activity depending on the alignment of the prosthesis and the foot was found between any prosthesis which was 1 cm longer than normal alignment and also in any prosthetic foot which was in dorsal flexion. There were always small forward translations for the following tested muscles: m. biceps femoris, m. gastrocnemius medialis, and m. tibialis anterior on the non amputated lower limb and for the m. tensor fasciae latae on the amputated lower limb.

In all tested bilateral muscles, the extension of the prostheses by 1 cm led to the most symmetrical mean of the reaction activity of the muscles of the experimental group. This prosthesis alignment led also to a decrease in the mean of the reaction activity in the m. gastrocnemius medialis and the m. tibialis anterior on non amputated leg. "Normal" prosthesis alignment didn't present the most optimal alignment for any measured muscle. Neither in the case of a decrease of muscle activity on non amputated leg in comparison with tested prosthesis alignments nor in the case of more symmetrical activity among bilaterally tested muscles.

The trend of reactive muscle activity is showed in Fig. 3 (the evaluated section is marked off with two white vertical lines) in measured muscles of the amputee's left leg in small forward translation during four alignments of the prostheses (normal alignment, prosthetic foot in dorsal flexion, prostheses 1 cm longer and 1 cm shorter than normal). The section marked with a dart demonstrates a bilateral optimalization of the reactive activity in the m. rectus femoris in a situation, when the prosthesis was extended by 1cm. From the Fig. 3 is also evident that in this alignment the bilaterally lowest activity was to be found in m. tensor fasciae latae and the lowest activity was in the m. tibialis anterior in all tested situations in the case of this amputee's image.

Fig. 3
The trend of reactive muscle activity of all tested muscles in a subject with an amputated left leg in four different prosthesis alignments in the case of a small forward shift



Legend
TFL – m. tensor fasciae latae
RF – m. rectus femoris
BF – m. biceps femoris
Gastro med. – m. gastrocnemius medialis
TA – m. tibialis anterior

Assessment of the measured data with a kinesiological examination and medical history data

A qualitative assessment of both the measured and examined data and each patient's personal medical history suggested the positive influence of the residual limb length on weight symmetry. On the other hand, for the latency there wasn't found any connection with those data. There is not any evident relationship between muscle activity, the examined data and the patient's personal medical history in the experimental group.

DISCUSSION

When we want to make an assessment of the measured data we have to take into account not just the variability of the experimental group (the variability is because of broad age differences, varied duration of prosthesis usage, and the cause of amputation), but also the fact, that not every human being in common circumstances (i.e. circumstances which don't require maximal effort) reacts in the same way in one tested situation – (the principle of indefinableness) (Véle, 2006; Míková, 2006). Each time each person chooses a different strategy to achieve the objective. This is a particular manifestation of "healthy movement". The tested prosthesis alignments were chosen on purpose because of the simulation of the everyday situations which can be present in transtibial amputees. This means, that the experimental group were accustomed to these small changes of prosthesis alignments by some way. There is also the relatively difficult "correlative" interpretation of several kinesiological methods – surface electromyography, kinesiological examination and the patent's personal medical history.

Postural stabilization is a complex motor skill. The only way as we can obtain valid information is to evaluate postural stabilization in its complexity (Míková, 2006). Posturography provides us with the means to test all aspects of postural stabilization. The Motor Control Test, which was used in our study, gives us information about postural stabilization during reactions to any unexpected exactly defined external stimulus. This test evaluates postural control during both involuntary movements and also during the action of unexpected external forces. Particular parameters of posturographic tests in combination with both surface electromyography and kinesiological examination enable us to obtain a comprehensive picture about postural behaviour. This combination is necessary for testing of postural stability.

Weight symmetry parameter

For all tested situations most of the body weight was on the non amputated leg in the experimental group. This matches the statement that COG displaces toward the non amputated limb (Gauthier-Gagnon, 2000). The minimum difference from all tested situations in the distribution of body weight between the amputated and non mputated leg was when the prosthesis was extended by 1 cm shorter within the dynamic conditions (Fig. 1). However we don't consider this alignment to be the most kinesiologically optimal, as the maximum symmetry in this tested situation was not actively secured by increasing reactive muscle activity on the amputated leg.

Latency parametr

The latency of postural reactions gradually decreased in normal prosthesis alignment with every tested situation independently on direction or magnitude of platform translations (Fig. 2). Thus that after every following tested situation (platform translations) income more effective answers on external stimulus. But in the tested prosthesis alignment differed from the normal one there was always a longer reaction time within the first small forward translation with regard to the previous tested translation. Therefore when the prosthesis alignment differs from common alignment of the user, the effectiveness of the answer on dynamic external stimulus is lowered.

Reactive activity of the muscles

The activity of the measured muscles in the experimental group was variable. This could be to a great extent influenced by inhomogeneity of tested subjects. The tested prosthesis alignment changes differed only "slightly" from normal one and therefore it is difficult to find relations between change in prosthesis alignment and muscle activity.

A statistically significant difference was measured in non amputated leg muscles (m. gastrocnemius medialis, m. tibialis anterior and m. biceps femoris) between 1 cm longer than normal prostheses alignment and the prosthetic foot alignment in dorsal flexion within small forward platform translations. This indicated that an unexpected change in the direction of platform translations led to an increased effort in activity of non amputated leg muscles. This took place when the prosthetic foot was in dorsal flexion, in the situation whereby the ground reaction force vector displaced forward because of dorsal flexion. On the contrary, whereby the

prosthesis was 1 cm longer than the normal prosthesis alignment, the effort was lowered on non amputated thigh muscles in first small forward translation. In this prosthesis alignment there was also an equation in reactive activity between amputated and non amputated thigh muscles and decrease in effort of reactive activity of m. gastrocnemius medialis and m. tibialis anterior (on non amputated leg).

In light of optimal and economic reactive activity of all tested muscles we consider as the most optimal prosthesis alignment extension of the prostheses by 1 cm. We presume that it is due to of better "postural certainty" in situations whereby the position of the COG replaced more above the non amputated leg. The amputees were feeling subjectively better in the situation, whereby the prosthesis was 1 cm shorter than normal alignment (personal announcement). Within the activities in a close kinematic chain is optimized muscle activity as reaction on external stimulus whereby the prosthesis is extended by 1 cm.

We suggest more investigation into impact of extension of the prostheses by 1 cm in kinesiotherapy of transtibial amputees. To complete this data of long term measurements within gait in different prostheses alignments.

Even though "normal alignment" appears to be the most optimal alignment in light of stand asymmetry minimalization (Fridman et al., 2003), in our study, normal alignment didn't present the most optimal alignment for any tested muscle in the terms of reactive muscle activity equation between either leg or in the terms of muscle activity effort reduction.

From the measured data and the personal medical history we can state that the length residual limb participates in the amputee's body weight symmetry. The longer residual limb presents a longer lever arm and then less muscle activity needed for stabilizing of destabilizing forces between the residual limb and the socket. The personal medical history of the experimental group showed, that subjects with knee pain on the non amputated leg and above average residual limb length, put more weight on the amputated leg. It is known, that lower limb pain influences the postural stabilization and functional capacity to a great extent (Menz & Lord, 2001). It is possible that the transtibial amputees are able to compensate for non amputated leg pain through amputated leg functional capacity improvement.

CONCLUSIONS

We found the extension of the prostheses by 1 cm as compared with normal alignment most optimal, as this alignment led to more symmetrical measured muscle activity. The normal prosthetic alignment presented the most effective adaptation on external stimulus in transtibial amputees. The weight symmetry within the platform translations was the most optimal in 1 cm shorter prostheses alignment than in the normal one. Nevertheless in this alignment the "advantage" wasn't approved by more optimal gradation in the reaction muscle activity.

We suggest using the combination of surface electromyography with both posturography and kinesiological examination. It is necessary to employ a comprehensive view on the postural behaviour.

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VLIV NASTAVENÍ PROTÉZY A PROTETICKÉHO CHODIDLA NA POSTURÁLNÍ CHOVÁNÍ U OSOB PO TRANSTIBIÁLNÍ AMPUTACI

(Souhrn anglického textu)

Amputace dolní končetiny představuje aktuální kineziologický problém vzhledem k alteraci posturálního chování. Biomechanické a neurofyziologické změny následující po amputaci dolní končetiny jsou důsledkem mnoha kompenzačních a adaptačních mechanismů. Volba a nastavení jednotlivých protetických komponent u jedinců po transtibiální amputaci do značné míry determinuje charakter posturální stability a bipedální lokomoce. Cílem této studie bylo posoudit vliv změny nastavení protézy a protetického chodidla na posturální chování u osob s transtibiální amputací. U souboru 13 probandů (věk 56 ± 13 let, hmotnost 88,46 ± 12,3 kg) bylo analyzováno posturální chování při pěti různých nastaveních protézy a protetického chodidla. Pro všechna nastavení jsme hodnotili symetrii rozložení tělesné hmotnosti a latenci posturálních reakcí za dynamických podmínek posturografického testu Motor Control Test (NeuroCom®) za současného snímání svalové aktivity pomocí povrchové elektromyografie (Noraxon). Z výsledků studie vyplývá, že změna nastavení protézy a protetického chodidla má vliv na svalovou aktivitu a na vybrané posturografické parametry. Za kineziologicky nejoptimálnější lze označit prodloužení protézy o 1 cm vzhledem k normálnímu nastavení, protože při tomto nastavení došlo k nejvíce symetrické aktivaci testovaných svalů. Při normálním nastavení byli transtibiálně amputovaní jedinci schopni nejefektivnější adaptability na vnější podnět, což se projevilo kontinuálním snižováním latence posturálních reakcí na rozdíl od jiných testovaných nastavení. Nejmenší asymetrie v rozložení tělesné hmotnosti při testu MCT byla při nastavení chodidla o 1 cm kratším, to se však neprojevilo na svalové aktivitě při tomto nastavení.

Klíčová slova: transtibiální amputace, postojová stabilita, protézy, posturografie, povrchová EMG.

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EFFECTS OF INTERVENTION PROGRAMS ON CHANGES IN RESTING ENERGY EXPENDITURE

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The aim of the study was to assess the effects of two types of weight reducing programs on changes in resting energy expenditure (REE) in overweight middle aged women. We recruited 28 overweight or obese premenopausal women at the age of 40–50 years via poster advertisements, of which 6 of the women were withdrawn early. Participants were divided into 2 groups – D and DC. Women assigned to group D (n = 10) had only a diet regime prescribed, whereas group DC (n = 12) followed a combined diet and exercise intervention. The diet was identical for both groups and the daily energy restriction for each participant was approximately 2000 kJ. Group DC combined resistance training and aerobic exercise. Both programs ran for 6 weeks. At the beginning and end of the intervention REE values (measured by indirect calorimetry), REE/kg and selected anthropometric parameters: body weight, stature, BMI, waist, hips and thigh girth, and body fat percentage were monitored.

In the combined intervention program the REE decrease was smaller than in the group with only an energy restricted diet. However, the REE and REE/kg changes detected at the end of the monitored period were not statistically significant, and there was no significant statistical difference between the applied intervention programs. Apart from the thigh circumference, the two intervention programs did not show different effects of any statistical significance on the change of monitored anthropometric indices. However, for all the parameters monitored (REE as well as the anthropometric ones) we can see that energy restricted diet combined with exercise is more effective than diet alone.

To affect the REE more markedly, prescription of physical exercise of longer duration, and of greater intensity and frequency would be necessary.

Keywords: Obesity, resting energy expenditure, exercise, weight reduction.

INTRODUCTION

The occurrence of obesity in developed countries has recently reached epidemic dimensions. This is also the reason for the growing number of research work and studies focusing on finding the most convenient obesity therapy. In most cases programs focusing on weight reduction include dieting and training regime intervention, as these are the most effective tools for weight management. Therefore, with respect to the long term effectiveness of weight loss programmes, the loss of fat mass while maintaining fat free mass and resting energy expenditure seems desirable.

Resting energy expenditure (REE) represents 60–70% of one's total daily expenditure and thus plays a substantial role in body weight modulation (Poehlman, 1989). Results of research dealing with changes in REE during the keeping of a reducing diet is not clear. Luscombe et al. (2002), Stiegler and Cunliffe (2006) or Wadden et al. (1996) have shown that a reducing diet results in REE decrease; others, however, do not confirm this (Brehm et al., 2005; Rumpler et al., 1991).

A uniform opinion of researchers prevails concerning the effects of increased physical activity on increasing the resting energy expenditure (Gilliat-Wimberly et al., 2001; Goran et al., 1994; Poehlman, Melby, & Goran, 1991; Stiegler & Cunliffe, 2006). According to Poehlman, Melby and Goran (1991) exercise may influence REE in two ways: 1) a prolonged increase in post exercise metabolic rate from an acute exercise challenge; and 2) a chronic increase in resting metabolic rate associated with exercise training. At the same time, however, the authors say that an exercise prescription for the general population that consists of exercise of low (less than 50% VO_2max) or moderate (50–75% VO_2max) intensity does not appear to produce a prolonged elevation of post exercise metabolic rate that would influence REE. Van Zant (1992) has shown that the REE value increases only via endurance exercise at > 70% VO_2max increases REE. However, such a level of strain intensity cannot be applied to untrained obese individuals.

The trouble with programs focusing on weight reduction is that they may lead to a decrease in the resting energy expenditure, since the exercise intensity is far too

low for effective adjustment of REE reduced by the diet restriction. This REE decrease is often the main cause of weight gain after the reducing program is ended.

This study aims to assess the effects of an energy restricted diet and of an energy restricted diet combined with physical activity on REE changes in a group of overweight or obese middle aged women. This research sets to determine such a program that would result in weight loss, but not in REE decrease. In the study we have used exercise at 50–60% of maximum heart rate reserve and a diet with slight reduction of energy intake (by 2000 kJ per day), which should significantly decrease REE.

METHODS

The research was carried out on women recruited via poster advertisements. There were several criteria for subject inclusion: BMI > 25 kg/m^2, an age of 40–50 years and regular menstruation. Exclusion criteria were: thyroid disease, diabetes mellitus, hypertension or hyperlipidemia, the fact of having undergone surgical or medication obesity therapy, drug addicts and alcoholics, and also weight loss of > 3 kg during the last 3 months. All subjects were non smokers and before the study was started had not exercised regularly.

The study was approved by an ethics committee and each subject was informed of the entire course of the examination verbally and in writing, and by her signature confirmed her voluntary participation in the study.

There were 28 asymptomatic obese or overweight women at the age of 40–50 years who were included in the study. Six of them were withdrawn early; the final group thus consisted of 22 women of a mean BMI value of 29.2 ± 4.3 kg/m^2 and aged 45.8 ± 7.4 years.

The women were randomized into subgroups D (n = 10) and DE (n = 12). Women assigned to group D had only diet program prescribed, whereas group DE followed a combined diet and training intervention program. Both programs ran for 6 weeks.

At the beginning and after the 6 week intervention REE values and anthropometric parameters were taken. The subjects were tested always after fasting for at least 12 hours in the physiology lab of the Faculty of Physical Culture in Olomouc.

Diet intervention

At the beginning of the program each woman completed a questionnaire analysing her eating habits and appetite preferences. Based on the results of the anthropometric values and eating habits questionnaire, a detailed eating plan was drawn up for the subjects. Daily energy restriction for each subject was approximately 2000 kJ. Basic nutrients in the food were represented in accordance with standard recommendation – fats 20–30%, saccharides 55–60% and proteins 15% of the total energy intake. The diet was divided into five meals during the day (three main meals and two snacks), and their energy value was determined following a model, in that the breakfast represented 30% of daily energy intake, lunch 30%, dinner 20% and morning and afternoon snacks 10% each. The individual portions were composed so that their energy density reached at most 500 kJ/100g of food. To achieve an optimum liquid intake it was recommended to drink 2.5–3.0 l of unsweetened liquids per day. The prescribed reducing diet was identical for both groups.

Exercise intervention

A combination of resistance training practised by a method of very slow repeating (Westcott et al., 2001) and aerobic exercise was designed for women assigned to group DE. The subjects had an individual program designed for each training unit, changing according to the principles of gradually increasing exercise of intensity and durance. After a short warm up and stretching, the resistance training program involving all major muscle groups (muscles of the chest, shoulder, abdomen and limbs) followed; the positive (concentric) stage lasting 5 seconds and the negative (eccentric) stage 7 seconds and was repeated in one sequence 5 to 7 times. During the first two weeks of the program 1–2 sets per exercise were applied (depending on the subject's abilities), and from the third week on 2 sequences were always used. In the first week of training the following aerobic part on a bicycle ergometer or stair stepper had a 60% intensity of maximum pulse reserve and lasted 20 minutes; every week one minute was added. A telemetric heart rate monitor (Polar) was available to all subjects to accurately determine exercise intensity. Training with a fitness specialist was scheduled twice a week in about 90 minute lessons.

Resting energy expenditure

Measurements were taken always in the afternoon after at least 12 hours of fasting. Indirect calorimetry together with a ventilation mask and ZAN 600 Ergo USB device (ZAN Messgeraee GmbH, Oberthulba, Germany) was used. Calibration was performed before each measurement. While being measured the subjects were lying on a bed in a quiet room with a comfortable temperature of 23°C. Following half an hour of measuring, the ventilation mask was applied and oxygen consumption and carbon dioxide production were recorded for 30 minutes. Mean values of ventilation gases necessary for REE calculation by Weir's formula (Weir, 1949) were calculated based on the results of the last 20 minutes of measuring (the first 10 minutes of data were discarded to ensure all subjects had reached equilibrium).

Anthropometric measuring

The following parameters were statistically evaluated: weight, waist, hips and thigh circumference, and body fat percentage. BMI was calculated by dividing weight (kg) by square of height (m^2). The body weight and stature were measured by a medical digital scale with precision to 0.1 kg and 0.1 cm. The waist circumference was measured with a metal tape measure with precision to 0.1 cm in the midpoint between the lower part of the rib cage and the illiac crest in the horizontal plane; hip circumference was measured at the widest part of the hip region in the horizontal plane. The body fat percentage was determined with callipers by measuring performed on 10 skin folds following Pařízková (1973).

Statistical data processing

For each monitored quantity, basic statistical quantities were calculated (the arithmetic mean and standard deviation). Due to the character of data measured we applied non parametric tests. The significance of the changes of the monitored parameters at the end of the intervention program was tested by a sign test and the difference between groups D and DE was verified by the Mann-Whitney U test. The α significance level was set to 0.05. The statistical processing of results was carried out by computer software Statistica 6.

TABLE 1
Changes of the measured data after a 10 week weight reduction programme

Parameter	Group D (n = 10)	Group DE (n = 12)	D vs DE
	M SD	M SD	
Age (years)	48.70 3.80	43.83 8.82	NS
Stature (cm)	167.60 5.04	167.25 6.27	NS
Weight 1 (kg)	81.34 12.54	81.25 14.14	NS
Weight 2 (kg)	78.72 * 14.06	77.84 * 13.62	NS
R_weight (kg)	2.62 2.99	3.41 2.41	NS
BMI 1 (kg/m^2)	28.88 3.58	29.07 5.01	NS
BMI 2 (kg/m^2)	27.93 * 4.16	27.80 * 4.90	NS
R_BMI (kg/m^2)	0.95 1.08	1.20 0.85	NS
Waist circumference 1 (cm)	99.30 9.03	91.83 11.08	NS
Waist circumference 2 (cm)	95.60 * 9.98	87.58 * 9.85	NS
R_waist circumference (cm)	3.70 3.68	4.25 3.77	NS
Hip circumference 1 (cm)	109.70 7.20	111.17 7.88	NS
Hip circumference 2 (cm)	107.50 * 7.56	108.75 * 6.36	NS
R_hip circumference (cm)	2.20 1.81	2.42 2.54	NS
Thigh circumference 1 (cm)	64.25 4.26	60.29 7.58	NS
Thigh circumference 2 (cm)	62.00 * 4.80	57.58 * 5.20	+
R_thigh circumference (cm)	2.25 1.93	2.71 3.78	NS
Body fat 1 (%)	32.85 4.20	29.66 5.47	NS
Body fat 2 (%)	30.80 * 4.94	26.19 * 6.20	NS
R_body fat (%)	2.05 1.89	3.47 2.71	NS
REE 1 (kcal)	1750.11 299.84	1778.96 276.50	NS
REE 2 (kcal)	1538.78 ns 487.64	1700.35 ns 276.58	NS
R_REE (kcal)	211.33 385.46	78.60 258.54	NS
REE/kg 1 (kcal/kg)	21.36 3.17	22.23 3.41	NS
REE/kg 2 (kcal/kg)	19.89 ns 7.31	22.40 ns 5.01	NS
R_REE/kg (kcal/kg)	1.40 5.50	−0.17 3.49	NS

Legend
D – group with diet restriction
DE – group with combined diet and exercise intervention
M – arithmetic mean
SD – standard deviation
R_... – difference in measured parameters
Statistically significant difference:
a sign test
* $p < 0.05$ changes from baseline
ns – no significant from baseline
Mann-Whitney U test
+ $p < 0.05$ D vs DE
NS – no significant D vs DC

RESULTS

Results of the data measured are presented in TABLE 1. REE and REE/kg input values for groups D and DC did not show any statistically significant differences.

At the end of the monitored period REE decreased by 12.1% vs. 4.4% as compared to the initial values (D vs. DE). REE/kg in group D decreased by 7% and in group DE increased by 0.8% as compared to the initial values. The changes in REE and REE/kg were not statistically significant and there were also no differences between groups D and DE. At the beginning of the intervention there were no statistically significant differences in the monitored anthropometric parameters between groups D and DE. At the end of the six week intervention, weight decreased by 2.62 ± 2.99 kg vs. 3.41 ± 2.41 kg, BMI by 0.95 ± 1.08 kg/m^2 vs. 1.20 ± 0.85 kg/m^2, waist circumference by 3.70 ± 3.68 cm vs. 4.25 ± 3.77 cm, hip circumference by 2.20 ± 1.81 cm vs. 2.42 ± 2.54 cm, thigh circumference by 2.25 ± 1.93 cm vs. 2.71 ± 3.78 cm and body fat by 2.05 ± 1.89% vs. 3.47 ± 2.71% (D vs. DE). The weight change oscillated around the generally recommended value of 0.5 kg/week, on average it was 0.4 kg/week in group D and 0.6 kg/week in group DE. In both groups a statistically significant decrease in all anthropometric values occurred. In two women (each in a different group) weight, body fat as well as other anthropometric parameters increased. In an interview it was elicited that the woman from group D adhered to the prescribed diet program rather loosely, and the subject from group DE, although attending the training regularly, often contravened the dieting regime. The only statistically significant difference in the monitored anthropometric parameters between group D and group DE was the thigh circumference shortage.

DISCUSSION

This study has confirmed that when energy intake decreases, so does the energy expenditure. This is a very important fact that needs to be taken into account in obesity therapies. In a recent study Brehm et al. (2005) describe a 7% REE decrease and 1% REE/kg decrease in 50 obese women undergoing a two month reducing diet. The women had a prescribed daily restriction of 3500 kJ and decreased their weight by 5.8 kg. Similarly Miles et al. (1993) have found a REE decrease in obese women by 8.8% while their weight was reduced by 7.3 kg. In this study we applied less strict dietary restrictions (2000 kJ/day), with weight in group D decreasing on average by 2.62 kg. We could therefore also assume a more moderate REE decrease, as the diet induced REE decrease depends on the amount of weight loss (Froidevaux et al., 1993). In fact, however, the REE values in group D decreased by 12% and REE/kg by 7%. Detected values showing significant REE decrease can be explained by the short duration of the intervention, since during the first weeks of the reducing regime the REE decrease is probably more marked and only later subsides. A continuation of the above study by Brehm et al. (2005) might suggest so, as after the next two months of the reducing diet the REE values decreased only by 6% as compared to the initial values and REE/kg values even increased by 5%. For this reason a study that is to be a continuation of the present one will prolong the intervention to 6 months.

REE and REE/kg values in group D obtained during the initial measuring were highly diffuse as compared to group DE (great SD). In single subjects a great variability of reaction to the intervention programs used was detected. Causes can be seen in individually differing reactions to the training stimulation conditioned by genetic dispositions (Joosen et al., 2005). In addition, the amount of habitual physical exercise not monitored within the study also differed.

The REE increase caused by regular exercise has been described in a number of works (Gilliat-Wimberly et al., 2001; Goran et al., 1994; Poehlman, Melby, & Goran, 1991; Stiegler & Cunliffe, 2006; and others). Nevertheless, the sole increase of physical activity for weight reduction in obese women without also modifying their diet is not too happy a solution, since women, more so than men, tend to increase their energy intake in proportion to the increased energy expenditure (Westerterp et al., 1992).

For REE maintenance the regular exercise model applied combining slow resistance training and endurance training with the intensity of 60–70% of maximum heart rate reserve was sufficient. This result does not correspond to the outcomes of Van Zant's (1992) or Poehlman, Melby and Goran's (1991) works, who state that in this respect effective exercise must have higher intensity. It should be realised that obese untrained subjects would not be even able to perform regular exercise under higher intensity. Higher exercise frequency and longer duration of the intervention program could affect the metabolism more significantly, as suggested by the first results of a new continuation study with the intervention period prolonged to six months.

CONCLUSION

In the group with a combined intervention program, the REE decrease was smaller than in the group with only dieting restrictions. REE and REE/kg changes at the end of the monitored period were, however, not statistically significant and there was not a statistically significant difference detected between the two intervention programs applied. The two intervention programs also did not show a statistically significant difference in the change of the monitored anthropometric parameters, with the exception of thigh circumference. Nevertheless, both reducing programs resulted in marked changes

in all the monitored anthropometric parameters. For all monitored parameters (REE and anthropometric) a reducing diet combined with exercise tends to be more effective than dieting alone.

The often described "yo-yo" effect is linked to the REE decrease as a result of the reducing diet carried over even after the energy restrictions are ended. If maintaining or even increasing REE is successful, the reduced weight is also easier to maintain. In this experiment the selected exercise program succeeded in maintaining or even slightly increasing the REE reduced by the diet. In the case of the REE/kg value it is apparent that the diet intervention used decreases its value, whereas the combined intervention slightly increases it.

To affect the REE more markedly, prescription of physical exercise of longer duration, and of greater intensity and frequency would be necessary.

The presented results suggest that to reduce weight in obese women, it is more effective to apply a complex program comprising dieting restrictions and higher physical activity.

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VLIV INTERVENČNÍCH PROGRAMŮ NA ZMĚNY KLIDOVÉHO ENERGETICKÉHO VÝDEJE

(Souhrn anglického textu)

Cílem naší studie bylo posoudit vliv dvou typů redukčních programů na změny klidového energetického výdeje (REE) u skupiny žen středního věku s nadměrnou hmotností. Intervenčních programů se zúčastnilo 28 asymptomatických žen ve věku 40–50 let s nadváhou či obezitou, 6 žen studii nedokončilo. Soubor byl rozdělen na 2 skupiny – D a DE. Ženy zařazené do skupiny D (n = 10) měly předepsanou pouze dietní intervenci a ve skupině DE (n = 12) kombinovaný program dietní a pohybové intervence. Dietní program byl v obou skupinách stejný a denní energetická restrikce činila pro každého jedince přibližně 2000 kJ. Ve skupině s pohybovou intervencí byla zvolená kombinace silového a aerobního tréninku. Oba programy trvaly 6 týdnů. Na počátku a konci intervence jsme sledovali hodnoty REE (nepřímou kalorimetrií), REE/kg a vybrané antropometrické parametry: tělesnou hmotnost, výšku, BMI, obvod pasu, boků a stehna a procento tělesného tuku.

Ve skupině s kombinovaným intervenčním programem byl pokles REE menší než ve skupině s pouhou dietní restrikcí. Změny REE a REE/kg na konci sledovaného období však nebyly statisticky významné a nebyl zjištěn statisticky významný rozdíl ani mezi použitými intervenčními programy. Rozdílné intervenční programy rovněž neměly, kromě obvodu stehna, statisticky významně rozdílný vliv na změnu sledovaných antropometrických ukazatelů. Ve všech sledovaných parametrech (REE i antropometrických) můžeme však pozorovat tendenci efektivnějšího působení kombinace redukční diety a cvičení než samotné diety.

Pro výraznější ovlivnění REE by bylo patrně zapotřebí použití předpisu pohybové aktivity s delším trváním, vyšší intenzitou a frekvencí cvičení.

Klíčová slova: obezita, klidový energetický výdej, cvičení, redukce hmotnosti.

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THE POSITION OF SPORTS WITHIN THE PUBLIC POLICY OF THE LOCAL ADMINISTRATION IN LARGE CITIES – PREPARATION PHASE OF A CASE STUDY OF THE CAPITAL CITY OF PRAGUE

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The significant enforcing of the position of towns and municipalities and public policies realized in its territory by the local municipal authorities were a result of the integration of the Czech Republic into the European structures and the related reformation of the public administration. The approach of the local municipal authorities to the individual fields of public policy, thus sports as well, then significantly affects the environment and quality of life in the pertinent area.

This paper presents the preparation and introductory results of a research project focused on the approach of the local municipal authorities to sports in the territory of the capital city of Prague. The research is based on the content analysis of specialized documents, and the in depth interviews with the responsible employees of the authorities.

The preliminary findings outline the position of sports in public policies and its organizational, financial and personnel background within the organizational structures of the authorities. The results point out the different approaches of the local authorities to sports and the influence of financial limitations, stated priorities, and also personal preferences of the individual representatives.

Keywords: City, local authority, sport policy, public policy.

INTRODUCTION

In addition to the generally accepted opinion that sports is an important part of a healthy lifestyle, its role and contribution to the development of personality and the social consciousness of an individual is also being stressed more and more during the present period. An active lifestyle becomes, especially for the young generation, the most effective tool for the prevention of negative social phenomena, for example criminality, alcoholism or drug abuse. Sports is generally accepted not only as a factor influencing physical health, but also as a phenomenon which cultivates an individual on the spiritual, social and moral side (ÚV ČR, 2003).

Even though it is mainly an individual activity, it definitely takes place in a social context. Therefore, it must not lie outside the field of view of society and its specialized institutions, state administration and municipal organs, which should create conditions nurturing its development, encouraging it and making it easily accessible (Slepička, 2000). In the legal environment of the Czech Republic, this is confirmed by Act no. 115/2001 Coll. on Support for Sports, which sets the position of sports in the society as a community benefiting activity and orders the institutions of the state and local administration to support it. The competent organization of sports in the environment of large cities, in particular, becomes important – settlements with more than 100,000 inhabitants, where children and youth are subjected to high risks which are brought about by the currently growing problems related to criminality, drug abuse and other negative social phenomena or to civilization illnesses such as child obesity (Collins, 2005; Schmeidler, 2000; Buriánek, 2001). All this is for its specifics, which are caused by the effects of urbanity factors such as density of population, type of housing construction, polarization of residential and working zones, but also by demographic factors including the number and composition of inhabitants, etc. (Horská et al., 2002). These specifics significantly influence social relationships inside the community, related to the elevated level of the mentioned risks on one side and urban limited possibilities of sporting activities on the other side. Another strong factor in the realm of large cities is also the constantly deeper and deeper diversification of the individual town parts concerning the social-economic composition of the inhabitants (Horská et al., 2002), which forces each local municipal administration to react to the specific local conditions and requirements, even in the field of sports, and find their own solutions maximizing the positive impact of sports on the community. The specific way of providing such support depends very much on the above mentioned institutions and their approach to public politics.

OBJECTIVES

Only recently, the Czech Republic went through a wave of important changes, such as entering the European Union and reforms of the public administration. These brought along, besides other factors, a significant reinforcement of the role of the municipal administration (Act no. 128/2000 Coll. on Municipalities, Act no. 129/2000 Coll. on Regions and consequential laws) on the regional and, mainly, municipal level. However, distribution of competencies in the sports field was not clearly specified legislatively, and neither did the long expected Act no. 115/2001 Coll. on Support for Sports clarify anything. Therefore, it depends on the individual regional and town or municipal authorities what approach they take regarding the concept of the support and development of sports. One must realize that the municipal authorities have become, even in the field of sports, one of the main elements of its support.

The object of our research is to find out whether the organs of the local administration are ready, with respect to their organization, finances and personnel, to undertake this responsibility and, after evaluating a specific situation in the area administrated by them, conceptually design and implement a specific policy in the field of sports and continuously adjust it according to the continuous results of the permanent evaluation of its impact on the quality of the life of the community being administered. This is not only an immediate measure of the municipality administration itself, but also its cooperation with the non profit sector, formed by civil associations, or with the commercial sector, formed by entrepreneurial units, offering services in the sports field.

Key objectives of this phase of research were to learn the approach of the individual town parts to the sports issue, identify the spectrum of the work agenda of the responsible employees and subsequently create a questionnaire for the next phase of research.

METHODS

After the introductory study of domestic and foreign specialized literature, available official records and documents, we proceeded to conduct semi structured interviews with selected employees of the municipal authorities of five randomly (by lot) selected parts of the capital city of Prague. The interviews were carried out with the employees who are, with their position, the closest to the sports field. Due to the different approach of the individual town parts to the support of sports, the respondents were both the employees who only handle sports as well as multi tasked employees. Most often they were heads of the education and cultural section, in which sports concerns are often included. These interviews took place during arranged meetings, in person, at the workplace of the contacted persons. The goal of these interviews was to learn the approach of the individual town parts to the sports issue and to identify the spectrum of the work agenda of the responsible employees. The content of the interviews was up to the paradigm of the qualitative research gradually adjusted according to the previous interviews, which expanded the interviewer's knowledge of the relevant matter. The scope was from 45 minutes to 1 hour. The interviews were recorded on a voice recorder and, afterwards, in the form of a verbatim transcription and summarizing protocol, transferred into written electronic form.

Based on the evaluation of the data collected in the first phase of the research, i.e. data from the specialized literature, official records and documents as well as from the carried out interviews, we created a questionnaire which would serve to collect data from all the town parts of the capital city of Prague. The questions were chosen to completely cover the sports issues from the point of view of the municipal authorities and work agenda of its employees or elected representatives. The questionnaire was, with respect to the different approaches of the individual town parts, designed as semi structured, to cover the causes and nuances of the chosen approach to the sports field. The data collected in this way will clarify the position of sports within the public policies of the local municipal authority.

In order to verify the structure of this questionnaire, the chosen questions were discussed with a sample of relevant respondents. The five previously contacted employees as well as five employees from other town parts were contacted. All those experts were asked to respond to and provide comments as to the content and comprehensibility of the questions. Subsequent adjustments covered not only the formulation and content of some questions, but also their number, where some questions were completely removed and some new were added. The pertinence of these adjustments was then again verified with all previously interviewed employees. The evaluation of the adjusted questionnaire brought significantly more specific and complete information than its previous version. Also, the comments of the interviewed employees were positive. All those interviewed agreed on the comprehensibility and justness of the content of the questions. The respondents also expressed their feeling of gratification about the fact that the pertinent matter is being examined in this way.

PRELIMINARY RESULTS

Even the preliminary results of the pilot study imply that the individual municipal authorities in the pertinent town parts attach a different importance to sports and sporting activities. A difference is already visible in the managing of the sports and sporting activities

within the organizational structures of the municipal authority. Sports is either incorporated as a part of the education or cultural sections, where it often gets much lower attention compared to the main specialization of the section. It also happens that more separate sections are assigned to take care of sports, when it apparently causes insufficient mutual communication about the steps taken by the individual sections and consequent disinformation. The position of sports is much stronger in the town parts when the sports care is a part of the work agenda of the mayoral office and his/her assistants. During the pilot verification of the questionnaire, no separate department or section for sports was found.

There is almost no town part where a document outlining a concept or goals in the sports field exists. In several town parts, they take the statement of policy of the council of the town part as a directive document; however, it tends to be very general in the sports field. This consequently results in the approach to the individual fields of organization and support of sports.

Many town parts rely, probably too much, on the grant proceedings within which they support the activities of the sports organizations with activities within their territory. However, these grant proceedings are based on non uniform, and sometimes very controversial, selection criteria and, also, the following checks and evaluation of the spent means appears insufficient from either the theory of the public politics or from the management theory viewpoint. Also, in the field of organizing sporting events or the realization of social programs directly by the municipal authorities, we can see different approaches which are, along with the priorities of the local municipal authorities, also influenced by human factors.

In all of the contacted town parts, the major emphasis of importance is on the renovation of school facilities. However, the announced opening to the public in the afternoon or evening hours, to extend the possibilities of sports for the general public, often collides with the clearly commercial use of the facilities.

CONCLUSIONS

Due to the fact that the approach of the individual town parts to the sports field is very different and there are often very original public policies in this field, it has not been definitely decided yet whether the created questionnaire will be distributed solely in a written form with an attached cover letter and instructions or whether the questionnaire will be to be filled in directly in the presence of an interviewer. In this case, the selected persons will first be sent the questionnaire and responses would be conveyed during the meeting directly to the interviewer who could immediately ask complementary questions if necessary.

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POZICE SPORTU V RÁMCI VEŘEJNÉ POLITIKY MÍSTNÍ SAMOSPRÁVY VE VELKÝCH MĚSTECH – PŘÍPRAVNÁ FÁZE PŘÍPADOVÉ STUDIE HLAVNÍHO MĚSTA PRAHY

(Souhrn anglického textu)

Důsledkem integrace České republiky do evropských struktur a s ní spojené reformy veřejné správy bylo výrazné posílení pozice měst a obcí a veřejné politiky realizované na jejich územích místní samosprávou. Její přístup k jednotlivým oblastem veřejné politiky, tedy i sportu, pak následně výrazně ovlivňuje prostředí a kvalitu života v jimi spravované oblasti.

Příspěvek prezentuje přípravu a úvodní výsledky výzkumu zaměřeného na přístup místní samosprávy k oblasti sportu na území hlavního města Prahy. Výzkum je založen na obsahové analýze odborných dokumentů a hloubkových rozhovorech s odpovědnými pracovníky samosprávy.

Úvodní zjištění nastiňují pozici sportu v oblasti veřejné politiky a jeho organizačního, finančního a personálního zabezpečení v rámci organizačních struktur samosprávy. Výsledky poukazují na rozdílný přístup místní samosprávy k oblasti sportu a míru vlivu finančních omezení, sledovaných priorit, ale i osobních preferencí jednotlivých zastupitelů.

Klíčová slova: město, sportovní politika, samospráva, veřejná politika.

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TEMPORAL SYMMETRY OF SOUND AND PROSTHETIC LIMBS DURING TRANSTIBIAL AMPUTEE GAIT WITH VARIOUS PROSTHETIC ALIGNMENT

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The term "gait" refers to fundamental locomotion by means of which the individual moves him/herself from one place to another. For people afflicted by some involvement of the lower limbs, this activity is partially or completely reduced. In the course of the biomechanical investigation of gait in subjects with various afflictions, the symmetry of lower limb loading is also the object of research.

A certain number of biomechanical studies are focussed on the kinematic and dynamic variables of the gait cycle in subjects with transtibial amputation (Bateni & Olney, 2002; Thomas et al., 2000; Perry, 2004). An interesting problem is the evaluation of gait symmetry between a transtibial amputee and groups of healthy persons (Winter & Sienko, 1988; Dingwell, Davis, & Frazier, 1996). Miff et al. (2005) compared temporal symmetries in a healthy group with the values in a transtibial amputee group during gait initiation and termination. Nolan et al. (2003) took an interest in changes in gait symmetry influenced by gait speed in transtibial and transfemoral amputees in comparison with a healthy group. The interlimb gait symmetry of transtibial amputees wearing two different prosthetic feet in the early rehabilitation stage was investigated by Marinakis (2004).

Full symmetry in one's gait isn't always desirable. The human system, with its major structural asymmetries in the neuromuscular skeletal system (one limb has been amputated) cannot perform optimally when the gait is symmetrical (Winter & Sienko, 1988). Non symmetrical gait performance, with constraints of its residual system and the mechanics of its prosthesis, is better in this case. For persons who have undergone amputation, asymmetrical gait may be the instrument which protects the stump of the disabled limb. We can say that gait asymmetry would be a relevant measure for investigating the gait characteristics of amputees and establishing their propensity for future joint pain and degeneration (Nolan et al., 2003).

For amputee gait, the choice of a suitable prosthesis is very important. The influence of a prosthetic foot on gait variables in a group of these subjects was observed by Gitter et al. (1991). Efficiency of performance of the gait cycle is also markedly influenced by a prosthesis or prosthetic foot alignment.

Rehabilitation of an amputee can be considered to be successful only when the amputee finds the prosthesis aesthetic and comfortable during walking. Prosthesis alignment has to correspond to the demands of the prosthetist (Fridman, Ona, & Isakov, 2003). When the prosthetic foot isn't aligned optimally, this fact can show up in different levels of gait cycle performance. During gait analysis, the prosthesis is intentionally "not optimally" aligned in order to elicit the implied implications.

Fridman, Ona and Isakov (2003) observed the influence of a prosthetic foot positioned in external rotation. Schmalz, Blumentritt and Jarasch (2002) used sagittal shifting of the foot to both anterior and posterior directions and foot alignment to both plantar a dorsal flexion. Blumentritt et al. (1999) focussed on the effects of sagittal plane prosthetic alignment to the magnitude of knee joint loads on a standing transtibial amputee.

The objectives of prosthetic alignment in persons with lower limb amputation are the enhancement of the remaining limb's comfort and to maximize the individual's walking capabilities. In biomechanical gait analysis, it is important to investigate not only the relationship between prosthetic foot alignment and the prosthetic limb, but also the relationship between this alignment and activity of the contralateral, sound limb (Pinzur et al., 1995). An accent on the sound limb appears in other studies (Nolan & Lees, 2000; Hurley et al., 1990), but there the question of various prosthetic alignments isn't considered. This relationship between the sound and the prosthetic limb can be quantitative, measured by the symmetry or asymmetry of the measured variables.

Keywords: Transtibial amputation, alignment, gait, temporal variables.

OBJECTIVES

The objectives of this study were to evaluate the influence of the prosthesis and prosthetic foot alignment on temporal variables of gait and to observe how these various alignments influence the symmetry of temporal variables between the sound and the prosthetic limb.

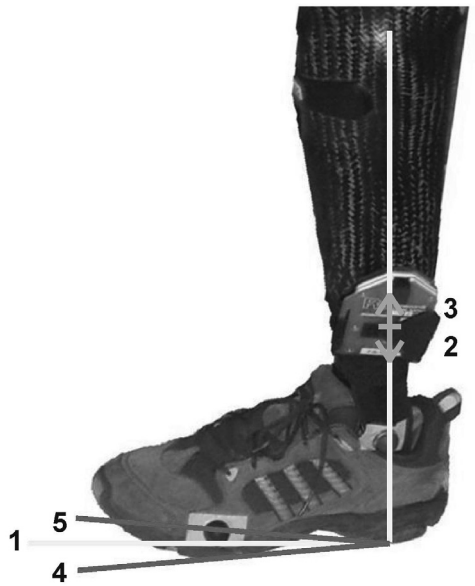
MATERIAL AND METHODS

Eleven men (aged 58.9 ± 9.47 years, height 177.3 ± 5.49 cm, weight 87.9 ± 14.85 kg) participated in this study. Each of them used a dynamic prosthetic foot type, which is characterized by a smooth rollover during gait. This foot is intended for second level activity users.

For measurement we used a walkway for time variable analysis. The length of this equipment is 10 m. It makes it possible to do the measurement for each limb individually.

Each of the subjects executes two gait trials with each alignment. There were the following alignments: 1. optimal (assessed by a prosthetist), 2. prosthesis length 1 cm shorter, 3. prosthesis length 1 cm longer, 4. prosthetic foot aligned to plantar flexion (+5°), 5. prosthetic foot aligned to dorsal flexion (–5°) (Fig. 1). Two strides were analyzed in each trial.

Fig. 1
Prosthetic alignments used during measurement



Legend
1 – optimal alignment
2 – prosthesis about 1 cm shorter
3 – prosthesis about 1 cm longer
4 – prosthetic foot aligned to plantar flexion (+5°)
5 – prosthetic foot aligned to dorsal flexion (–5°)

In the process of our measurements, we observed the following absolute temporal variables (stance – stance phase duration, swing – swing phase duration), as well as relative temporal variables (% stance – stance phase duration divided by the duration of the gait cycle, % stance = stance/(stance + swing) × 100) and the frequency of the gait cycle. Then we calculated an index of symmetry for each temporal variable according to the following equation (modified from that of Dingwell, Davis, & Frazier, 1996):
$SI = (X_{Sound} - X_{Prosthetic})/(X_{Sound} + X_{Prosthetic}) \times 100\%$, where X means an appropriate temporal variable on both the sound and the prosthetic limb. After substitution we obtained three new variables:
SI stance – index of the symmetry of the stance phase's duration,
SI swing – index of the symmetry of the swing phase's duration,
SI % stance – index of the symmetry of the stance phase's duration divided by the duration of the gait cycle.

If the perfect symmetry between the sound and the prosthetic limb (the variable is the same for both limbs), then being equivalent to SI equals zero. A positive number indicates a higher value of the variable on the sound limb; whereas a negative number indicates a higher value of the variable for the prosthetic limb.

For statistical analysis we used the Statistica 6.0 programme. We performed both the ANOVA and Fisher post hoc tests.

RESULTS AND DISCUSSION

The influence of prosthetic alignment to temporal variables of the sound and prosthetic limbs

Values of measured variables and their standard deviations for each alignment are presented in TABLE 1. Statistically significant differences ($p < 0.05$) between variables in various prosthetic alignments for both sound and prosthetic limbs are introduced in TABLE 2. In the frequency of the gait cycle, we didn't find any statistically significant difference.

During the evaluation of absolute variables, we have to take account of the fact that their magnitude can be influenced by gait speed.

Regarding gait performance, there are considerable inter-individual differences. It's perceptible in magnitudes of standard deviations. We found less statistically significant differences between sound and prosthetic limbs than we expected. We used prostheses and prosthetic foot alignments, which appear from experience and correspond with differences, which the prosthetist can make. The changes of prosthetic foot position about ± 5° or changes of the prosthesis length about

TABLE 1
Mean values of observed variables for whole group in each alignment

Variable	Limb	Alignment 1		Alignment 2		Alignment 3		Alignment 4		Alignment 5	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
% stance	Sound	66.10	4.32	65.40	3.36	65.70	3.71	65.40	3.72	65.70	3.85
	Prosthetic	65.20	3.82	65.60	4.55	65.30	3.30	64.90	4.99	65.80	4.08
Stance (s)	Sound	0.87	0.13	0.85	0.15	0.86	0.13	0.85	0.15	0.83	0.12
	Prosthetic	0.86	0.12	0.85	0.15	0.85	0.12	0.85	0.16	0.84	0.12
Swing (s)	Sound	0.44	0.05	0.45	0.03	0.44	0.04	0.45	0.05	0.43	0.04
	Prosthetic	0.46	0.05	0.44	0.06	0.45	0.04	0.45	0.05	0.43	0.05
Frequency (step/min)		92.18	8.88	94.12	10.60	93.25	9.29	93.53	11.55	95.59	9.55

Legend
SD – standard deviation

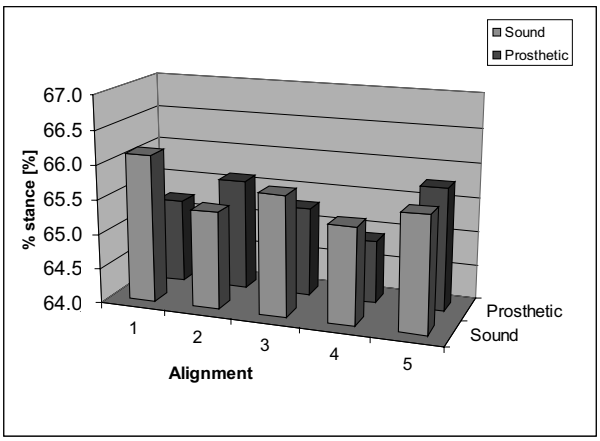
± 1 cm can occur during common amputee daily activities, for example by change of footwear (various heights of the heel). If a prosthetic foot was aligned to plantar or dorsal flexion by about 10 and more degrees or the prosthesis was prolonged or shortened by about 2 and more cm, we would probably find more statistically significant differences, but we would get away from realistic conditions. Similar situations occurred in the study of Fridman, Ona and Isakov (2003). These authors found statistically significant differences in stance time and swing time only for the prosthetic foot with 36° external rotation (with 18° statistically significant difference wasn't found).

TABLE 2
Statistically significant differences between measured variables ($p < 0.05$) in various prosthetic alignments

Variable	Sound	Prosthetic
% stance	4 < 1	4 < 5
Stance	5 < 3, 1	5 < 1
Swing		5 < 3, 4, 1; 2 < 4, 1

On the sound limb, the amputee with a prosthetic foot aligned to plantar flexion, had a smaller relative stance phase duration in comparison with gait performance with optimal alignment (Fig. 2). On the prosthetic foot, the smallest value of this variable was also found in the foot alignment to the plantar flexion. It was probably caused by later initial contact of the gait cycle in this prosthetic foot alignment. The biggest value of relative stance phase duration during gait cycle was observed in the alignment to the dorsal flexion. As we found differences for this variable, especially in the alignment 4 and 5 (plantar and dorsal flexion), we can suppose that the change in alignment of the prosthetic foot (10°) has a greater influence on the relative temporal variables of gait than the change in prosthesis length (2 cm).

Fig. 2
Relative stance phase duration of gait cycle on sound and prosthetic limbs in the various prosthetic alignment positions



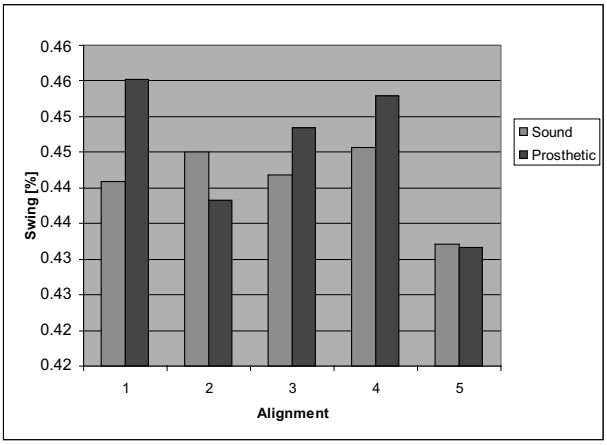
Legend
% stance – relative stance phase duration
1 – optimal alignment
2 – prosthesis about 1 cm shorter
3 – prosthesis about 1 cm longer
4 – prosthetic foot aligned to plantar flexion (+5°)
5 – prosthetic foot aligned to dorsal flexion (–5°)

Stance phase and swing phase duration were the smallest in the foot alignment to dorsal flexion on both sound and prosthetic limbs. In this case, the frequency of the gait cycle was the biggest, but the difference wasn't statistically significant. The prosthetic foot, which was aligned to dorsal flexion, hurries the subject forward during the late stance phase, thereby the gait speed is bigger.

Comparison of sound and prosthetic limbs

A statistically significant difference between the sound and prosthetic limbs was found only for the swing phase duration when there was optimal alignment (Fig. 3). On the prosthetic limb, the swing phase lasts longer. It corresponds with the longer duration of the stance phase on the sound limb (Pinzur et al., 1995). However in this case, we didn't find any statistically significant difference.

Fig. 3
Swing phase duration of gait cycle on sound and prosthetic limbs in the various degrees of prosthetic alignment



Legend
Swing – swing phase duration
1 – optimal alignment
2 – prosthesis about 1 cm shorter
3 – prosthesis o 1 cm longer
4 – prosthetic foot aligned to plantar flexion (+5°)
5 – prosthetic foot aligned to dorsal flexion (–5°)

There is the question of why we found a difference between the sound and prosthetic limbs only in the case of optimal alignment. We can suppose that a certain degree of asymmetry was natural for the amputee in the case of optimal prosthetic alignment. Better symmetry of temporal variables of the gait cycle between the sound and prosthetic limbs when aligneed differently isn't necessarily positive. It's caused by the fact that the sound limb can't fully execute its compensational function during gait.

Temporal symmetry of the sound and prosthetic limbs

In the observed group, there are large inter individual differences in the values of symmetry indexes again (Fig. 4). The biggest difference was found for SI swing variables between alignments 1 a 2. The value of this variable is less for more subjects (9 from 11) in optimal alignment (1) than in alignment 2. The lower value of the SI swing variable indicates a longer swing phase duration of the gait cycle on the prosthetic limb in optimal alignment. It appears that the shortening of a prosthesis (alignment 2) causes longer loading of prosthetic limbs during gait. Apparently, the prosthetic limb isn't relieved during gait and compensation mechanism can't be fully applied.

Temporal symmetry is different for an amputee as opposed to healthy persons. In the study of Dingwell, Davis and Frazier (1996), symmetry indexes weren't significantly different from zero value for healthy subjects. These authors found significantly larger asymmetry in relative stance phase duration (% stance) and in single support phase duration (swing) for the amputee group than for the healthy group.

The asymmetry of the gait cycle can't be always considered to be undesirable. The central neural system of an amputee has recognized new asymmetries (caused by amputation) and has compensated for lost motor function and altered anthropometric indicators (Winter & Sienko, 1988).

While asymmetries of certain variables might be related to each other, other variables aren't interrelated and in general can't refer to each other. An amputee can alter gait cycle to decrease one form of asymmetry by increasing other forms of asymmetry. It's necessary to dedicate more effort to identifying those variables for which attaining a more symmetrical gait pattern are most beneficial (Dingwell, Davis, & Frazier, 1996).

Asymmetry of the temporal variables of the gait cycle, as a side effect of gait modification after amputation, also appear in transfemoral amputees. Nolan et al. (2003) found considerably larger temporal asymmetry for groups of transfemoral amputees than for group of transtibial amputees.

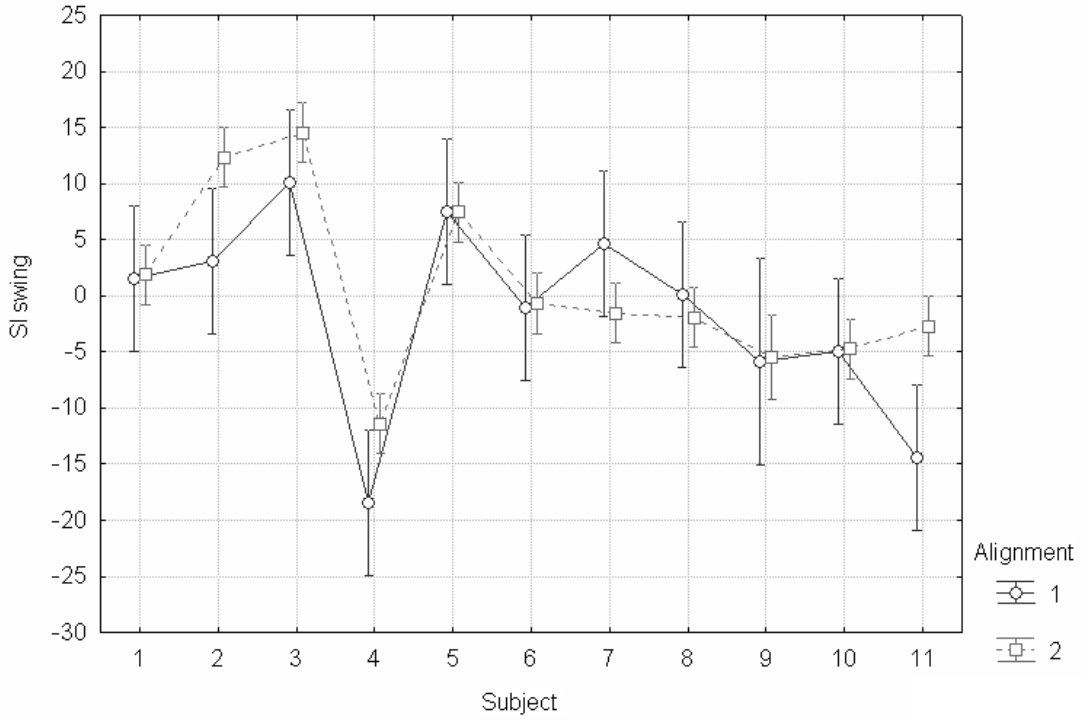
Quantifying asymmetry in amputee gait in relation to healthy subjects is the first step in trying to define what degree of asymmetry is acceptable or desirable in amputee gait during rehabilitation (Dingwell, Davis, & Frazier, 1996).

CONLUSIONS

Alignment of the prosthesis to dorsal and plantar flexion influences the relative stance phase duration of the gait cycle more than any change in prosthesis length. In the foot alignment to the plantar flexion this variable is smaller on both the sound and prosthetic feet.

When optimal alignment is present, the difference between the swing phase duration on the sound and prosthetic limb is the biggest. On the sound limb, the stance phase is longer and the swing phase is shorter than in other forms of alignment. This asymmetry during the gait cycle compensates for limb loss and is desirable to a certain extent. In other forms of alignment, the asymmetry between the sound and prosthetic limb are less, which means that the compensational function of the sound limb is limited.

Fig. 4
Symmetry indexes of swing phase duration for each observed subject



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DOČASNÁ SYMETRIE ZDRAVÝCH A PROTETICKÝCH KONČETIN BĚHEM CHŮZE OSOBY S TRANSTIBIÁLNÍ AMPUTACÍ S RŮZNÝM PROTETICKÝM ZAŘAZENÍM

(Souhrn anglického text)

Termín „chůze“ označuje základní pohyb, jehož pomocí se jednotlivec pohybuje z jednoho místa na druhé. U osob s postižením dolních končetin je tato aktivita částečně či zcela redukována. Během biomechanického šetření chůze u osob s různým postižením se také zkoumala symetrie zatížení dolních končetin.

Určité množství biomechanických studií se zaměřuje na kinematické a dynamické proměnné cyklu chůze u osob s transtibiální amputací (Bateni & Olney, 2002; Thomas et al., 2000; Perry, 2004). Zajímavým problémem je hodnocení symetrie chůze mezi osobami s transtibiální amputací a skupinami zdravých jedinců (Winter & Sienko, 1988; Dingwell, Davis, & Frazier, 1996). Miff et al. (2005) srovnává dočasnou symetrii u zdravé skupiny s hodnotami u skupiny osob s transtibiální amputací během počáteční a konečné fáze chůze. Nolan et al. (2003) se zajímal o změny v symetrii chůze ovlivněné rychlostí chůze u osob s transtibiální a transfemorální amputací ve srovnání se zdravou skupinou. Symetrii chůze u osob s transtibiální amputací, které na počátku rehabilitace nosily dvě různé protetické nohy, zkoumal Marinakis (2004).

Úplná symetrie chůze není vždy žádoucí. Lidský systém s velkou strukturální asymetrií v neuromuskulární kosterní soustavě (jedna končetina byla amputována) nemůže optimálně fungovat, když je chůze symetrická (Winter & Sienko, 1988). V tomto případě je lepší nesymetrická chůze s omezením reziduálního systému a mechaniky protézy. U osob, které podstoupily amputaci, může asymetrická chůze být nástrojem, jenž chrání pahýl postižené nohy. Lze říci, že asymetrie chůze je relevantním měřítkem pro zkoumání charakteristiky chůze osob s amputací a stanovení jejich sklonu k budoucí společné bolesti a degeneraci (Nolan et al., 2003).

Pro chůzi osob s amputací je velmi důležitý výběr vhodné protézy. Vliv protetické nohy na proměnné chůze ve skupině těchto probandů zkoumal Gitter et al. (1991). Efektivnost chůze je také významně ovlivněna nastavením protézy nebo protetické nohy.

Rehabilitaci osoby s amputací lze považovat za úspěšnou pouze tehdy, pokud tato osoba považuje protézu během chůze za estetickou a pohodlnou. Nastavení protézy musí vyhovovat potřebám postiženého (Fridman, Ona, & Isakov, 2003). Když protetická noha není optimálně vyladěna, může se tento fakt projevit v různých cyklech chůze. Během analýzy chůze je protéza úmyslně „neoptimálně“ nastavena, aby se vyvolaly skryté následky.

Fridman, Ona a Isakov (2003) pozorovali vliv protetické nohy umístěné ve vnější rotaci. Schmalz, Blumentritt a Jarasch (2002) použili sagitální posun nohy vpřed a vzad a nastavení nohy do plantární a dorzální flexe. Blumentritt et al. (1999) se zaměřil na účinky nastavení protézy v sagitální rovině na velikost zatížení kolenního kloubu u stojící osoby s transtibiální amputací.

Nastavení protézy u osob s amputací dolní končetiny má pomoci zvýšit pohodlí zdravé nohy a maximalizovat možnosti chůze těchto osob. V rámci biomechanické analýzy chůze je důležité prošetřit nejen vztah mezi nastavením protetické nohy a protetické končetiny, ale také vztah mezi tímto nastavením a aktivitou druhé, zdravé končetiny (Pinzur et al., 1995). V jiných studiích se objevuje důraz na zdravou končetinu (Nolan & Lees, 2000; Hurley et al., 1990), ale v nich není řešena otázka různých nastavení protéz. Tento vztah mezi zdravou a protetickou končetinou může být kvantitativní, měřený dle symetrie nebo asymetrie měřených proměnných.

Klíčová slova: transtibiální amputace, nastavení, chůze, dočasné proměnné.

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CHOSEN PROBLEMS IN EXPERIENTIAL EDUCATION RESEARCH

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This paper is concerned with research in the field of experiential education. At first we picked out some problems of research in general. Than using examples from published studies we focused on problems of the quantitative and qualitative approaches. Amongst others we touched on the questions to whether the researchers in the field should put emphasis on verifying existing theories or rather on generating theory peculiar to experential education. Especially in the Czech environment we prefer the latter possibility, which can contribute to the creation of a common language and to our own body of knowledge.

Keywords: Theory verification, theory generation, body of knowledge.

INTRODUCTION

Experiential education can be regarded as a relatively widespread approach to educational activity, particularly in the areas of extracurricular education and recreational time. Nevertheless, the field still has not been fully embraced by the academic community. While we cannot find it in any systematic classification of educational approaches, Hodaň (2004) and Jirásek (2005) place experiential education under kinanthropology.

According to Baldwin, Persing and Magnuson (2004) the cause of this situation is the highly idiosyncratic nature of experiential education, a fact which makes it difficult to find direct evidence as to how it actually works. This is explained by those in the field as the result of this approach being holistic, i.e. that it works through non transmittable experiences. However, this argument is insufficient for the academic community. According to Itin (2004) the lack of a uniform language is one of the fundamental problems facing our field, one that complicates communication both within the discipline and with other branches. One of the ways to create a common language is through high quality research that is relevant to the characteristics of experimental education. This text addresses the issues of research in this specific field.

EXPERIENTIAL EDUCATION RESEARCH

Research in this field has been under way since 2002 with the founding of the Symposium for Experiential Education Research (SEER) at the Association for Experiential Education (AEE). Experiential education research in the Czech Republic is also developing for instance as a part of the research program Physical activity and inactivity of inhabitants of the Czech Republic in the context of behavioral changes (Palacký University in Olomouc).

However, research of a complicated social problem such as experiential education is very demanding. Sibthorp (2000) compares it to a discussion about the weather. In his opinion agreeing on the weather for any given day is highly problematic for, say, meteorologists from Minnesota and Florida; while one of them measures precipitation in the form of rain, the other encounters an accumulation of snow. Yet another problem would arise if these two individuals tried to share their knowledge beyond the borders of the USA, where measurements are not made in inches but in centimetres. This example illustrates that research in experiential education is a complicated phenomenon, and that the potential scholar will face the problem of how to capture these researched phenomena, as well as how to share these observations with researchers taking a different approach to their work.

The complexity of converting or comparing the output of individual studies has even led to criticism of the oft cited metaanalysis by Hattie, Marsch, Neil and Richards (1997). Their forty categories of output organized into six dimensions can make it seem that experiential education is regarded as a "generic cure all treatment" (Baldwin et al., 2004). In addition to this argument it is worth questioning, for example, whether self-concept was understood in the same way in all 96 studies included in the analysis, or if each study measured a different facet of this phenomenon.

The difficulty of defining complex phenomena under research in our field discourages many researchers from serious inquiry. Therefore, the studies that are realized

are mostly short term and limited, typically at the level of graduate students (Bocarro & Richards, 1998). In these types of studies it is very difficult for the researchers, often from the ranks of enthusiastic young experiential educators, to avoid problematic research areas. These will be discussed here in more detail. Another problem is the historic attempt to "defend" experiential education against critical regard from the outside. Especially abroad this effort also takes the form of confirming effects to agencies providing grants to operators of recreation centres and similar facilities.

Due to these difficulties research reports are often only statements of the positive results of the studied courses or measured values that confirm the effectiveness of the courses. The emphasis on measuring changes in specific characteristics confirming or disproving that something is indeed happening at the course is a weakness in experiential education that is often criticized. In this way the research suppresses the essence of experiential education – the experiences of individuals and the meanings that they make of their experiences (Allison & Pomeroy, 2000). If participants are intentionally encouraged to create their own interpretations of reality from their experiences it is questionable whether it is even possible to consider the testing of such outcomes of the programmes in the traditional sense of the word (Zappe, 2006).

The topics discussed above belong to the area of quantitative research in experiential education. It is necessary to point out some problematic topics of qualitative research as well. Despite the fact that today researchers are backing away from such questions as "What is happening?" in favour of "Why is this happening?" this attempt to connect the education process with its output isn't without its question marks. Research related to this question should lead to an understanding of the education process and its components and also should create recommendations for practical use. This type of approach is important, though it is still necessary to realize that it is not always possible to unequivocally connect the effects of courses to specific parts of the education process.

The reason is the already labelled social nature of researched problems, the enormous dynamic of processes that plays out at the course and which, furthermore, cannot be strictly separated from the effects of numerous influences that come from the everyday reality of the participants. Šindler (2004) aptly described this situation when he compared the Lipnice summer school "DoNitraZeMě" with SUR type psychotherapeutic training: "The DNZ course is similar to billiard balls – one forceful break sends all the balls (participants) flying, each in a different direction. On the other hand the training is a broom, which persistently sweeps all participants in approximately the same direction" (134). This direction is self-development. In the author's opinion a truly deep change depends on the "honesty" with which participants search for the "blossoming of their individuality". This searching in the mentioned psychotherapy training lasts five years, while in the researched experiential course it is only nine days. The experiential courses therefore create a space for personality change, one for which the participant must be strongly preset in order for the course to represent the "proverbial last straw". It is necessary to mention that external influences related to the effects of the course must be kept in mind not only beforehand but after the course and during research.

This description of the situation in research doesn't mean, however, that we should consider research hopeless. We only want to warn of all the pitfalls of experiential education and contribute to a discussion of ways to improve this research. We will take a look at several problems of research in the following parts of the text.

PROBLEMS IN THEORY VERIFICATION

The problem of a uniform language was already mentioned above. The importance of a clear language in research appears when we realize that in experiential education we are mainly researching extremely abstract constructs that include many other phenomena (such as self-concept). If we are incapable of precisely formulating what we actually do, conducting research becomes extremely difficult. This inability to grasp researched phenomena becomes particularly apparent in quantitative research, which requires the identification of variables. We will therefore look first at quantitative research, which is still preferred in scientific publications more than the qualitative approach.

According to Neil (2003) the preference for standardized research is one of the reasons why published work doesn't actually reflect the real practices of experiential courses, since a great amount of research isn't even published.

Why is it then so difficult to use standardized tools for measuring in experiential education? In a simplified form this can be explained by the fact that individual courses are prepared for small groups of participants and these courses are never repeated in the same form. We can apply a general formulation to elaborate this explanation into several areas where the use of standardized methods is problematic.

Groups of participants generally range in size from a few individuals up to about thirty. Programme realization is always dependent on the reaction of participants, whose highly divergent behaviour can lead to substantial changes in the programme. A researcher who attempts to limit these changes would suppress the basic

characteristics of experiential education and would not measure the method by which they are normally realized. Researchers often observe changes whose measurement results (pretest/posttest) are not statistically significant or are, for example, below the recognized border of effect size values (Hattie, Marsch, Neil, & Richards, 1997).

The preservation of constant time for measurement is also part of the methodology of standardized tools. This most frequently occurs at the beginning and the end of programmes, which are often held in non standard or outdoor conditions that do not provide quiet environments for measuring instruments. While the anticipated effect of "travel fever" on pretest results has yet to be proven, posttests are not regarded to reflect the normal condition of the individual due to so called "post course euphoria" (Newes, 2001).

The bias of this measurement at the end of the course could be compensated by follow up measuring. In the metaanalyses mentioned earlier, follow up measuring was performed only in twenty percent of the studies, though these measurements produced positive observations of the long term impacts of the courses (Hattie, Marsch, Neil, & Richards, 1997).

Questionnaires are the most frequently applied research technique in this case. The common disadvantage is that subsequent measurements have a relatively low return rate and that the people who do respond tend to have similar opinions (Bernard, 2002). In the case of experiential education these people will likely be those who had a positive experience with the courses. As an example we can take the research of Czech intertouch courses. Interpersonal development was mentioned as an outcome by 88% of the participants (Martin, Leberman, & Neil, 2002). If we consider that the return rate was 47%, than those who did not respond could either agree or disagree. This means that responses confirming this outcome are in a vague zone of 41–91% (Zappe, 2006). In general it can be said that the problem of self-reported tools is that they produce responses that are socially required but also untrue. Additional problems are incorrectly formulated questions that can be misunderstood, as well as weak content and criteria validity (Sibthorp, 2000).

A great problem with experiential education is the study of negative cases, i.e. people that either don't finish or are dissatisfied with the programme. These could in fact be the most valuable source of information for improving practices. The flip side of the same coin is the unwillingness of organizers to present unsuccessful programmes (Bocaro & Richards, 1998).

The question remains as to what extent the research approaches and results of foreign researchers correspond to the Czech concept of experiential education. According to Martin (in press) the Czech concept is significantly different than the international concept. If we disregard local peculiarities, the lack of standardized tools is resolved internationally by the use of accessible tools from related fields. But these are sometimes used inappropriately, as few tools were originally developed for groups joining experiential programmes (for example, tests intended for a school class rarely count on the possibility of handing out questionnaires following the completion of a programme at a mountain lodge, especially to a one time group of participants).

In spite of this, techniques from other social sciences are often adopted, as creating a unique tool is very time consuming and from the perspective of the problems described above the possibility of the standardization of such a tool presents us with a big question.

However, the problems of quantitative research and the use of knowledge from other scientific fields points out the error in understanding the needs of experiential education and the formulation of demands on research.

TO VERIFY OR TO GENERATE?

The fact that our field takes both methodology and theory from other scientific domains does not help experiential education become a truly recognized discipline. This dependence on other fields reflects the basic deficiency of experiential education identified by Henderson (2004) – a non existent body of knowledge. If we do not create our own theory and develop its own body of knowledge, it will not be possible to speak of an independent field of experiential education. It will also not be possible to create a unique language understood by teachers and researchers in the field of experiential education, as well as colleagues from related disciplines.

Experimental education wrestles with a lack of understanding of the basic emphasis in research in the same way as defined in sociology by Glaser and Strauss (1967) in the last century. Contemporary research should not serve to verify theories that are adopted from elsewhere and needn't necessarily correspond to processes in experiential education; instead this research should be used to generate a unique theory for the field. At the same time, there is "no fundamental clash between the purposes and capacities of qualitative and quantitative methods and data. What clash there is concerns the primacy of emphasis on verification or generation of theory" (Glaser & Strauss, 1967, 17).

The matter is not to prefer one or the other approach to research. Instead, it is important to define the current needs of experiential education. In our opinion the priority is the generation of theory. It is however true that in experiential education in the Czech Republic, a field that is rarely researched, the utilization of qualita-

tive methods could be suitable and helpful for creating theory that would ground the field in its own body of knowledge.

PROBLEMS IN THE THEORY GENERATION

Discussing research conducted using qualitative methods is somewhat more difficult than research employing quantitative approaches, as the later is based on a positivistic philosophy and offers clear points of evaluation. Qualitative methods are more current and less utilized; they were developed in the social sciences as a philosophical reaction to positivism. Even though it is necessary to take into consideration several differences in interpretive approaches, the call for increased use of qualitative and mixed methods is rather unequivocal (e.g. Bocarro & Richards, 1998; Neil, 2003; Martin & Leberman, 2005). This reflects the real up to date need for the generation of a theory inherent to the field of experiential education.

Ethnography is frequently used abroad in experiential education research. We can observe an approach that utilizes sequential analysis in Germany (Vollmar, 2007). An example of the application of grounded theory in the Czech environment has been published by Okrouhlý and Zappe (2007).

Nevertheless, we can say that research using qualitative methods often does not fully take advantage of its potential. Perhaps it wouldn't even matter that results are often published only in a descriptive form, because even this can be legitimate, though not always appropriate. A greater problem is that many researchers choose to use qualitative methods, conduct interviews or use questionnaires with open questions, but then calculate the answers and present them on the basis of response frequency.

For example, Martin and Leberman (2005) used quantification of responses in their research of outward bound courses. This quantification is supplemented by the unrelated responses of participants concerning parts of the programme, which raises questions about the depth of the analysis that has been performed. The qualitative method of inquiry known as "laddering" is similar to this (Goldenberg, McAvoy, & Klenosky, 2005). Researchers poll the opinions of participants and present them in the form of hierarchical maps. While the method is interesting, its analysis is again based on the quantification of responses.

From the perspective of the needs of experiential education, both presented studies are interesting: they are both explorative and attempt to connect the processes and results of the courses, and as such support the generation of experiential education theory. What is more problematic is the research concept, as researchers are unable to precisely say what their method is based on. Even here the unclear description of research methodology proves to be a big problem, since the reader cannot draw unambiguous conclusions regarding the credibility and applicability of the conclusions of such studies.

In the Czech context we regard the research of Šindler (2004), who created participant case studies using interpretive phenomenological analysis, as interesting. However, he was not successful in extending his analysis to include a deeper integration of individual findings. In his work the author created remarkable findings that summarize the identical features of the case studies. But he was not able to further interpret the differences and dissimilarities in participant responses, which causes the research to lose some of its breadth and depth.

The question remains as to what causes the superficiality of some qualitative studies. On one hand this could be the result of the difficulty in presenting findings in the limited number of periodicals. On the other hand it could be the product of the vague focus of research that is unable to precisely specify the problem being investigated and elaborate an analysis to a sufficient conclusion. This results in resignation in the effort to generate theory in favour of reformulating existing theory.

CONCLUSION

The identification of certain fundamental problems should not lead to the repudiation of research of such socially rich situations like experiential courses. On the other hand, it is necessary to understand how these problems arise and to better define the main purpose of research. Experiential education should consider "the primacy of emphasis on verification or generation of theory", as mentioned above. This can be accomplished through the use of both quantitative and qualitative methods, as well as approaches that combine these two. If experiential education aspires to be regarded as an independent branch it must produce its own high quality research that would contribute to the body of knowledge and clarification of language used within the field.

In conclusion we would like to point out that research is a political matter (Garvey, 2006). Therefore, we need our own research that will reflect the actual needs of our field, instead of trying to succeed in measuring, which has little in common with the goals of our programmes. We should preserve the capacity to research and evaluate experience programmes in an appropriate manner. Otherwise, in the opinion of this author, even institutions unfamiliar with the essence of this field will be able to meddle in the substance of the educational process. This could result in the entire field

being controlled, for example, by grant agencies and the government.

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VYBRANÉ PROBLÉMY VE VÝZKUMU ZÁŽITKOVÉ PEDAGOGIKY

(Souhrn anglického textu)

V textu se zabýváme výzkumem v oblasti, kterou pro potřeby článku nazýváme zážitková pedagogika. Nejdříve se věnujeme některým problémům výzkumu v obecné rovině. Dále se s využitím příkladů z dříve publikovaných studií zabýváme problémy jak kvantitativního, tak kvalitativního výzkumu. Dotýkáme se mimo jiné i otázky, zda by výzkum v dané oblasti měl klást důraz spíše na ověřování stávajících teorií, či tvorbu teorie vlastní. Zejména pro české prostředí se přikláníme k druhé variantě, která může spíše přispět k tvorbě společného jazyka a znalostního základu oboru.

Klíčová slova: ověřování teorie, tvorba teorie, jednotný jazyk, znalostní základ.

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SECTION
Erasmus Mundus Master in Adapted Physical Activity

Articles in this section were based on the master thesis projection completed as a part of the international master degree programme Erasmus Mundus Master in APA at the Faculty of Physical Culture, Palacký University, Olomouc.

ATTITUDES OF FUTURE PHYSICAL EDUCATORS TOWARD TEACHING CHILDREN WITH DISABILITIES IN PHYSICAL EDUCATION IN THE REPUBLIC OF SOUTH AFRICA

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The Republic of South Africa has undergone significant changes with regard to people with disabilities in the past number of years, which have also included changes in legislation and education. In the education of children with disabilities, inclusion is quite a new phenomenon. In order to prepare for inclusion, universities must focus on teacher preparation. Sherrill (1998) emphasised the role of attitudes in teacher preparation and therefore we have focused on the attitudes of university students toward inclusion. The aim of this study was to examine the differences in attitudes between two groups of students of the Department of Sport Science at the University of Stellenbosch in the Republic of South Africa. 30 of the students were specialized in coaching people with disabilities and 30 students were without this specialization. The adapted version of the questionnaire "Attitudes Toward Teaching Individuals with Physical Disabilities in Physical Education" (ATIPDPE), an instrument designed according to TPB (Ajzen, 1991, 2000) was used. To compare the attitudes of the two groups of students from the Republic of South Africa, a one way analysis of variance (ANOVA) was used. The computer program SPSS PC 11.0 was used to determine significant differences between students in intention to include participant with physical disability into general activity and behavioral belief. Two groups were compared with regard to TPB components and the results showed no significant differences between these groups.

Keywords: Inclusion, physical disability, attitudes, physical activity, physical education.

INTRODUCTION

The Republic of South Africa has undergone significant changes with regard to people with disabilities in the past number of years. These include changes in legislation, the structure of special education, general education, access to employment and others. Inclusion in the Republic of South Africa is quite a new phenomenon. It is thus not surprising that the restructuring and redesigning of education is in the very early stages. Gradual movement away from a segregated setting for learners with special needs is taking place, in the direction of the provision of education for all learners in an inclusive and supportive learning environment (Engelbrecht, Green, Naicker, & Engelbrecht, 1999).

Attitudes can be defined as someone's tendency to approach or avoid something. These choices as to whether to approach or avoid something, in turn lead to the formation of new attitudes with regards to the environment and one's self. Attitudes can be oriented towards anything ranging from, for example: objects, oneself, other persons, a disability, or a racial group (McMurray, 2003).

Attitudes towards the inclusion of people with disabilities have been influenced by the following aspects – ethical and cultural influences, beliefs, differences, structure of the population, the educational system and the system of education for future professionals. Many people are affected by a change to inclusion ranging from teachers, principals and parents to the learners both with and without disabilities. These changes are affected by current attitudes (some positive and some negative) (McMurray, 2003).

"In South Africa, the critical barrier to inclusion are negative and discriminatory attitudes in society towards difference with respect to race, class, gender, culture, disability, religion, ability and other characteristics" (Muthukrishna & Schoeman, 2000, 325). In an effort to promote successful inclusion, methods for the targeting the development of positive attitudes must be discovered and implemented (McMurray, 2003).

Research has shown that the attitudes of teachers are one of most crucial determinants in the inclusion of children with disability into general physical education and those which are of utmost importance if the process of inclusion is to be successful. "The most prevalent bar-

riers to including students with disabilities are related to teacher preparation and teacher attitudes as well as perceived and actual barriers to instruction that can include equipment, programming, and time" (Sherrill, 1998, 241).

Dube (2005) has reported that the life experiences of black and white disabled people under apartheid were very different and reflected the general inequalities between white and black people in South Africa. However, it must also be recognised that under apartheid, all disabled people – black and white – were discriminated against and marginalised because of their disability. In particular, they had limited access to fundamental socio-economic rights such as employment, education and appropriate health and welfare services.

After the year 1994, changes in legislation have begun regarding the structure of special education, general education, access to employment and others. According to Rooyen (2002), policy documents, green papers, white papers and acts have been produced constructing their purpose as promoting and protecting the rights of people with disability since 1994. In education, children with disabilities are referred to as being part of a larger group "learners with special needs" or "learners experiencing barriers to learning and development".

In 2001, the census data indicated that there were 2 255 982 people (1 173 939 females, 1 082 043 males, 1 854 376 were African, 168 678 of color, 41 235 Indian/Asian and 191 693 white) with various kinds of disability in the Republic of South Africa. This is 5% of the total population. The prevalence increased from 2% in the age group below 9 years to 27% in the age group aged 80 years and above. The prevalence of people with disability who had no schooling was high (10.5%) compared to those who had post secondary education (3%).

Furthermore, 5.2% had primary level education and 3.9% of the people had a secondary level education. This number can be a result of the fact that disabled people were often excluded in the past from educational opportunities, as the environment in regular school does not make for easy inclusion. The second explanation is that low levels of education are generally connected with low socio-economic status (poverty). No access to education could therefore be a result of both lack of access to educational opportunities and poverty (Lehohla, 2005).

The school system in South Africa enables many disabled children to attend primary school in the mainstream system. This does not in any way mean that inclusive education has been achieved, or that disabled children have been catered to. As pointed out by the National Commission on Special Needs in Education and Training (NCSNET) and the National Committee on Educational Support Services (NCESS), this inclusion is ad hoc, and does not deal with the issues of special educational needs or disability (Dube, 2005). "It is simply that there are no other services and so disabled children are generally dumped into mainstream schools by their parents or the education system" (Dube, 2005, 29). An inclusive education system could take various forms and be characterized differently in South Africa. In some provinces, initial support systems will have to be established prior to inclusive education. Large numbers of children are being mainstreamed by default, mainly in sites of learning of the former Department of Education (Engelbrecht et al., 1999).

Sport and physical activity is important for each of us, including people with disability. Physical activity in this population has implications far beyond the improvement of their physical condition. It gives the possibility for participation, socialization, and the improvement of quality of life and a range of positive emotions which can be experienced through activity. Such possibilities apply particularly to children with a disability. Participation of people with disability in sport, the problems they have encountered and ways of overcoming these problems have given rise to the academic discipline and profession entitled Adapted Physical Activity. In the Republic of South Africa it is possible to study this specialization at their third level of university studies under the name "Sport Coaching of People with Disabilities".

According to study by McMurray (2003), a substantial percentage of children with disabilities is included into the non Learners with Special Education Needs (LSEN) school. These schools have small class sizes and physical education activities are provided by trained specialists. McMurray (2003) found that at the LSEN schools, none of the children with disability were currently participating in physical education and only a small percentage of learners with disabilities participate in extramural physical activities. Children with disabilities could also experience certain barriers to sport participation because of problems engaging in educational and sport structures. The time has arrived for the individual's needs in the educational and sport system in South Africa to be addressed (McMurray, 2003).

In South Africa, physical education is not an independent subject, but is part of a greater subject entitled "Life orientation" (Life orientation is in the field of human and social studies). Life orientation is the study of the self in relation to others and society, and applies a holistic approach. It is concerned with the personal, social, intellectual, emotional and physical growth and development of learners, and the way in which these dimensions are interrelated and expressed in life. The focus is the development of self in society, and a balanced and confident improved quality of life for all. Life orientation guides and prepares learners for life and its responsibilities. This subject addresses knowledge, values, attitudes and skills regarding the self;

responsible citizenship; a healthy and productive life; social engagement; and the environment (Department of Education, 2002, 66).

The purpose of the subject of Life orientation is to prepare learners to engage on a personal, socio-economic, psychological, physical, moral, cultural and constitutional level with the demands of the world. In the area of recreation and physical activity, the student should learn about healthy practices and participate in recreational and leisure time activities. The goal of the area of recreation and physical activity is that students will gain an understanding of the relationship between health and physical activities and of how the environment can improve the quality of life and well being of all learners (Department of Education, 2002). It is not compulsory for any school to include the area of recreation and physical activity as part of the curriculum. Attitudes, behaviour, knowledge and skills about overcoming obstacles of inclusion are interconnected. According to some experts in the field, one solution is to prepare future teachers on how to include children with disabilities into their lessons. Furthermore, the first step in transforming attitudes is to first recognise where they stand presently. The aim of this study was to examine the differences in attitudes between two groups of students of the Department of Sport Science at the University of Stellenbosch in the Republic of South Africa. Thirty of the students specialized in coaching people with disability and 30 students were without this specialization.

METHOD

Participants

The collection of data was completed during the summer semester of 2007. A total number of 60 university students from the Republic of South Africa completed the ATIPDPE questionnaire. Students were from the Department of Sport Science. Of the 60 students, 30 of them were enrolled in Sport Science without a specialization in the Sport Coaching of People with Disabilities (SCPD) and 30 were enrolled in Sport Science with SCPD. There were 20 females and 10 males enrolled in Sport Science without SCPD and 24 females and 6 males enrolled in Sport Science with SCPD. Participants had different combinations of subjects: sport science was combined with either psychology, geography or physiology. There were 24 females and 6 males enrolled in Sport Science with SCPD. They also had different combinations of subjects: sport science and psychology, geography or physiology, plus sport coaching of people with disabilities. The mean age of students without SCPD was 19.03 and the mean age of students with SCPD was 21.57.

Instrument used

The questionnaire Attitude toward Teaching Individuals with Physical Disabilities in Physical Education (ATIPDPE) developed in 2002 by Kudláček, Válková, Sherrill, Myers and French was used. This instrument is based on the "theory of planned behaviour" by Ajzen (1991) and was constructed in the English language. In this questionnaire, attitude was inferred from behavioral beliefs. Content validity evidence was established by experts in two countries and pilot studies working with 96 university students to elicit their accessible beliefs and intensions (Kudláček, Válková, Sherrill, Myers, & French, 2002). Kudláček et al. (2002) used three methods of examining construct validity in the development of ATIPDPE: Pearson product moment correlation, multiple hierarchical regression, and known group differences. In the examination of the reliability of repeated measures, ANOVA was used, revealing that test-retest scores were not significantly different.

The introduction to the questionnaire contains definitions of terms relating to students with physical disabilities and inclusion, and detailed instructions for filling out the questionnaire. The questionnaire itself is composed of 2 items asking about the understanding of definitions, 4 intention statements, 12 behavioral belief statements, 2 normative belief statements, 2 control belief statements, and 14 questions concerning demographic data. The 7 point Likert type rating scale was used with each belief and intention statement. Behavioral belief evaluation scores were transformed from unidirectional (1, 2, 3, 4, 5, 6, 7) to bi-directional (–1, –2, –3, 0, 1, 2, 3) scoring. Scores for each statement were multiplied to create the item belief scores as shown in TABLE 1.

The results of the multiplications were summed and reported as the summary behavioral belief index (attitudinal score). This index represents the state of attitudes towards the target behavior. Scores for intention statements were also summed up and created the summary intention index. The questions about normative beliefs and control beliefs were created as direct measures and they were reduced in comparison with the original questionnaire, because this research is focused on behavioral beliefs as a main component of influenced attitudes. It is argued that students can not relate to the situation at schools and also their perceived competence could be much distorted without the benefit of personal experience (Kudláček et al., 2002).

The instrument was modified for purpose of this study. The original version of the instrument could not be used because this questionnaire is aimed at potential future educators of physical education. In South Africa however, this is not a subject at the university, given, as mentioned previously, that PE is not a stand alone subject but part of the subject – Life orientation. The

TABLE 1
Sample items from the attitudinal scale

Behavioral belief (outcome belief)
Likelihood
Including participants with physical disabilities in physical activity will help participants without disabilities to learn to interact with persons with physical disabilities:
An extremely unlikely outcome :____:____:____:____:____:____:____:
An extremely likely outcome
1 2 3 4 5 6 7
Evaluation
Students without disabilities learning to interact with persons with physical disabilities is:
An extremely bad outcome :____:____:____:____:____:____:____:
An extremely good outcome
1 2 3 4 5 6 7

majority of participants in this study were preparing for coaching or another activity connected with sport. The modified questionnaire was adapted by two experts in this field. One of these experts was from South Africa and altered the content with regard to language and culture differences to aid better comprehension by the subjects.

To compare the attitudes of the two groups of students from the Republic of South Africa, a one way analysis of variance (ANOVA) was used. Computer program SPSS PC 11.0 was utilised to determine if there were significant differences between students in their intention to include participants with physical disability into general activities and to hold the corresponding behavioral belief. The level of significance was set at 0.05.

RESULTS

The sample of students from the Republic of South Africa consists of 30 students of sport science with SCPD and 30 students of sport science without SCPD. Results of the demographic data study (TABLE 2) revealed that there were more females (66.7%) than males (33.3%) in the sample of students without SCPD. The same outcome is found among students with SCPD, in which case there are absolutely more females in the sample (80%) as opposed to males (20%). Personal experience with people with disabilities was reported to be one hundred percent by the students of Sport Science with the subject SCPD, while 73.3% students without SCPD do not have personal experience with people with disabilities. Only one student without the subject of SCPD has had a bad experience with people with disability. In both groups of students, a very positive evaluation of their previous experience dominates. Of students without SCPD, 12 evaluated this experience as very good, 7 as sufficient and 4 as great. From 30 students with experience, 2 have sufficient, 25 very good and 3 great experiences.

TABLE 2
Information about participants – students without SCPD and students with SCPD

Variable	Students without SCPD % (n = 30)	Students with SCPD % (n = 30)
Female	66.70	80.00
Male	33.30	20.00
Personal experience with PD	73.30	100.00
Evaluation of experience with PD:		
bad	3.30	–
sufficient	23.30	6.07
very good	40.00	83.30
great	13.30	10.00
Taking APA course at university	26.70	93.30
Getting information outside of the university	40.00	50.00
Perceived competence to teach participants with PD today:		
not at all	20.00	–
somewhat	56.70	70.00
very	23.30	30.00
Perceived competence to teach participants with PD after graduation:		
not at all	3.30	–
somewhat	33.30	43.30
very	63.30	56.70
Intent to teach PE after graduation	20.00	50.00

Among students without SCPD, 26.7% reported taking some SCPD course at University, while 93.3% of students with SCPD had had some SCPD course at University. Of students without SCPD, 40%, as well as half (50%) of the sample of students with SCPD received information outside of the University. Among students without SCPD, 20% reported not being competent at all, while 56.7% of them reported being somewhat competent and 23.3% very competent. None of the students with SCPD declared themselves not to be competent, while 70% of them felt somewhat competent and 30% felt very competent to teach people with physical disability.

In regards to their perception of competency after graduation, only 1 of the students without SCPD and none of the students with SCPD reported having no competence at all, while 10 of the students without SCPD and 13 of the students with SCPD declared themselves to be somewhat competent, and 19 of the students without SCPD and 17 of the students with SCPD reported feeling very competent. Twenty percent of the students without SCPD and in contrast to them, 50% of the students with SCPD reported having an intention to teach physical education (PE) after their graduation.

Comparison of groups and descriptive statistic for the behavioural beliefs component

To compare the attitudes of the two groups of students from the Republic of South Africa (students of Sport Sciences with SCPD and students of Sport Sciences without SCPD) we used a one way analysis of variance (ANOVA) and found that there are no significant differences among these groups ($F = 0.38$, $p = 0.54$). The scores on behavioral beliefs are contained in TABLE 3. Intention toward behavior can be inferred from the summative behavioral belief index. Scores which show an opinion of likelihood (that the outcome will occur) were calculated based on a 1 to 7 scale. Scores indicating an evaluation of a good or bad outcome were calculated on a –3 to +3 scale. Both groups of students reported a positive outcome, that inclusive physical education will improve people's knowledge about people with physical disability, encourage them to help each other and that tolerance and cooperation will also be taught in this way. These statements were highlighted as being very good and also as being a very likely outcome. Students believe that these outcomes are more likely to occur and they also believe that inclusion will likely have a positive effect on the personalities of students with physical disability.

The majority of answers reported that teaching physical education with the inclusion of people with

TABLE 3
Scores of sport science with and without SCPD students on behavioral beliefs

Beliefs about the outcome	Scale	Students without SCPD (n = 30) M (SD)	Students with SCPD (n = 30) M (SD)
1) Will facilitate persons without PD learning to interact with persons with PD	Likelihood Evaluation Like × Eval	6.17 (1.21) 2.30 (0.88) 15.00 (6.54)	6.27 (0.74) 2.17 (0.87) 13.80 (6.17)
2) Will make my presenting physical activity more difficult	Likelihood Evaluation Like × Eval	4.43 (1.20) 0.13 (1.20) 0.97 (5.79)	5.30 (1.12) 0.97 (1.16) 5.30 (6.36)
3) Will encourage participants to learn to help others	Likelihood Evaluation Like × Eval	6.23 (0.77) 2.63 (0.72) 16.43 (5.05)	5.87 (1.11) 2.57 (0.77) 15.37 (5.54)
4) Will make lesson planning and preparation more difficult	Likelihood Evaluation Like × Eval	5.00 (1.46) 0.63 (1.19) 2.70 (6.03)	5.33 (1.03) 1.17 (0.95) 6.67 (5.93)
5) Will teach participants greater tolerance	Likelihood Evaluation Like × Eval	5.63 (1.47) 2.43 (1.04) 14.67 (6.59)	5.97 (0.89) 2.27 (0.78) 13.70 (5.50)
6) Will have a positive effect on the personalities of participants with PD	Likelihood Evaluation Like × Eval	6.23 (1.01) 2.50 (1.07) 15.73 (7.57)	6.10 (0.99) 2.33 (0.84) 14.70 (6.59)
7) Will experience discrimination against participants with PD	Likelihood Evaluation Like × Eval	3.20 (1.73) –2.53 (0.97) –7.87 (5.64)	3.43 (1.72) –2.40 (1.00) –7.83 (5.15)
8) Will slow down instruction and progress in a group	Likelihood Evaluation Like × Eval	4.17 (1.34) –0.60 (1.22) –2.07 (5.01)	4.53 (1.07) –0.13 (1.28) –0.40 (6.03)
9) Will improve the knowledge of participants about persons with PD	Likelihood Evaluation Like × Eval	6.50 (0.78) 2.67 (0.61) 17.60 (4.92)	6.30 (0.70) 2.50 (0.62) 16.00 (4.95)
10) Will teach participants cooperation	Likelihood Evaluation Like × Eval	6.20 (0.89) 2.73 (0.64) 17.20 (5.08)	6.03 (0.76) 2.60 (0.86) 15.83 (5.88)
11) Participants without disabilities will experience discrimination	Likelihood Evaluation Like × Eval	2.20 (1.71) –2.33 (1.35) –5.27 (4.70)	2.70 (1.60) –1.77 (1.45) –4.23 (5.19)
12) Will reduce the quality of the experience	Likelihood Evaluation Like × Eval	2.57 (1.25) –1.93 (1.05) –4.73 (3.83)	3.23 (1.52) –1.30 (1.34) –2.93 (3.94)

Legend
M (SD) – mean (standard deviation)
PD – physical disability
PA – physical activity

disability will be more difficult, along with increased difficulty in preparation and planning for the lessons as being a very likely outcome. Students with the subject SCPD evaluated these outcomes (inclusion of people with disability will be more difficult) slightly more positively (M = 5.30) than students without this subject (M = 4.43). The most negative outcome was evaluated by students as being potential discrimination against students with physical disabilities. The most positive outcome according to both groups of students is that participants without physical disability will have better and more knowledge about participants with physical disabilities.

DISCUSSION AND CONCLUSIONS

One of the main barriers to the inclusion of children with disabilities into regular physical education is the attitude of teachers. These attitudes toward inclusion of children with disability can arise from insufficient knowledge or lack of experience. An obvious solution would be to improve these two elements (knowledge and experience) and the most opportune time would be at university. The main aims of the study were to adapt the questionnaire ATIPDPE for South African students and to use this questionnaire for comparing students from two different groups. These students were from the Faculty of Sport Science. We gave the questionnaire to 30 students with a specialization in SCPD and 30 students without this specialization.

The results upon comparing behavioural beliefs showed that there are no significant differences between groups. It is very difficult to establish the reasons for these results. In other countries, significant differences were noted between similar subjects. Blanková (2006) found that students of general physical education have less favourable attitudes toward including students with physical disability into general physical education classes than do primary adapted physical education students in the Republic of Slovenia and also in the Czech Republic. There may be several reasons for these results. The Republic of South Africa is a multicultural country. Children grow up in a world, where differences are commonplace. For them, social contact or working with people with any dissimilarity might prove to be much easier. Another fact is the structure of the educational system. In South Africa there have not been a lot of special schools and children with disabilities have been educated in ordinary schools. Students, now studying at universities, had more possibilities to meet these children with disabilities at primary or high school.

Quite interesting are also the results of the demographic data study. To the question "Do you intend to become a teacher after graduation?" fifteen students with SCPD specialization answered yes and only six of the students without specialization in SCPD had the same answer. Six of the thirty students without SCPD do not feel competent today in providing leadership or teaching physical activity to participants with physical disabilities. These numbers decreased when asked the question of how competent they will feel after graduation. The answer "not at all" occurred only in one response, but the answer "very competent" increased from seven to nineteen. This result could be because students from the group without SCPD will take a course in coaching people with disabilities before graduation. The group without SCPD felt slightly more competent. The proposed research identifies the attitudes the future educators hold in relation to inclusion. Knowledge of these attitudes (as they are and whatever they are) gives us the opportunity of identifying what should be done in the preparation of future teachers towards the inclusion of these children in their classes. More literature about the attitudes of future physical educators can be a contribution towards the betterment of this situation in comparison with other countries particularly where similarities exist in their educational systems and in conditions of inclusion.

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NÁZORY BUDOUCÍCH PEDAGOGŮ NA ZAČLENĚNÍ DĚTÍ S POSTIŽENÍM DO TĚLESNÉ VÝCHOVY V JIHOAFRICKÉ REPUBLICE

(Souhrn anglického textu)

Jednou z bariér, týkající se začlenění dětí s postižením do tělesné výchovy, mohou být negativní postoje učitelů. Tyto postoje mohou pramenit z neznalosti nebo nedostatku zkušeností s dětmi s postižením. Pro překonání těchto bariér je nezbytné změnit postoje těch, kteří mají být prostředníky v inkluzi. Tripp a Sherrill (1991) opakovaně vyzdvihují význam postojů v aplikovaných pohybových aktivitách a jejich výzkumu. Teoreticky podložený výzkum o utváření postojů může stanovit rámec porozumění faktorům, které působí na vztah mezi postojem a chováním (Tripp & Sherrill, 1991). V rámci výzkumu postojů jsme upravili dotazník „Attitude Toward Teaching Individuals with Physical Disabilities in Physical Education" (ATIPDPE) pro studenty oboru „sport science" na Universitě Stellenbosch v Jihoafrické republice. Do výzkumu bylo začleněno 60 studentů. Utvořili jsme dvě skupiny, ve kterých bylo 30 studentů se specializací trenérství osob se zdravotním postižením a 30 studentů bez této specializace. Porovnali jsme skupiny v komponentech teorie plánovaného jednání a výsledky ukázaly, že mezi postoji studentů v těchto dvou skupinách není statisticky významný rozdíl.

Klíčová slova: inkluze, integrace, tělesné postižení, postoje, pohybová aktivita, tělesná výchova.

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ANALYSIS OF CHINESE CHILDREN'S NEWSPAPER REPORTS ON THE PHENOMENON OF DISABILITY

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In this study we examined the reports on disability and people with disabilities in major Chinese children's newspapers. Eight newspapers from 2003 to 2006 were chosen on the basis of the following factors: national reach, media coverage of disabilities and people with disabilities, and availability (resources can be obtained through internet).

Articles were selected for inclusion in this study if they referred to a specific disability, a chronic illness which incurs disabilities or to disability in general, whether in a headline, text, picture or illustration.

There are 152 articles published related to disabilities and persons with disabilities in total. The proportion for report on disability is 5.6% in Chinese children's newspapers, which is higher than that (2.3%) in the Czech Republic. Most of the articles in this study were focused on children, which was determined by the target population of the newspapers. Both studies showed (in China and Czech Republic) an increased amount of reporting report due to greatly important events.

Keywords: Attitude, disability, children newspaper, adapted physical activity, Paralympics, Special Olympics.

INTRODUCTION

Attitudes are formed, developed and stabilized through a variety of socializing forces, including families, schools, the media, etc. Most social psychologists would agree that the bulk of our attitudes are learned. That is, attitudes result from our experiences not our genetic inheritance. Through socialization, individuals learn the attitudes, values, and behaviors of their culture. Important influences in the process include parents, peers, schools, and the mass media (Kenneth & Irwin, 2002). Because of the rapidly increasing development of mass media, they play a more and more important role in forming and changing people's attitudes. Duncan and Brummett (1987) explored the theory of media logic, developed by Altheide and Snow (1979), who described the media's potent influence on viewers and emphasized that the media often shapes the meanings of "social phenomena" for their audiences.

Childhood is a very important life period for positive attitude formation and development. Children's attitudes are manifested behaviorally by a predisposition to act in a positive or negative way when they encounter the attitude referent. When attempting to promote certain attitudes, educators must address the three fundamental influences on attitude formation (i.e. indirect experiences, direct experiences, and the child's social group) (Triandis, Adamopoulos, & Brinberg, 1984). Thus, the media also have a great influence on how the positive attitudes of children can be developed.

"Disability" is a quite new idea and big phenomenon in the whole society in China. According to the latest statistics of the second China National sample survey on disability, there are nearly 82.96 million persons with different types of disabilities in China. With reference to the 2005 year end statistics on the total population of China released by the National Bureau of statistics of China, it is estimated that there were 1,309.48 million people in China at the time when the survey was conducted. Based on this figure, the estimated proportion of disabled persons to the total national population is 6.34 percent (communique on major statistics of the second China National sample survey on disability, http://www.cdpf.org.cn/english/top-7.htm).

Apparently, the media have a great influence on how the society views the disability and persons with disabilities. If we are ever to change people's perceptions of disability, we must identify the media's abounding messages about the subject (Byrd & Elliott, 1988; Longmore, 1987). However, the media have often provided only poor coverage on disabilities and the people with disabilities in China.

Children form attitudes about people with disabilities as early as at 4 or 5 years of age (Gerber, 1977; Jones & Sisk, 1970), and often those attitudes are negative or rejecting (see Horne, 1985; Jones, 1984; Yuker, 1988 ex-

tensive reviews). As a kind of indirect experience, a typical children's newspaper is a very important instrument for the formation, knowledge and education of children, including their attitude towards persons with disability. In China, there are approximately 130,000,000 children. Their positive attitudes toward disabilities and people with disabilities are very important for improving and developing the status of people with disabilities in the near future. Thus, it is necessary to establish how typical children's newspapers report on disabilities and persons with disability.

No published research has focused on children's newspapers coverage of disabilities and persons with disability. This research offers a preliminary analysis of the phenomenon "disability" in selected Chinese children's newspapers, especially paying attention to the topics pertaining to sports and making a logical comparison with the situation in the Czech Republic.

METHODS

Data collection

The target of this study was articles on disabilities and people with disabilities published in major children's newspapers in China. Eight newspapers for children were included in this study. The newspapers were chosen on the basis of the following factors: national reach, media coverage of disabilities and people with disabilities, and availability (resources can be obtained through internet). A survey of articles is presented in Appendix 1 (Czech articles) and Appendix 2 (Chinese articles). Chinese articles are divided into categories related to children and youth by age: kids = preschool age, children = elementary school age, teenagers and students = secondary school age (from 11 up to approx. 16).

All the issues of these newspapers during the period between the year 2003 and 2006 were surveyed. Of course, there was the latest set of Olympic Games networks (Paralympics, Special Olympics, Deaflympics), so we can get fresh information into our study. We examined all the articles of these eight newspapers except for advertisements, notices, rules, regulations and letters to the editor.

Articles were selected if they referred to a specific disability, a chronic illness which incurs disabilities or to disability in general, whether in a headline, text, picture or illustration. Then, we scrutinized for all references to the terminology used to describe disabilities and the language and images used to portray people with disabilities.

Data were collected based on two main groups of variables:

- structure of the articles – source (from which newspaper); type of article (news, feature or other) and visual effects (photographs or illustrations),
- content variables – the main character in the article (specific person/s with disability, family members, groups of disabled individuals or organizations); the category of disability of the main character (physical disability, hearing impairment, speech and language disability, visual impairment, intellectual disability, multiple disability and the general terms handicapped or disabled); the kind of details used to describe main characters who were persons with disabilities (for example age, gender, occupation); governmental agencies and other service providers; specific problems experienced by disabled people; physical activity, recreation and sport competition for people with disabilities (for example Special Olympics, Paralympics, or adapted physical activity).

Data evaluation

Categories for the variables were derived from previous studies and through content analysis (Thomas & Nelson, 2005; Tripodi & Epstein, 1980; Jones, 1985). All the coding was done by the researchers themselves. Preliminary categories were tested on a sample of 40 articles from 5 newspapers, collected prior to the start of the study period; results were compared and categories redefined. This process was repeated a second time until agreement was reached on all variables. Using these variables according to our guidelines, a member of the research team read each newspaper, and any article containing a key word or phrase of disabilities or people with disabilities was identified for possible content analysis. After targeting this article, another member of the research team, the rater, made the judgment whether the disability was a major or minor focus of the article. We only included major focus articles in the content analysis.

RESULTS

The eight newspapers examined in this study published a total of 152 articles concerning disabilities and people with disabilities between the year 2003–2006. The number and frequency of the articles published by each newspaper is presented in TABLE 1.

We can see that among the totally published 2496 issues of all eight newspapers, there were only 139 issues contained articles about disabilities and people with

disabilities, the average proportion was 5.6%. Among these newspapers, Chinese middle school students had the most reports – 38 articles, but Shanghai middle school students showed the highest proportion of reports – 9.4%.

TABLE 1
Number of articles about disabilities and people with disabilities

Newspaper	Number of articles	Issues included	Issues in total	%
Chinese Teenagers' News	13	11	192	5.7
Chinese middle school students	38	34	384	8.9
Chinese Kids' Weekly	16	15	192	7.8
Shanghai middle school students	18	18	192	9.4
Family Education Times	16	13	192	6.8
Teenagers' Daily	36	34	1152	3.0
Modern Students	6	6	96	6.3
Shanghai Education	9	8	96	8.3
Total	152	139	2496	5.6

In the type of articles, among the 152 articles there were news, features and other types (TABLE 2). Other types about knowledge introduction (n = 11), stories (n = 7), essays written by students (n = 17) and opinions (n = 5), accounted for an additional 26.3% of the references. Of the references, 45.4% were news articles, which represent the majority of articles.

As to the pictures used in articles, of particular note was the high proportion of picture usage in the newspaper Chinese Kids' Weekly, which represents 25% in both single and multiple pictures accompanying the articles, and 12.5% in pictures as the main focus. The target populations for Chinese Kids' Weekly are children from 3 years old to 8. Apparently, to use more pictures in articles is an appropriate strategy for them.

The relative frequency of the coverage of various disabilities was also of interest. The category of the general terms handicapped or disabled received the most references (22.5%), followed by intellectual disability (17.2%) and visual impairment (16%). Ironically, the category of learning disability, which constitutes the largest population within special education programs, was not mentioned in any articles; Yoshida and his colleagues (1990) found a similarly low frequency of articles about persons with learning disabilities in their study. The frequencies

TABLE 2
Structure of articles related to the type of articles and the picture usage (n = 152)

	Type of article						Accompanying, multiple				Accompanying, single			
Newspaper	News		Feature		Other		None picture				Picture as main focus			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Chinese Teenagers' News	8	61.5	1	7.7	4	30.8	12	92.3	1	7.7	0	0	0	0
Chinese middle school students	22	57.9	6	15.8	10	26.3	21	55.3	9	23.7	1	2.6	7	18.4
Chinese Kids' Weekly	11	68.7	1	6.3	4	25	6	37.5	4	25	4	25	2	12.5
Shanghai middle school students	10	55.5	5	27.8	3	16.7	14	77.8	4	22.2	0	0	0	0
Family Education Times	6	37.5	8	50	2	12.5	10	62.4	3	18.8	3	18.8	0	0
Teenagers' Daily	9	25	16	44.4	11	30.6	31	86.1	5	13.9	0	0	0	0
Modern Students	0	0	2	33.3	4	66.7	6	100	0	0	0	0	0	0
Shanghai Education	3	33.3	4	44.5	2	22.2	7	77.8	2	22.2	0	0	0	0
Total	69	45.4	43	28.3	40	26.3	107	70.4	28	18.4	8	5.3	9	5.9

for other categories were as follows: hearing impairment (15.4%), physical disability (13%), speech and language disability (9.4%) and multiple disability (6.5%).

With regard to content variables, in general, there were more articles related to groups of people with disabilities than to any other characters. TABLE 3 shows that more than half of the reports were concerning groups of people with disabilities, such as, people with visual impairment in one community and students with intellectual disability in a special school, and there were more articles about solo individuals than multiple individuals. The articles published in the newspapers that focused on children occupied a dominant position (94%), which represented the specific characteristics of children's newspapers. The majority of individuals and groups of people with disabilities portrayed in articles were the children in normal and special schools. It's not hard for us to find that most of the articles were focused on both genders or unclear, the numbers of articles that mentioned the specific gender (male and female) of main characters were exactly the same.

TABLE 3
Detailed information of the main character in articles (n = 52)

Variable	n	%
Main character in article		
Individual person with disability or family member	51	33.6
Several individuals with disabilities	17	11.2
Group of people with disabilities	80	52.6
Other	4	2.6
Age group of main character		
Child or adolescents (< 18 years)	94	61.8
Adult (18+ year)	25	16.5
Both or unclear	33	21.7
Gender of main character		
Male	28	18.4
Female	28	18.4
Both or unclear	96	63.2

As for the problems disabled people have experienced, most of the articles included in the sample (n = 102, 67.1%) cited at least one problem. Financial and mobility problems were those cited most often followed by prejudice, functional limitation and services. Services referred to the absence of services, their inaccessibility and/or their poor quality. In China, most of the disabled people live under the poverty line, that's why the financial factor shows such a high percentage in all types of problems they have experienced.

Regarding the reports on disability sport in these children's newspapers, there were a total of 42 articles related to disability sport in eight selected newspapers from 2003 to 2006. What needs to be pointed out is, that 6 of these articles talked about two aspects at the same time, for example, the article "Goalball for blind people" published in issue 1030 of Chinese middle school students mentioned APA and Paralympic Games at the same time.

TABLE 4 identifies the reports of disability sport in each newspaper from each year. We can see that the amounts of reports on disability sport in these newspapers are similar except for Teenagers' Daily, there were 13 articles in this period, Teenagers' Daily is the only daily newspaper of the eight newspapers. There was only 1 article related to disability sport in Chinese Kids' Weekly during the 4 years mentioned, for children from 3 years old to 8, it's nearly nothing for the purpose of giving them an impression and changing their attitudes toward disability.

TABLE 4
Number of disability sport articles in each newspaper

Newspaper	Publisher	2003	2004	2005	2006
Chinese Teenagers' News	China Children's Press & Publication Group	1	1	2	2
Chinese middle school students	China Children's Press & Publication Group	2	0	1	2
Chinese Kids' Weekly	China Children's Press & Publication Group	0	0	1	0
Shanghai middle school students	Shanghai Educational Press Group	1	1	2	6
Family Education Times	Shanghai Educational Press Group	0	0	0	2
Teenagers' Daily	Shanghai Educational Press Group	1	4	0	8
Modern Students	Shanghai Educational Press Group	0	1	0	1
Shanghai Education	Shanghai Educational Press Group	1	0	0	2
	Total	6	7	6	23

These articles were analyzed by categories of disability sport (TABLE 5). The highest frequency of report on disability sport was for the Special Olympic Games, especially in the year 2006. As we known, in 2006 the Special Olympics Shanghai Invitation Competition was

held in Shanghai and the 2007 Special Olympics World Summer Games were to be held in that city, too. That's the main reason for the growing reports on the Special Olympic Games. It indicates the significant influence of important sport competitions on the newspaper coverage of disabilities and people with disabilities. APA and the Paralympic Games also showed an increase of their reports in 2006. The Paralympic World Summer Games will be held in China in 2008, which indicates again that the big events will support the reporting on disabilities and people with disabilities. Reports on adapted physical education showed more stably. From the analysis, we found that there was no report on the Deaflympic Games, it gained the least attention of all the top games.

TABLE 5
Number of articles by category of disability sport

Disability sport	2003	2004	2005	2006	Total
Adapted physical activity & recreation	4	4	1	7	16
Adapted physical education	2	1	2	2	7
Top games					
Paralympic Games	1	1	1	5	8
Special Olympic Games	0	2	1	14	17
Deaflympic Games	0	0	0	0	0
Total	7	8	5	28	48

DISCUSSION

The purpose of this study was to determine the characteristics of reporting in eight selected Chinese children's newspapers and to establish how the press for children reports on disability and persons with disabilities. We tried to analyze and describe the general situation regarding the coverage of the phenomenon called "disability" in Chinese children's newspapers, and we especially paid attention to the coverage of sport for persons with disabilities. We also wanted to make a logical comparison about the coverage of disabilities and persons with disabilities in children's newspapers and journals between China and the Czech Republic.

We found that during these four years from 2003 to 2006, the eight selected Chinese children's newspapers published 152 articles on disabilities and persons with disabilities in total. We can see that among the total of 2496 published issues of all eight newspapers, there were only 139 issues containing articles about disabilities and people with disabilities, the average proportion was 5.6%. Compared to the situation in the Czech Republic, as Faldynová (2006) found in her MA diploma thesis, among the total of 7293 articles published by 24 Czech children's journals from 1995 to 2005, 166 articles were related to disability and people with disabilities, the average proportion was 2.3%, it's nearly only half of what was published on the topic in China. But we should notice that among the 152 articles related to disability and people with disabilities we found in Chinese children's newspapers, 67 articles were published in the year 2006, which almost contributes half of the amount. So the higher proportion of reports on disability in China may be due to the inclusion of fresh information.

The results showed that 45.4% of the articles were news, 28.3% of the articles were features, the other types including knowledge introduction, stories, essays written by students and opinions accounted for 26.3% in our results. As to the pictures used in articles, of particular note was the high proportion of picture usage in the newspaper Chinese Kids' Weekly, which represents 25% in both single and multiple pictures accompanying the articles, and 12.5% in pictures as the main focus. As we have identified in this study, the target population for Chinese Kids' Weekly are children from 3 years old to 8. Apparently, these types of articles are easier for children to understand and useful for forming and changing their attitude toward disability and people with disabilities. What we must point out is that 5 of the students' essays were written by children with disabilities, one with hearing impairment, one with physical disability and three with visual impairment.

Through the study of the main character in the articles related to disability, we discovered that the articles published in children's newspapers focusing on children were in a dominant position (94%), which represented the specific characteristics of children's newspapers. According to our findings, financial and mobility problems were the most often cited problems experienced by people with disabilities in the articles. It reflected the real situation in their daily lives. In the analysis of governmental institutions and service providers, it is striking that in 32.2% of the articles there was at least one organization mentioned. The governmental authorities including foreign, national and provincial governments were mentioned in 18 articles, and the service providers were mentioned in 33 articles.

Based on the results of this study and what was found by Faldynová (2006) in her MA diploma thesis, we can find some similarities and differences between China and the Czech Republic. First, as to the frequency of the coverage of various disabilities, in my findings, the category of the general terms handicapped or disabled received the most references (22.5%), followed by in-

tellectual disability (17.2%), visual impairment (16%), hearing impairment (15.4%), physical disability (13%), speech and language disability (9.4%) and multiple disability (6.5%). While in the research in Czech Republic, the top three highest proportions were the general terms handicapped or disabled (55%), physical disability (19%) and multiple disability (13%), there were few reports on the other types of disabilities. Second, regarding the reports on disability sport, in this study, there were a total of 42 articles found in 8 children's newspapers during the period 2003–2006. In these articles, 17 articles were related to APA and adapted physical education, 19 articles were related to the top games including Paralympic Games, Special Olympic Games and Deaflympic Games, while 6 articles talked about APA and top games at the same time. In the results of the Czech Republic, the amount of articles related to disability sport was lower than that in China. From the examined 24 journals during the period 1995–2005, 17 articles were found, of which 8 focused on APA and recreation, whereas 9 focused on competitions. Third, in the analysis of reports on disability in different years, we found that there is an obvious increase of reports on disability and people with disabilities in 2006, especially for intellectual disability and the Special Olympic Games. Through the following analysis of each newspaper, we found that the newspapers that are published by the Shanghai Educational Press Group were especially focussed on intellectual disability. As we know, the 2006 Special Olympics Shanghai Invitation Competition was held in Shanghai and the 2007 Special Olympics World Summer Games were to be held in that city, too. Special Olympics are for children and adults with intellectual disabilities. That's the main reason for the growing reports on intellectual disability and Special Olympic Games. In Faldynová's thesis, she also found an increased report on disability in 2004 due to the Paralympic Games. It indicates the significant influence of important sport competitions on the newspaper coverage of disabilities and people with disabilities. For children, it was a good opportunity to let them know more about disability and to form and change their attitude toward disability and people with disabilities.

The contrast between these findings in China and the Czech Republic might be explained by (a) the newspapers and journals examined, (b) the days on which they were published, perhaps most significantly, (c) the different economic and social environment between the two countries and the cultural significance of disability therein.

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ANALÝZA ZPRÁV O FENOMÉNU POSTIŽENÍ V ČÍNSKÝCH DĚTSKÝCH ČASOPISECH

(Souhrn anglického textu)

V této studii jsme zkoumali zprávy o postižení a postižených lidech v hlavních čínských dětských tiskovinách. Bylo vybráno osm časopisů z let 2003 až 2006, a to na základě těchto faktorů: celonárodní dosah, mediální pokrytí handicapů a postižených lidí, dostupnost (zdroje lze získat na internetu).

Do této studie byly zahrnuty články, které se zabývaly specifickými handicapy, chronickými chorobami, jež vyvolávají invaliditu, nebo postižením jako takovým, a to v nadpisech, textu, na fotografiích nebo ilustracích.

Celkem jsme zaznamenali 152 článků zaměřených na handicapy a postižené osoby. Poměr článků o postižení v čínském dětském tisku je 5,6 %, což je více než v České republice (2,3 %). Většina těchto článků byla zaměřena na děti, což bylo vyvoláno cílovou skupinou čtenářů. Obě studie prokázaly (v Číně i České republice) zvýšený počet článků z důvodu blížících se významných událostí.

Klíčová slova: postoj, handicap, dětské časopisy, přizpůsobená fyzická aktivita, paralympijské hry, speciální olympiáda.

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Appendix 1

Articles in 24 Czech children journals about disability and disability sport during 1995–2005 (according to Faldynová, 2006)

Journals in Czech	Journal in English	Vol./ year	Total Articles	Articles about disability	%	PD	HD	VD	MD	MUL	LD	GEN	Pr	Sport
Printed journals														
ABC	ABC	26	182	28	15	13	0	1	2	2	2	8	1	3
Barbie	Barbie	14	126	0	0	0	0	0	0	0	0	0	0	0
Čarodějka W.I.T.CH.	Witches' WITCH	26	104	0	0	0	0	0	0	0	0	0	0	0
Čtyřlístek	Four leaf clover	18	198	0	0	0	0	0	0	0	0	0	0	0
Čtyřlístek speciál	Four leaf clover special	8	88	0	0	0	0	0	0	0	0	0	0	0
Dáda	Dáda (nickname of Czech female entertainer of children)	12	72	3	4	0	0	0	0	0	0	3	0	1
Kačer Donald	Donald Duck	26	286	0	0	0	0	0	0	0	0	0	0	0
Kyber myš	Cyber mouse	12	48	0	0	0	0	0	0	0	0	0	0	0
Mateřídouška	Wild Thyme	12	72	3	4	2	0	0	0	0	0	1	0	0
Méďa Pusík	Teddy's Kisser	12	72	2	3	0	0	0	0	0	0	2	0	0
Medvídek Pú	Winnie the Pooh	16	128	0	0	0	0	0	0	0	0	0	0	0
Modelář	Modeller	12	132	0	0	0	0	0	0	0	0	0	0	0
Sluníčko	Tiny Little Sunnie	12	84	14	17	0	0	0	0	0	0	0	0	0
Tom a Jerry	Tom and Jerry	6	42	0	0	0	0	0	0	0	0	0	0	0
Electronic journals														
Abicko.cz	Little ABC.cz	*	788	30	4	13	1	2	2	2	2	8	1	3
Balónek	Small balloon	*	117	2	2	0	0	0	0	0	0	2	0	0
Klub vodních strážců	Club of Water Guards	2	10	1	10	0	0	0	0	0	0	1	0	0
Koblížek	Little Donut	*	137	0	0	0	0	0	0	0	0	0	0	0
Kroky	Steps	6	48	0	0	0	0	0	0	0	0	0	0	0
Magazín eKamarád	Buddy eMagazine	*	4013	22	0	0	0	0	0	0	0	0	4	1
Teepek.cz	Teepek.cz	*	26	3	12	0	0	1	0	1	0	1	1	0
Zámeček	Small Castle	*	52	52	100	1	0	0	0	1	0	50	0	0
Zavináč	@	*	461	6	0	0	0	0	0	0	0	0	1	1
Země pohádek	Country of tales	7	7	0	0	0	0	0	0	0	0	0	0	0
Total				166		29	1	4	4	6	4	76	8	9

Legend
PD = physical disability
HD = hearing impairment
VD = visual impairment
MD = mental disability
MUL = multiple disability
LD = learning difficulty
GEN = general terms of disabled
Pr = physical activity and recreation for disabled people
Sport = sport competition for disabled people
* = no regular volume

Appendix 2
Title of the articles about disability in Chinese children newspapers

中国少年报 **Chinese teenagers' news**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
让碘盐充分发挥作用	How to make full use of iodized salt	2006	2534
“十佳”感动了我	Affected by the pioneer	2006	2525
小小“爱心发明家”	Little inventor	2006	2508
让阅读日成为我们共同的节日	Let's enjoy the reading day together!	2006	2498
走路的时候两只手为什么要摆来摆去	Why do we need to wave our hands when walking?	2005	2478
我和爷爷吃月饼	Grandfather and I share the moon cake	2005	2474
帮助无声世界的孩子	Help the children in silence	2005	2444
读读“数”的信息	Information	2005	winter holidays pack
成龙、杨受成献爱心	Cheng Long and Yang Shoucheng donated for children with disabilities	2004	2415
聋儿的“六一”	The children's day of deaf children	2004	2402
特奥会庆“六一”	Celebrate the children's day at the Special Olympic Games	2004	2402
爱心送给残疾人	Help people with disability	2004	2400
助残献爱心	Help people with disability	2004	2400

中国中学生报 **Chinese middle school students**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
图片报道	Picture news	2006	1387
有种不幸叫做“瞎”	The unfortunate situation of the blind	2006	1378
受伤致残能要求哪些赔偿	The compensation for leading disability	2006	1363
学生玩转小科技	Students and minute technology	2006	1361
图片报道	Picture news	2006	1304
迎奥运 学手语	Welcome to the Paralympics – learn finger language	2006	1289
图片报道	Picture news	2006	1285
图片新闻	Picture news	2006	1285
图片新闻	Picture news	2006	1263
盲人也能投篮	Blind people can play basketball	2006	1244
盲人手机	Mobile phone for blind people	2005	1235
长沙有一群“小按摩师”	A group of massage therapists in Changsha	2005	1221
他，用膝盖敲开了成功之门	He opened the door of success with his knees	2005	Summer holidays pack
我来了，中国男孩来了！	Here I come, a Chinese boy	2005	Summer holidays pack
图片报道	Picture news	2005	1183
6岁的盲女“音乐家”	A musician of 6 years old is a blind girl	2005	1178
校园图片报道	Picture news in school	2005	1176
心系残疾学生和失学儿童	Care for the students with disability	2005	1169
笑脸	Smiley face	2005	1167
聋哑女孩真大胆 入店窃钱被判刑	A deaf girl was punished for stealing	2005	1167
上帝的孩子	Son of God	2005	1166
15岁的生命重量	The weight of the life of a 15 year old	2005	1143
中学生发明“感知盲道”	Middle school student invented a road for the sensitive blind	2005	1140

中国中学生报 **Chinese middle school students**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
盲人投篮运动	Basketball for blind people	2005	1137
聋哑学生体验“数码快乐”	Deaf students enjoy the digital world happily	2004	1134
聋哑学生的那一片天	The sky for deaf students	2004	1131
约定	Promise	2004	1112
强者	To be a strong man	2004	1103
大陆小演员慰问香港残障小朋友	Performance for the disabled children in Hong Kong	2004	1076
偏袒之爱	Love of nepotism	2004	1067
智能轮椅	Brainpower wheelchair	2004	1041
生活不相信眼泪	Life doesn’t trust a tear	2004	1038
盲人门球	Blind goal ball	2003	1030
图片新闻	Picture news	2003	1029
假如我有一个能许愿的花瓣	If I have a piece of a flower that can be used to make a promise	2003	1024
枯树生出成才枝 哑巴说出标准话 牡丹江市今年四名聋哑生圆了大学梦	Four deaf students entered the university	2003	1024
上海9名盲考生欲圆大学梦	Nine blind students in Shanghai wanted to enter university	2003	1023
盲人踢足球	Blind people play soccer	2003	972

中国儿童报 **Chinese Kids’ Weekly**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
爱心赠队报	Donate newspapers to children with disability	2006	1867
我们有颗感恩的心	We have indebted hearts	2006	1813
哇，做得真好	Wow, well done!	2005	1764
让座该不该？	Shall we let him take the seat?	2005	1758
让座该不该？	Shall we let him take the seat?	2005	1757
两次宣布	Two announcements	2005	1731
校园快讯	Brief news in school	2005	1731
新闻	News	2005	1719
校园快讯	Brief news in school	2004	1706
歌声与微笑	Song and smile	2004	1687
别人快乐我也快乐	If you feel happy, I feel happy, too	2004	1684
手拉手我们都是好朋友	Hand in hand, we are good friends	2004	1681
光明使者在行动	The light emissaries on action	2003	1662
放学路上	On the way home	2003	1657
新学期，我们一起上学	Let’s go to school together in the new semester	2003	1647
学点“换位”教育	Learn transposition education	2003	1638

上海中学生报 **Shanghai Middle School Students**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
多一只“创造之手”	Another hand of creation	2006	2006-C35
Ｉ Ａm	I am	2006	2006-A28
实践志愿精神 传播特奥理想——“特奥进校园”宣传周正式启动	Starting the promoting week of the Special Olympics in schools	2006	2006-B29
心手相连，托起爱的太阳——二十一世纪学生讲坛推出走近特奥主题演讲会	The lectures on the Special Olympics in a 21st century student forum	2006	2006-B28
爱心，在这个暑假放飞	Let your caring fly	2006	2006-A22
寻找强者 学习强者 争做强者——沪新学子认真倾听强者的声音	Students in Shanghai visited lectures of people with disability	2006	2006-B18
特别的爱给特别的你——2007年特奥会前走近一群智残少年	Report about some children with intellectual disability before the Special Olympic Games	2006	2006-A14
五爱学子爱心“接力”	Relay of love	2006	2006-B10
他们是最亮丽的一道风景	They are the most beautiful view	2006	2006-A10
大山深处的“保尔”感动育才师生	Students and teachers are affected by the teacher with disability	2006	2006-A8
“眼睛”传神流露心声——特奥会会标在卢湾区辅读学校诞生	The logo of Special Olympic Games was born in a special school	2005	2005-A7
用坚强守望成功	Get success by adamancy	2005	2005-A6
聆听生命的呼唤	Calling of life	2004	2004-80
“我当上了化学家！”	I am a little chemist	2004	2004-66
我的生活充满了阳光	Our lives are full of sunshine	2004	2004-48
闵行区特教学生获中国少儿艺术赛银奖	The students in special school get the silver medal in the China children’s art competition	2004	2004-38
感受人生磨难 获取宝贵体验——黄兴学校请残疾朋友进校园畅谈人生	People with disabilities gave lectures in school	2003	2003-82
比乐中学为患病同学捐款	Students in a middle school donated for the benefit of their classmate with disability	2003	2003-60

家庭教育时报 **Family Education Times**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
智障儿俊俊的成长相册	The road of a child with mental retardation	2006	A181
残疾人子女心理状况令人忧	Worried about the mental health of children with disability	2006	A176
“我们10岁啦”	We are 10 years old	2006	A173
关爱特殊人士共同支持特奥	Support for the Special Olympics	2006	A172
“我的心，没有缺陷”——访“加油！好男儿”亚军宋晓波	My heart without defectiveness – report of the runner up of a “good boy” show	2006	A171
捐款体验让一年级新生落泪	The experience of donation makes the fresh students weep	2006	A172
成都：健全学生扮“盲聋”体验“残疾生活”	Normal students experience what it’s like to be blind and deaf	2006	A164
残障学生以歌舞感恩生活	Students with disability sing and dance	2006	A164
她在黑暗中成长	She was raised in darkness	2006	A152
困境里播种幸福的种子	Spread the seeds of happiness in the face of difficulty	2006	A150

家庭教育时报 **Family Education Times**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
妈妈愿是你的一条腿	Mum wishes to be one of your legs	2006	A149
感恩让生活更快乐	Thanks make you feel happy	2006	A149
妈妈，你在哪里	Mum, where are you?	2006	A148
身在病榻 心在社会	Work for the society with disability	2006	A145
长宁区召开特教家长交流会	The communication meeting was held for the parents of special education	2004	A090
用爱打造幸福	Create your happiness by means of love	2003	A053

少年日报 **Teenagers' Daily**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
可惜了（科幻小说）	What a pity!	2006	285
用心“留住”眼前色彩	Keep the color by heart	2006	283
2006年特奥会上海国际邀请赛开幕	The 2006 Special Olympic International Invitation Competition was held in Shanghai	2006	248
超级明星与智障学生零距离	Super Star and the students with mental retardation	2006	656
特奥会赛场故事多	Stories in the Special Olympic Games	2006	250
执法人员为“特奥”举行“火炬跑”	The torch relay of officers for the Special Olympic Games	2006	242
用爱心和热情温暖孩子的心	Warm up the children's hearts by means of love	2006	220
北京残奥会吉祥物“福牛乐乐”“诞生”	The mascot of the year 2008, the Beijing Paralympic Games, was born	2006	215
她带给盲人一种别样的光明	She brings light to blind people	2006	202
“独臂少年”志气高	The ambition of a boy with one arm	2006	194
献出友谊之爱 伸出援助之手	Give them your hand and show your friendship	2006	135
你行， 我也行	You can, I can too!	2006	151
上海助残周	The week for helping people with disability in Shanghai	2006	123
悦读园	Reading garden	2006	111
跪着书写人生——贵州残疾教师陆永康的故事	The story of a disabled teacher in Guizhou	2006	91
体验盲人生活，学习文明行路	Experience the life of blind people	2006	86
特殊的师生情	Special affection between a student and a teacher	2006	57
盲人象棋和盲人篮球	Blind chess and blind basketball	2006	49
小发明源于喜欢问为什么——全国十佳少先队员李南金的故事	Story of a little inventor	2006	15
不用耳朵听的手机	A mobile phone can be used without ears	2006	13
千手观音	Kwan-yin with a thousand hands	2005	75
由残疾人车位想到的	Thinking from the parking place for people with disability	2005	571
我们心目中的媒体——“２００４我眼中的媒体”未成年人论坛发言节录（聋童作文）	An essay written by a deaf child	2004	We 561
用心唱出自强歌——记上海启星学校杨辰	The story of a student in a special school	2004	We 554
摔出来的世界冠军——记上海市第一聋校郭文枭	The champion – one student in Shanghai's No. 1 deaf school	2004	553
喜欢向困难挑战的女孩房玉菁	A girl likes facing the challenge	2004	256
巨人的的宣言	The announcement of the giant	2004	202
盲人看得见 聋子听得清	Blind people can see and deaf people can hear	2004	160

少年日报 **Teenagers' Daily**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
特奥会的故事	Story of the Special Olympic Games	2004	58
（小说）魔石	Magic stone (novel)	2004	We 516
榜样	Model	2004	30
（童话）小雪花的泪	Tear of a snow flower (tale)	2004	30
竞技场上的同龄人——访上海市体育运动学校学生	Report of students in a Shanghai sports school	2004	24
深度耳聋没有击垮她	She wasn't beaten by deafness	2003	245
脑瘫女孩创造奇迹	The girl with cerebral palsy creates a miracle	2003	480
诞生在世界之巅的“第一”	No. 1 that was born on the top of the world	2003	480

当代学生 **Modern students**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
与残疾人交往的礼仪	A means of communication with people with disability	2006	2006-7-8
[现代文阅读] 良知	Conscience	2006	2006-7-8
残缺的美丽	The beauty of lack	2006	2006
进取意识：创新的“发动机”	The enterprising consciousness	2006	2000-3
俄罗斯智障电影明星	Russian movie star with mental retardation	2004	2004-3
残疾人奥林匹克运动会	Paralympic Games	2004	2004-1

上海教育 **Shanghai Education**			
Title in Chinese	**Title in English**	**Year of publish**	**Issue No.**
镜头感动你我	We are affected by the scene	2006	2006-11A
特奥来了	The Special Olympics are coming	2006	2006-10A
全纳教育走世界	Inclusion education in the world	2006	2006-04A
长宁初职：建构幸福共同体	Report of changing professional schools	2005	2005-03B
韩正市长视察第四聋校	Han Zheng's mayor visited deaf school No. 4	2004	2004-06A
领路人	The leader	2004	2004-04A
上海市聋哑青年技术学校：无声世界不平凡	Report about Shanghai's deaf youth technical school	2004	2004-01AB
因“短”施教	Educate according to the “short”	2003	2003-09B
闵行区启智学校 用智慧播撒阳光	Report of the Minhang district special school	2003	2003-09B

MOTOR SKILL DEVELOPMENT IN PRESCHOOL CHILDREN WITH MENTAL AND DEVELOPMENTAL DISORDERS – THE DIFFERENCE AFTER A ONE YEAR COMPREHENSIVE EDUCATION PROGRAM

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The aim of this study was to reassess the motor skill performance of preschool children with mental and developmental disorders. The study follows the first part of the study which was completed in 2006 (Samoulidu, 2006).

In 2006, significant deficits in motor skills performance were found to exist in these children. There were 5 participants in this study – 4 boys and 1 girl. One participant from the last year's assessment did not participate as he left the special kindergarten during the year. As of February 2007, the participants had completed a one year comprehensive program at the special kindergarten. This program was guided by recommendations made by MABC (Movement Assessment Battery for Children results, Henderson & Sudgen, 1992). Scores presented therein showed that considerable development had taken place in the various areas of motor skill development as assessed by the MABC. This can be attributed in part to the school program. As well as motor skill improvements, the social and behavior patterns of the children also improved which was noted primarily during the qualitative observations. Positive development has taken place as a result of this early intervention. Further guidelines were given in order that this development may continue into the future.

Keywords: Mental retardation, motor skill development, developmental disorders, autism, preschool age, early intervention, MABC (Movement Assessment Battery for Children).

INTRODUCTION

The prevalence of mental retardation (MR) "is generally estimated at 3% of the total population" (Sherrill 1998, 524) depending on the population and the classification system used. The variation and heterogeneity of the MR population is evident in the fact that there are over three hundred and fifty known causes (Eichstaedt & Lavay, 1992).

Approximately 40% of the diagnosed cases of MR have no clear epidemiology. The three primary causes of MR are Down's syndrome, which is the most common genetic cause, Fragile X, which is the most common inherited cause and fetal alcohol syndrome, which is the third most common cause. Diagnosis and classification of MR occurs in the main with reference to the DSM – IV or ICD – 10 guidelines (Sherrill, 2003).

Research has indicated time and again that motor skills and motor skill development in this population is impaired, in some cases quite significantly (Cowden & Eason, 1991; Cunningham, 1988; Eichstaedt & Lavay 1992; Winnick, 2005).

Berkeley et al. (2001) examined the locomotor and object control skills of children aged 6–8 years with autism and compared them to the norm values reported by Ulrich (1984) in the Test of Gross Motor Development (TGMD). Overall fundamental skill delays were demonstrated by 73% of all the participants – thus placing them in the poor or very poor TGMD performance categories. Similarly, Miyahara et al. (1997) administered the Movement Assessment Battery for Children (MABC, Henderson & Sudgen, 1992) to children with both autism spectrum disorders and learning disorders. It was found that 85% of these children displayed a lack of motor coordination.

Given the heterogeneity of the population, the level and degree of motor delay differs from child to child and also through the range of disorders. Progress in motor development has typically been measured in terms of achieving motor milestones which represent the usual sequence of emergence. The motor performance of children with mental retardation has often been compared to these milestones in order to establish the degree of the motor delay. Norm referenced assessment also serves as a comparative tool – using the results obtained from the assessment and comparing them to the norm values for that particular test.

One such assessment tool, and the tool which is used in this research, is the MABC (Henderson & Sudgen, 1992). This standardized assessment tool has been vali-

dated for use in the childhood population with mental retardation, developmental delay and children with autism in many countries around the world though it is based on USA norms (Chow et al., 2002). This process of validation has been successful in some European countries such as Norway (Sigmundsson & Pederson, 1992) and Sweden (Rosblad & Gard, 1998) but not in others, for example Spain (Ruiz et al., 2003). MABC also has been validated in China (Chow et al., 2006) but not in Japan, where the norms were found to be unsatisfactory (Miyahara et al., 1998). In the Czech environment the MABC instrument was first used in a clinical study (Samoulidu & Válková, 2007) in a diagnostic and follow up intervention program for preschoolers with mental retardation and developmental delay.

The main focus of this research was on the effect of an early intervention program on the motor skills of preschool children. The intervention lasted for one year and had two phases. The first one was a comprehensive education program, focused on the overall development of the children in many areas of their lives. Social, cognitive and motor developments were all included in this phase, which it took place from May 2006 to February 2007. Between February and May 2007, the second phase was initiated. This was a much more intensive program focused solely on motor skill development. Previous research supports and many professionals in the area are strong advocates of early intervention. In many cases, it is said that intervention cannot come early enough (Blackman, 2002; Casto & White, 1984; Connolly et al., 1993; Cowden & Easton, 1991; Goodway & Branta, 2003; Hamilton et al., 1999; Stedman, 1998). Mannisto et al. (2006) highlighted in particular the need for the intervention program to be structured to suit the individual for whom it is intended. Individuality of intervention is essential if is to be effective in the MR population as the variation of diagnosis is endless.

METHODOLOGY

The kindergarten

The children in this study come from a special public kindergarten in the city of Olomouc, the Czech Republic. Founded in 1991, this kindergarten caters to 20 children varying in age from 3 years to 7 years old. The kindergarten's space is comprised of two playrooms, a dining room, a sleeping room and a locker room, a room for social events and a garden and outdoor play area. There are three teachers on the staff and other assistants. These three teachers have MA level qualifications in special education and many years of experience in working with children with disabilities. This is essential given the diagnosis of many of the children in the kindergarten. This school caters to children with atypical diagnoses within the realm of intellectual disability. Many have multiple aspects to their diagnosis and combined intellectual and behavioral impairments.

Participants

Following on from the first stage of this research (Samouilidou, 2006) there were 5 participants in this study, four male and one female who went through assessment in May 2006. One boy was excluded from the last year of the study as he did not attend the special kindergarten at that point in time. The following are the case profiles for the 5 children involved. Age in months is given as of February 2007, the characteristics are as they were recorded in 2006.

Case one: M. A.

This 76 month old male was diagnosed with atypical autism and specific developmental delay of speech and language. There remain suspicions about the cognitive ability of this child. He was enrolled at the school on 1. 3. 2004. The predominant characteristics of this child are impulsivity, impatience, disorganization, being easily distracted, confusion and loss of concentration arising during the course of an activity.

Case two: M. T.

This 68 month old male was diagnosed with childhood autism and mild mental retardation. Enrolled on 1. 9. 2005, the predominant characteristics of this child are hyperactivity, impulsivity, being easily distracted, getting easily upset at any failure to complete a task, having no comprehension of instructions and a general lack of the ability to concentrate.

Case three: S. L.

This 72 month old male was diagnosed with moderate mental retardation and significant behavior impairment. Enrolled on 14. 3. 2005, the predominant characteristics of this child are over activity, nervousness, passive behavior during activity and lack of persistence in the face of challenging tasks.

Case four: J. A.

This 86 month old male was diagnosed with Asperger syndrome and an imbalance in mental ability. Enrolled on 1. 9. 2004, the predominant characteristics of this child are passive behavior, disorganization, lack of persistence at any task and needing constant motivation and encouragement in order to complete tasks.

Case five: M. O.

This 56 month old female was diagnosed with expressive language disorder. Enrolled on 1. 9. 2005, the predominant characteristics of this child are passive behavior, disorganization, lack of will to participate, confu-

sion, becoming tired easily, requiring support and help essentially and displaying a lack of facial expression.

Assessment

The three stage measurement of motor skill development is undertaken using the Movement Assessment Battery for Children (MABC) (Henderson & Sudgen, 1992). The MABC is a standardized norm referenced test, based on US norms (Henderson & Sudgen, 1992; Van Waelvelde et al., 2007). This battery has been updated and revised several times (Chow et al., 2002; Miyahara et al., 1998; Rosblad & Gard, 1998; Van Waelvelde et al., 2007).

Contained in this battery are two components – the performance test and the checklist. Administering the test takes 20–40 minutes per person. Included in the accompanying manual are strict guidelines and instructions to follow in administering this test, thus ensuring that it is used in a standard way throughout the assessment and that the scores obtained can be reliably be compared to those norms obtained by Henderson and Sudgen when the battery was created in 1992. Though based on US norms, this battery has been validated for use in many European and Asian countries. As is the nature of any motor assessment, the aim is to replicate the full ability of the child in the assessment context. Due to this, it is important to try and maintain as natural an environment as possible in order for the child to perform. This is very much the case with the MABC. The assessment tasks are play like in nature and should lead to full cooperation from the child.

Each task on the MABC is scored in either total seconds taken to complete the task, e.g. threading beads or counting the number of successful attempts out of total trial numbers, e.g. rolling a ball into a goal area. The obtained raw score is then computed and transformed into a scaled score, this being a six point scale ranging from 0–5. Five points denotes a task which has not been completed at all, or has been completed with difficulty. The Total Impairment Score (TIS) is the sum of all the scaled scores and this is then expressed as a percentile of the norm. For example, a TIS of 13+ would indicate that the child lies in the 5th percentile, and is therefore a very impaired score. For the purpose of this study we will focus on the performance test, which in itself includes both quantitative and qualitative data. The battery has been purposely designed to identify deviant or impaired performance and will not provide information on the overall motor abilities of the child, if the skills are advanced for their age. Authors of this test have stated the purposes of its use as identification and screening, intervention planning, program evaluation and as a research tool (Wiart & Darrah, 2001). The performance test can be administered to children from the age of four up to the age of 12. In all, there are 32 items in the battery – subdivided into the four age categories. These age categories are called "ge bands" and are distributed as follows. Age band one (4–6 years), age band two (7–8 years), age band three (9–10 years) and age band four (11+ years). For the purpose of this study, age band one and two are used. With 8 tasks in each age band, these are again divided into three areas, each associated with a different area of motor development. All three areas are identical throughout the battery in order to allow for continuation from one age band to the next and to allow for the monitoring of progression as the child grows older.

The three areas are manual dexterity (MD), ball skills (BS) and static and dynamic balance (SDB) and the 8 tasks within the first two age bands are highlighted below.

Age band one	**Age band two**
PC – posting coins (MD)	PP – placing pegs (MD)
TB – threading beads (MD)	TL – threading lace (MD)
BT – bicycle trail (MD)	FT – flower trail (MD)
CBB – catching bean bag (BS)	OBC – one hand bounce and catch (BS)
RBG – rolling ball into goal (BS)	TBB – throwing bean bag into box (BS)
OLB – one leg balance (SDB)	SB – stork balance (SDB)
JOC – jumping over cord (SDB)	JSq – jumping in squares (SDB)
WHR – walking heels raised (SDB)	HTW – heel to toe walking (SDB)

School program/intervention

There were two stages to this intervention program. First, from 2006 up to February 2007, a general program was applied in place. This program was focused on the holistic development of each child as an individual. Individual Education Programs (IEPs) were in place and were assessed every two months. Social interaction, eye contact and one on one teacher – pupil attention created the key characteristic of this program in an attempt to develop some vital life skills and knowledge in the pupils. The successful attainment of goals was dependent on the task being undertaken in three situations. Firstly, it had to be demonstrated in the presence of a different teacher and a modified environment, secondly in the presence of the peer group and thirdly outside the school environment in the home. Only at this stage could the child move on to the next set of goals for the following two month period.

The second stage of the intervention took place from February until May 2007. This was the specific motor intervention, and it is after this stage that we see the biggest improvement in motor scores occurring. Sixty minutes of intensive motor skill training were undertaken each day, divided into two thirty minute segments. This first was concerned with fine motor skill and included tasks of art and crafts and self care. Modeling, lego, lacing, buttoning, preparation and serving of basic food and getting dressed are examples of how the activities varied. The following thirty minutes was concerned

with body awareness. Pupils were involved in games and dance activities, for example – identifying body parts, rhythm and various forms of locomotion. Parents were continuously kept informed about these school activities and though not recorded it can be presumed that they were undertaken in the home also.

RESULTS

TABLE 1
TIS scores from 3 measurements

Participants	TIS 2006	TIS February 2007	TIS May 2007
MA	19	20	14.5
MT	34.5	31	21
SL	11	10	3
JA – AB1	28.5	22	12
JA – AB2		21	22
MO	34	20	14

Legend
TIS = Total Impairment Score

From the above table, TABLE 1, one can see the TIS scores from the three measurements of the 5 participants. All scores show a decrease in number, demonstrating an increase in skill level in the areas of the MABC test mentioned previously. There are two different results for J. A. He was first measured in the first age band in order to track his development, then in his current age band 2 in order to establish his position in relation to the norms.

TABLE 2 illustrates the scores from the individual items of the MABC for age band one. It contains the first measurement scores of 2006 with the final measurement of 2007.

Case one: M. A.

The comparison of measurement scores in the TABLE illustrates a decrease in the TIS to 14.5. M. A. lies on the 4th percentile for his age. This is due to the decrease in scores in two areas – MD and SDB, improvements of 2 and 2.5 respectively. BS has been maintained with prefect scores in two out of three measurements. In opposition to this, the TB task of MD has remained at the lower proficiency score of 5.

The qualitative observations in 2007 yielded the following results: When seated at a task, this participant is focused and exhibits very controlled and precise movement. This is the nature of the MD items of the battery. Contrary to this it appears evident from the data above that MD is the weakest area. The researcher has established a theory for this. The item BT has the best of the scores in this area, of 2 or 1. For this item, there is no time restriction; the score is based on the number of errors. The participant displays a high competency level in these tasks, a mature pincer grip and adherence to accuracy.

The items of BS posed no problems for this participant. As mentioned previously, it is at this stage of the assessment that the participant gets most distracted. The measurements in February 2007 were disrupted at this time as the participant was too distressed and distracted to participate immediately. Upon the intervention of the teacher, assessment was resumed shortly afterwards. In May 2007, no such behavior was observed and the par-

TABLE 2
Item scores of both first and last assessment – February 2006 and **May 2007**

	PC		TB		BT		CBB		RB		OLB		JOC		WHR	
MA	3	**2.5**	5	**5**	2	**1**	0	**0**	0	**0**	4	**3**	0	**0**	5	**3**
MT	4.5	**2.5**	5	**5**	5	**5**	5	**2**	2	**0**	5	**2.5**	5	**0**	3	**4**
SL	0	**0**	0	**1**	0	**0**	1	**0**	5	**0**	0	**0**	0	**0**	5	**2**
JA	4	**2**	5	**5**	0	**0**	5	**0**	5	**5**	4.5	**0**	5	**0**	0	**0**
MO	4	**2**	5	**5**	5	**5**	5	**1**	0	**1**	5	**0**	5	**0**	5	**0**

Legend
PC = posting coins
TB = threading beads
BT = bicycle trail
CBB = catching bean bag
RB = rolling ball into the goal
OLB = one leg balance
JOC = jumping over cord
WHR = walking with heels raised

ticipant remained focused and fully cooperative throughout. BS items were noted on both occasions as being very good throughout with only minor notes in relation to the participant adopting an individual technique to complete the task.

Case two: M. T.

There is a very significant difference in TIS from an original score of 34.5 to the latest measurement of 21. Therefore, as of the last measurement in May 2007, MT lies in the 3rd percentile for his age. Most notable is the 50% improvement in the area of SDB with the score being halved from 13 to 6.5. MD is the weakest area of performance with two of the tasks in this area, TB and BT, maintaining the lower proficiency score of 5. Improvements of notable stature can be seen in OLB, where the score has been halved and also in JOC where vast improvement has been recorded, transforming a score of 5 to 0.

When presented for assessment in May 2007, it was noted by the researcher that this participant was like "a different child". Behavior and mannerisms had altered completely. From the offset of measurement the participant was more relaxed, focused and most notably, there was the smile on his face. This was in stark contrast to the aggressive, teary eyed and tense child who had been measured 3 months previously. All of the items were completed with the aid of the teacher, as this was deemed the only way the participant could be measured.

MD is the weakest measured element of motor skill in this participant.

The TB item poses a lot of problems for this participant; in fact it is at this stage of both measurements that the participant becomes most distracted and distressed. The first attempt in both cases was an R or F, the second attempt is at least completed in February 2007 with only 7 beads successfully threaded in May 2007. In BT, he scores a persistent 5. This was due to the number of errors made by the participant, even given the assistance of the teacher. It can be noted that the line drawn does follow the direction of the trail even though quite vaguely.

Case three: S. L.

The TIS has decreased from 11 to 3. This places SL in the 65th percentile for his age. His BS score has gone from 6 to 0 – the most dramatic of all the changes. MD, having a score of 0 in 2006, had a score of 7 in February of 2007 and then a 1 in May 2007. BS and SDB tasks show scores of high proficiency as of May 2007. OLB and JOC items have maintained their 0 score right throughout the three measurements.

A good pincer grip was displayed at all times during the assessment. In the TB item, the time recorded in May 2007 was far quicker than the previous measurement. Hands were constantly changed during trials on both assessments. May 2007 saw a much more relaxed child. Posture was noted as being very good. Beads were guided down the thread; as opposed to in February 2007, when beads were released immediately upon threading. May 2007 also saw a more enthusiastic child. He was very happy with success and enthusiastic about completing a second trial, punching the air with his hands when completely successful. The last of the MD items, BT, yielded a similar result in February and May 2007. There was only 1 error difference, and it was a very slight deviation from the trail. He seems to go fast but still maintains control, not making errors. Again, he is very focussed, but not tense. He enjoys the success and the positive reinforcement from the assessor.

Case four: J. A.

TIS has decreased by more than 50% from 28.5 to 12, placing him on the 8th percentile for his age. The score in BS has also been halved from 10 to 5. Vast improvement is noted in the area of SDB from 9.5 to 0. Contrasting results have emerged within the MD category as BT was maintained at 0 while the TB was maintained at the lowest proficiency score of 5. Other items of interest were the CBB score from 5 to 0, OLB 4.5 to 0 and JOC 5 to 0. WHR has been consistently at 0, so no deterioration of that item has occurred.

Qualitative observations were noted as follows: The most persistent and prominent characteristics of this participant are apparent from the first two items of MD. Facial contortions, extreme tension in the upper body almost lifting the individual from the seat and short sharp breathing come to the fore when the participant is trying to do the item at speed. This occurs most often on the right rather than left side. Particularly in the PC item, this behavior leads to the misalignment of coins with the slot on occasion and towards the end a slump in energy expenditure and speed. A very effective pincer grip is used throughout the MD tasks. Measurement in May 2007 yielded some uncharacteristic behavior. The fingers seemed to be getting in the way, and the participant was fumbling with the thread and the beads. BT scores are persistently low. This task is completed without any problem. It was noted that the participant presses excessively hard on the paper.

The researcher noted the stark contrast in score from February 2007 to May 2007 in CBB. In February, the participant would catch the bean bag off balance with his leg lifted upwards and extreme tension in the upper body. The score of 0 in May 2007 was achieved by a more relaxed participant, bending the knees when catching and following the trajectory of the bean bag in the air. Failure to improve in the score of RB is primarily due to the incorrect technique adopted by the

participant. Even after instruction from the assessor, the participant seems to overestimate his own ability, rolling the ball from the front of the body with no pendular swing and a rotation of the wrist that results in the spinning of the ball. Errors are consistently to the right side of the goal and the hand of rolling is changed consistently during the trial.

Case five: M. O.

Dramatic improvement can be noted in TIS, from a score of 34 to 14, placing MO on the 9th percentile for her age. The improvement in SDB items is primarily responsible for this. The three items in this area have completely altered from a score of 5 to 0. The PC score has been halved and also the CBB has significantly improved from 5 to 1. Two items remain unchanged, that of BT and TB. The latter (TB) is not due to the lack of proficiency in skill but due to the speed at which the skill is executed.

As noted in the quantitative data, this improvement in TIS was very substantial. The researcher noted that the difference in the child between February and May 2007 was also quite significant. The timid, shy and passive child was replaced by a goal directed, efficient and focused child, who, though still timid to some extent, was the only child who was capable of being alone in the assessment room with the assessor and the researcher.

During the MD items, a very good pincer grip was displayed, though sometimes misaligning the coins with the slot. There was no significant discrepancy between the preferred and non preferred hand on this item. Between February and May 2007, MO has turned 5 so therefore the score category has changed. Also the item was completed in a slower time so these combined gave the lower proficiency score. The item itself was completed very efficiently and with controlled movement and a good pincer grip as above. Being the only female participant and considering the difference in diagnosis, it was noted how her behavior differed from her male counterparts. Once the beads were threaded, she did not worry so much about their exact alignment on the table whereas this had been the focus of the boys – to keep the beads neat and aligned at all times.

BS items have seen improvements, in particular the CBB. Labeled as I in February 2007, the participant in the latter measurement successfully caught 7 of 10 attempts. The bean bag is caught to the body mostly, and while not following the trajectory of the flight, she was very successful. SDB is the strongest element of this participant's performance. OLB was performed without fault on both legs – both evenly match for time, body control and posture. The JOC item saw a complete transformation of scores. In February 2007, this item was labeled as I for this participant. This was not the case in May 2007 as all three attempts were passed. There was some delay in initiating the movement, but with positive reinforcement and reassurance from the assessor it was completed with ease.

DISCUSSION AND CONCLUSION

What has been undertaken by the special kindergarten is two types of intervention combined into one were undertaken by the special kindergarten. First, we have the long term approach, the general and comprehensive education program, broadly based and focused on the overall development of the child, encompassing all areas of development – social, motor and cognitive. Following that comes the more intensive specific motor intervention.

This phase is focused on the motor skills as assessed by the MABC – manual dexterity, ball skills and balance, among others. The positive development of participants is presented related to the differences between the one year intervention program (May 2006 – February 2007). Dramatic improvement was found after a short intensive program in the period from February 2007 to May 2007. Even children with autistic syndrome achieved very good progress. This is contrary to the research by Berkeley et al. (2001).

But the challenge would be to see if these can be retained by the participants after a long period of time. The program in the special kindergarten was instigated with the teacher as the primary agent of delivery, and in spite of taking place over a year long period it has had the same progressive results as other interventions in previous research (Mannisto et al., 2006; Mahoney et al., 2001).

Resulting from three MABC measurements, conclusive evidence supports the effectiveness of the one year education program which has been in place in this school. This verifies what is in the MABC manual (Henderson & Sudgen, 1992), which means that repeated assessment can present us with true information.

Evidence of development in all areas of motor skills as assessed by the MABC and also behavioral alterations across all cases makes for a very positive conclusion to this research. The challenge now is for this development to continue through sustained efforts at individualised programs for these five children and also for the rest of the children in the school.

There are some key limitations to this study. Due to the number of cases involved, each case has been taken as a single entity. Results from this study cannot be generalised to a larger population, and are specific to the children who were assessed. Another key issue, which is pertinent to all research in this field, is inher-

ent in the nature of assessment. It is very difficult to get the best from this population on a one off assessment day. It may be the case, that the measurements on any given day do not fully represent the capabilities of the child – as in 2006. Adding to this is the fact that the assessor was different in 2006 and in 2007. Though this is a standardised assessment, individual difference of interpretation of the assessor must be taken into account. The third most prominent limitation of this study is determining that the effects on motor skill development which we have seen are solely due to the intervention program. Other factors which may have influenced the results are maturation or parental/familial activities which may have altered over the past year (e.g. extra curricular activities).

Motor skill level improved quite dramatically and in quite specific areas in different cases. Unfortunately early intervention literature is mainly focused on cognitive, academic and social variables (Casto & White, 1984; Guralnick, 1991; Zigler & Muenchow, 1992).

This has lead the researcher to believe that the development is indeed due to the school program which has been in place in the last year combined with maturation and other influences. This is particularly true for the period between February and May 2007 due to the intensive nature of the program which was undertaken by the participants. Behavioral changes have also been significant, attributed also to the school program and the environment within the school which is in every way conducive to the overall development and well being of the child, not just solely focused on motor development.

Contemporary literature on the benefits of motor skill intervention is limited: considering motor skill intervention for specific populations, as past investigations concerning preschoolers with mental retardation or developmental disorders are really few (Connolly et al., 1993; Mahoney, Robinson, & Fewell, 2001; Goodway & Branta, 2003; Zittel & McCubbin, 1996).

The outcome of this intervention has been positive for all due to the hard work and dedication of the teachers and staff at the kindergarten. The future holds more challenges for the school, in that it must try and replicate what has happened with these five cases with the other children who pass through the school. Standardization of MABC in the Czech language and field usage is the final challenge of the presented study.

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ROZVOJ MOTORICKÝCH SCHOPNOSTÍ U PŘEDŠKOLNÍCH DĚTÍ S MENTÁLNÍM A VÝVOJOVÝM HANDICAPEM – ROZDÍLY PO ROČNÍM KOMPLEXNÍM VÝUKOVÉM PROGRAMU

(Sourh anglického textu)

Cílem této studie bylo přehodnocení motorických schopností u předškolních dětí s mentálním a vývojovým handicapem. Studie navazuje na první část, která byla dokončena v roce 2006 (Samouilidou, 2006).

V roce 2006 byly u těchto dětí zaznamenány významné deficity v motorických schopnostech. Studie se zúčastnilo 5 dětí – 4 chlapci a 1 dívka. Loňského hodnocení se jeden z chlapců nezúčastnil, protože během roku odešel ze zvláštní školky. V únoru 2007 účastníci dokončili jeden rok komplexního programu ve zvláštní školce, který se řídil doporučeními MABC (Movement Assessment Battery for Children, Henderson & Sudgen, 1992). Uvedené výsledky prokázaly, že se dle hodnocení MABC projevilo významné zlepšení v různých oblastech rozvoje motorických schopností. Toto lze částečně přisuzovat školnímu programu. Kromě motorických schopností se zlepšilo i sociální cítění a chování dětí, což bylo zaznamenáno zejména během kvalitativních pozorování. Výsledkem tohoto včasného zásahu byl pozitivní vývoj. Aby tento vývoj mohl i nadále pokračovat, byly předány příslušné pokyny.

Klíčová slova: mentální zaostalost, rozvoj motorických schopností, vývojové handicapy, autismus, předškolní věk, včasný zásah, MABC (Movement Assessment Battery for Children).

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THE INFLUENCE OF ONE MONTH COMPLEX SPA THERAPY ON THE MUSCULAR FITNESS AND GENERAL PHYSICAL FITNESS OF OBESE CHILDREN

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Childhood and adult obesity are associated with various health problems. Obesity in childhood is also coupled with a range of potential medical and psychosocial complications, as well as being a risk factor for increased morbidity and premature mortality in adulthood. In recent years, the prevalence of obesity among children and adolescents has risen dramatically due to unhealthy changes in lifestyle. The aim of this study was to provide some basic information about the incidence, prevention and treatment of obesity in childhood. Special emphasis was placed on physical activity and a description of spa therapy for obese children in Spa Bludov which incorporated a plan of physical activity, diet and psychological therapy. Additionally the study set out to evaluate the actual muscular and physical fitness of obese children and determine the effect of one month spa therapy on muscular fitness and general physical fitness in obese children. This study included one group of 26 obese children who had complex spa therapy and one control group of non obese children. Before and after one month spa therapy measurements of muscular fitness and general physical fitness of obese children were taken utilising the Kraus-Weber test of minimal muscular fitness and a test of general physical fitness. Outcomes for both groups were compared. It emerged that complex spa therapy has a considerable influence on physical fitness in obese children.

Keywords: Childhood obesity, physical fitness, spa therapy in the Czech Republic.

INTRODUCTION

In recent years, the prevalence of obesity among children and adolescents has risen dramatically in many westernised countries and in countries undergoing economic transition, making it one of the most common chronic disorders in this age group. Both the range of potential medical and psychosocial complications associated with childhood obesity are of escalating concern, as well as the associated risk factor for increased morbidity and premature mortality in adulthood (Bauer, 2005).

In the Czech Republic, 2005, the incidence of childhood obesity in the 13 to 17 year old age group was reported as 11% and 20% amongst those who are 6 to 12 years old (Kunešová, 2006).

Kiess et al. (2001) reported multiple factors that are related to the high incidence of childhood obesity. Genetic/endogenous and environmental/exogenous factors (the increase of sedentary activities, a decrease in physical activities, a shift of the diet towards more fast foods with a high fat content, loneliness, psychosocial/family problems) contribute to the development of a high degree of body fatness early in life. It is acknowledged that obesity is also associated with some disorders such as endocrine diseases (Cushing's syndrome, hypothyroidism, growth hormone deficiency, hyperinsulinemia, etc.) and brain damage such as hypothalamic tumor/trauma or genetic syndrome. Various factors may contribute to childhood obesity.

A working definition of obesity in childhood has been a BMI (weight in kilograms divided by the square of the height in meters) greater than the 85th percentile. Morbid or severe obesity is defined as being characterized by a BMI above the 99th percentile for people of a given age and gender (Kiess et al., 2001).

Obesity does not present itself only as a cosmetic limitation as many people may think but more importantly it is a problem which is associated with serious medical and psychosocial consequences. Despite the fact that these consequences usually appear in adulthood, their causes are predominantly rooted in childhood – due to childhood obesity. Kiess et al. (2001) highlights some of these conditions as being poor self image, social isolation, autoaggression, suicidal tendencies, promiscuity, drug and alcohol addition, bulimia, binge eating, smoking, etc.

Therapeutic strategies that target childhood obesity include psychological and family therapy interventions, life style/behaviour modification and nutrition education. The role of regular exercise programs additionally needs to be emphasized. Successful therapy for obese

children has to include reduction of inactivity, promotion of a more active lifestyle, adequate diet and psychological support (Kiess et al., 2001).

When prescribing physical activity it is important to determine the intensity, duration, frequency and type of physical activity (aerobic/anaerobic) that meets the individual needs of the client. The general rules for physical activity prescription are described by Parizkova, Maffeis and Poskitt (2002) as being "aerobic exercise with a lower intensity than 60% of the maximum heart rate (or VO_{2max}) and a duration of at least 30 minutes repeated with a frequency of 3 days/week".

This study proposes a plan of physical activity for obese children and their parents. Appropriate changes in lifestyle such as an improved diet and an increase in regular physical activity are sometimes enough to decrease excess weight in children with obesity.

In the Czech Republic there is special spa for treating childhood obesity. Children spend six weeks in this spa and all therapy is paid by an insurance company. The spa therapy is complex and is based on three main blocks – motion, diet and psyche. Spa therapy usually consists of a plan of physical activity, diet and psychological treatment. There is a team of specialists such as a doctor, a diet specialist, a nurse, a physiotherapist and a clinical psychologist. Obese children from our research project had the following program during a six week period of spa therapy in Spa Bludov: morning exercise (seven times a week – 15 minutes), therapeutic group physical training in a swimming pool (thrice a week – 20 minutes), swimming (once a week – 20 minutes), therapeutic group physical training (seven times a week – 40 minutes), therapeutic physical training with equipment (thrice a week – 20 minutes), massage with a REDOR instrument (five times a week – 10 minutes) and control cross country walking (seven times a week – 2 hours). The food was divided into six parts during each day, built up according to the principle of a reducing diet specific for age and gender. The reduction diet includes the value of 4000 kJ/day for children from 3 to 10 years, 6000 kJ/day for children from 10 to 15 years and 7000 kJ/day for children from 15 to 18 years. They recieve a lot of vegetables and roughage.

It is known that this spa therapy improves body weight and BMI but it remains unclear what influence this spa therapy may have on the muscular development and general physical fitness of children with obesity. Development of muscular and general physical fitness is necessary for learning and mastering skills in childhood and also for lifespan physical ability.

The aim of the study was to determine actual physical fitness in a group of obese children and evaluate the influence of one month complex spa therapy on the physical fitness of obese children.

METHODS

Null hypothesis

The value of the Kraus-Weber test for minimal muscular fitness and the index of the general physical fitness of obese children aren't different from the value of the Kraus-Weber test for minimal muscular fitness and the index of the general physical fitness of non obese children.

Research questions

Will obese children achieve the index of general physical fitness and norm total score of the Kraus-Weber test for minimal muscular fitness at the beginning of complex spa therapy?

How will the index of general physical fitness and the total score of the Kraus-Weber test for the minimal muscular fitness of obese children change at the end of complex spa therapy?

Will obese children achieve the index of general physical fitness and norm total score of Kraus-Weber test for minimal muscular fitness at the end of complex spa therapy?

Participants

The children involved in this study were the children who spent 6 weeks in Spa Bludov in the Czech Republic receiving treatment for obesity. It was a group of 33 obese children (16 girls and 17 boys), aged 11–15 years, the average age was 13.5 years, and there was a minimal BMI > 90th percentile according to CDC (Mei, Grummer-Strawn, Pietrobelli, Goulding, Goran, & Dietz, 2002). Of these, 7 children were excluded because of illness or early departure from the Spa. Our research group includes a total of 26 obese children. From the school in the village Horka nad Moravou in the Czech Republic, 23 non obese children were integrated as a control group into our research project.

Measurement

For measurement of muscular fitness, the Kraus-Weber test for minimal muscular fitness was used. It includes six specific tests, e.g. a test of "lower abdominal strength" (Psoas = P), "upper abdominal strength" (A+), "abdominal muscle strength" (A–), "upper back muscles" (UB), "lower back muscles" (LB) and "back and hamstrings" (BH) test. The performance of each test is exactly described and classified by points. The maximum score of this test is 50 points and any child with average muscular fitness should obtain the full 50 points (Mathews, 1973).

For measurement of general physical fitness the motor test for the measurement of general physical fitness by Revenda and Špičák (1984) which is originally

Czech, was utilised. This test includes eight specific exactly defined tests, e.g. "forward bend – standing up with trunk rotation repeatedly", "hold on pull up", "static long jump", "running 4 × 10m", "running 5 × 20m", "throwing a ball weighing 2 kg", "knee bend – push up – knee bend – stand" and "sit ups". The performance of each test is classified by points specific for a child's age and gender and then the index of general physical fitness for children is calculated. We used only 6 subtests due to lack of children's free time in the Spa. The norm value means the index of general physical fitness. The most frequently occurring interval within the healthy population of children is 40–60 points. The average performance of general physical fitness is 400 (8 × 50 points) with an interval of ± 80, i.e. 320–480 points in case all 8 tests are evaluated. In case one modifies the number of the test for, e.g. 6, the point value is also modified (6 tests = 6 × 50 ± 60, i.e. 240–360 points).

Statistical analysis

Each test has specific classification on points. An arithmetical mean and standard deviation for the formulation of basic statistical characteristic was used. It was applied using a dependent paired T-test (Wilcoxon) for comparing the value of the Kraus-Weber test for minimal muscular fitness and the test of the general physical fitness of the same group of obese children before and after spa therapy. An independent unpaired U-test (Mann-Whitney) was used for the comparison of the group of obese children and the control group before and after spa therapy. The result of this testing is at the level of statistical significance.

TABLE 1
The basic statistical value of the Kraus-Weber test for the minimal muscular fitness of obese and non obese children

	Group of obese children (n = 26)		**Control group of non obese children (n = 23)**		
	M	SD	M	SD	p
P	8.37	2.76	9.35	1.23	0.54
A+	8.74	2.67	9.83	0.39	0.59
A–	9.44	2.12	9.96	0.21	0.84
UB	10.00	0.00	9.96	0.21	0.79
LB	9.56	1.95	10.00	0.00	0.65
BM	–1.00	1.78	0.00	0.00	0.07
Total	45.11	7.65	49.09	1.56	0.04*

Legend
n = number of participants
M = arithmetic mean
SD = standard deviation
p = level of statistical significance (* < 0.05)
P, A+, A–, UB, LB, BM = subtests of Kraus-Weber test for minimal muscular fitness

TABLE 2
Basic statistical value of the test of the general physical fitness of obese and non obese children

	Group of obese children (n = 26)		**Control group of non obese children (n = 23)**		
	M	SD	M	SD	p
Forward bend	38.92	9.44	46.21	7.49	0.018*
Pull up	23.73	20.77	35.78	15.43	0.074
Sit ups	31.92	13.57	49.07	5.82	0.000**
Long jump	30.15	11.82	43.00	5.48	0.000**
Knee bend	25.27	9.16	48.29	5.99	0.000**
Running 4 × 10 m	38.08	13.42	43.86	7.15	0.244
Total	188.08	55.67	266.21	30.74	0.000**

Legend
n = number of participants
M = arithmetic mean
SD = standard deviation
p = level of statistical significance (* < 0.05, ** < 0.001)
Forward bend, pull up, sit ups, long jump, knee bend, running 4 × 10 m = subtests of test of general physical fitness.

RESULTS

We determined a statistically significant lower total score on the Kraus-Weber test in the group of obese children, but also the value of all subtests except for the UB subtest was worse in the group of obese children compared with the non obese group. The statistically significant difference in the index of general physical fitness (total score) on the level of statistical significance 0.001 was determined between the group of obese and non obese children. The group of obese children before spa therapy had a significantly lower total score of general physical fitness than the group of non obese children. Also the point value of all subtests was statistically significantly lower in the group of obese children (TABLE 1 and 2).

In the beginning of spa therapy only 11 children of 26 achieved the norm value of the Kraus-Weber test for minimal muscular fitness and 5 children achieved the norm value of the index of general physical fitness (= norm value). The point value increased after complex spa therapy. The norm value of the Kraus-Weber test was achieved by 18 children and index of general physical fitness (= norm value) was achieved by 12 children (TABLE 3 and 4).

The total value of the Kraus-Weber test and its subtest "BH" was significantly different after one month complex spa therapy. The total value of the test of general physical fitness and each subtest except for "running" and "the long jump" was statistically significantly different (TABLE 5 and 6).

TABLE 5
The point value of each subtest and the total value of the Kraus-Weber test for the minimal muscular fitness of obese children before and after complex spa therapy

	Before	After
P	8.37	9.15
A+	8.4	9.44
A–	9.4	9.63
UB	10.0	10.00
LB	9.56	9.63
BH**	–1.00	–0.56
TOTAL*	45.11	47.30

Legend
P, A+, A– UB, LB, BH = subtests of the Kraus-Weber test for minimal muscular fitness
Before = point value measured before complex spa therapy
After = point value measured after complex spa therapy
* = level of statistical significance 0.01
** = level of statistical significance 0.05

TABLE 3
Point value and norm value of the Kraus-Weber test for the minimal muscular fitness of obese children before and after complex spa therapy

n	1	2	3	4	5	6	7	8	9	10	11	12	13
Before	50	46	50	50	50	50	44	43	39	45	50	46	30
After	50	46	50	50	50	50	48	50	50	50	50	50	28

n	14	15	16	17	18	19	20	21	22	23	24	25	26
Before	44	50	50	50	46	50	15	50	47	39	47	42	45
After	45	50	50	50	46	50	22	50	50	44	48	50	50

Legend
n = number of participants
50 = participants with points of norm value of Kraus-Weber test for minimal muscular fitness (50 points)

TABLE 4
Point value and norm value (index of general physical fitness) of the test of general physical fitness of obese children before and after complex spa therapy

n	1	2	3	4	5	6	7	8	9	10	11	12	13
Before	152	141	273	257	215	270	197	101	230	182	232	182	133
After	201	170	297	295	254	276	214	134	295	258	248	212	157

n	14	15	16	17	18	19	20	21	22	23	24	25	26
Before	116	211	284	226	215	208	158	108	250	123	128	132	166
After	136	219	288	288	204	260	185	150	289	196	195	235	281

Legend
n = number of participants
240–360 points = participants with points of index of general physical fitness (norm value of the test)

TABLE 6
Differences of value of each subtest and total index of the general physical fitness of obese children before and after spa therapy

	Before	After
Forward bend**	38.92	53.88
Pull up*	23.73	31.08
Sit ups*	31.92	37.15
Long jump	30.15	31.85
Knee bend**	25.27	32.15
Running	38.08	42.23
Total**	188.08	228.35

Legend
Forward bend, pull up, sit ups, long jump, knee bend, running = subtests of the test of general physical fitness
Axis x = subtests and index of general physical fitness
Axis y = points for each test and total index
Before = value measured before complex spa therapy
After = value measured after complex spa therapy
* = level of statistical significance 0.01
** = level of statistical significance 0.001

DISCUSSION AND CONCLUSION

The aim of this study was to assess the muscular and physical fitness of obese children and to evaluate the influence of one month complex spa therapy on this value of muscular and physical fitness. The Kraus-Weber test for minimal muscular fitness and the test of general physical fitness by Revenda and Špičák were utilised for confirmation of our hypothesis and our research questions.

A group of obese children spent one month in Spa Bludov in the Czech Republic in order to treat obesity by means of the reduction of weight. The complex spa therapy included physical fitness, diet and psychological treatment.

With reference to the physical fitness of obese children Deforche et al. (2003) reported that the performance of obese children is inferior on all tests requiring propulsion or lifting of the body mass compared with their non obese counterparts. The findings of the latter author are confirmed in this study. Obese children from our research group had significantly lower levels of minimal muscular fitness and general physical fitness before complex spa therapy than the group of non obese children. From our results the statistically significant difference in the index of general physical fitness (total score) on the level of statistical significance 0.001 between obese and non obese children was found. The group of obese children showed a statistically significantly lower score in each subtest. A statistically significant difference emerged in the total score of the Kraus-Weber test for minimal muscular fitness on the level of statistical significance 0.05 before complex spa therapy compared with non obese children. The differences of other point scores of each subtest between the groups of obese and non obese children weren't statistically significant, but the points were also lower in obese children. We didn't determine statistically significant differences, probably due to more subjective tests and less sensitive tests such as the Kraus-Weber test for minimal muscular fitness is.

We evaluated how many children achieved the index of general physical fitness and a normal total score of the Kraus-Weber test for minimal muscular fitness before complex spa therapy. The investigations found that only 5 children of the 26 obese children achieved the index of general physical fitness before spa therapy (240–360 points for 6 subtests) and only 11 children from the group of 26 obese children achieved the normal total score of the Kraus-Weber test for minimal muscular fitness (50 points).

When the influence of spa therapy on muscular and physical fitness was evaluated it emerged that spa therapy provided a means by which the level of muscular and physical fitness can be increased with the exception of a certain reduction of weight after complex spa therapy. The results demonstrate big differences between the value before and after spa therapy of obese children in the index of general physical fitness and each subtest. There is a change of the value of the "pull up" and also of "sit ups" on the level of statistical significance 0.01, next change of the value of "knee bend" on the level of statistical significance of 0.001 and a very important change of the value of the "forward bend" and the "total value" before and after spa therapy on the level of statistical significance 0.0001. Participants achieved better point value after complex spa therapy in all the results. Statistically significant differences are apparent also in the total score of the Kraus-Weber test for the minimal muscular fitness of obese children before and after spa therapy on the level of statistical significance 0.01 and the statistically significant differences of subtest "BH" on the level of statistical significance 0.05. The point score of all subtests indicated improvement after complex spa therapy.

We determined whether obese children achieved the index of general physical fitness and the norm total score of the Kraus-Weber test for minimal muscular fitness after complex spa therapy. From the results it is clear that 12 children of 26 obese children achieved the index of general physical fitness (240–360 points) after complex spa therapy. It is 7 children more than before complex spa therapy. The norm, consisting of the total score of Kraus-Weber test for minimal muscular fitness after complex spa therapy, was achieved by 18 children, which is 7 more children than before complex spa therapy. The complex spa therapy improved the norm total score of both tests.

Spa therapy targets the areas of diet, physical activity and psychotherapy. It can be said that spa therapy may be a more effective method for the treatment of obesity due to the fact that children are not alone in their attempt to accomplish tasks such as reduction of body weight but spend six weeks living in an environment that includes other children with the same problem. They are also with medical personal who are experts in this field and know how to help them.

The level of physical activity of obese children in normal life was not evaluated in this study. According to the Australian study of Trost, Kerr, Ward and Pate (2001) it can be stated that obese children report significantly lower levels of physical activity, they are involved in significantly fewer community organizations promoting physical activity and they are significantly less likely to report their father or male guardian as being physically active. It is therefore important to assist in the promotion of physical activity for obese children and to endeavour to boost self efficacy perceptions regarding exercise. It is also important to increase awareness of physical activity and access to related community programs and to increase the parental model of physical activity. A proposed plan of physical activity for obese children and advice for their parents is presented in Appendix 1.

The Kraus-Weber test for minimal muscular fitness was utilised to evaluate part of the physical fitness of obese children – muscular fitness. This test was selected due to the number of associated advantages with this method such as the simplicity of its administration, the use of minimal equipment and the fact that it permits a quick method for testing a pupil. The test of general physical fitness by Revenda and Špičák (1984) is an older test but it was assembled with consideration for children with some respiratory problems. According to Ebbeling et al. (2002) obese children often report respiratory problems.

At the end of this discussion an interesting question which Burniat (2002) presented in his study comes to mind, "whether low levels of physical activity are the consequence or cause of obesity – or both".

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VLIV MĚSÍČNÍ KOMPLEXNÍ LÁZEŇSKÉ LÉČBY NA POHYBOVOU A TĚLESNOU ZDATNOST U DĚTÍ S OBEZITOU

(Souhrn anglického textu)

Obezita v dětství i v dospělosti přináší spoustu zdravotních problémů. Obezita v dětství je také spojována s množstvím potenciálních zdravotních a psychosociálních komplikací stejně jako je rizikovým faktorem pro nárust morbidity a předčasného úmrtí v dospělosti. V posledních letech prevalence obezity mezi dětmi a adolescenty dramaticky stoupla především díky nezdravému životnímu stylu. Cílem studie je poskytnout základní informace o výskytu, prevenci a léčbě dětské obezity zaměřené především na fyzickou zdatnost, popsat komplexní lázeňskou léčbu ve Státních léčebných lázních Bludov zahrnující program pohybové aktivity, dietní opatření a psychologickou terapii a zjistit efekt měsíční lázeňské léčby na svalovou zdatnost a tělesnou výkonnost obézních dětí. Tato studie zahrnuje skupinu 26 obézních dětí, které podstoupily komplexní lázeňskou léčbu, a kontrolní skupinu neobézních dětí. Před a po lázeňské léčbě byla měřena svalová zdatnost a tělesná výkonnost obézních dětí pomocí Kraus-Weberova

testu minimální svalové zdatnosti a testu obecné tělesné výkonnosti. Výsledky byly srovnány s hodnotami naměřenými u kontrolní skupiny neobézních dětí. Z výsledků studie vyplývá, že měsíčníní komplexní lázeňská léčba má velký vliv na svalovou zdatnost a tělesnou výkonnost obézních dětí.

Klíčová slova: dětská obezita, pohybová a tělesná zdatnost, komplexní lázeňská léčba v České republice.

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Appendix 1

Our proposal of a plan of physical activity for obese children for one week and some advice for their parents

Boy, 14 years, height 168cm, weight 90kg, BMI = 31.9, 95th percentile

General rules such as:

- going to school by walking or by bicycle – avoid going by bus or car,
- if the child lives in a flat – use stairs instead of using the lift each time,
- participation in house work,
- seta limit for using the computer (playing computer games) – 30 minutes/day,
- set a limit for watching TV – 1 hour/day,
- have breakfast each morning,
- daily regular hot lunch at the same time each day,
- supper 2 hours before going to bed,
- each day have a small snack (fruit, vegetable, yogurt,...) in the morning and in the afternoon.

Proposal of the plan of physical activity

My proposal for the beginning is:

- first and second week – morning exercise and physical education in class,
- third week – add swimming and one day of physical activity during the weekend,
- fourth week – add team game or regular sport activity,
- fifth week – complete entire physical activity plan.

	Morning	*Afternoon*
Monday	morning warm up and stretching exercise 15 minutes	team games, some regular sport, children's games outside, etc. (1.5 hour) (training includes warm up, stretching exercise, improvement of general skills and physical fitness, exercise for strength, etc.)
Tuesday	morning warm up and stretching exercise 15 minutes physical education classes at school (45 min.)	walking 15 minutes to swimming pool – swimming 1 hour, walking 15 minutes to home
Wednesday	morning warm up and stretching exercise 15 minutes	team games, some regular sport, children's game outside, etc. (1.5 hour) (training includes warm up, stretching exercise, improvement of general skills and physical fitness, exercise for strength, etc.)
Thursday	morning warm up and stretching exercise 15 minutes physical education classes at school (45 min.)	walking 15 minutes to swimming pool – swimming 1 hour, walking 15 minutes to home
Friday	morning warm up and stretching exercise 15 minutes	relaxation and day off
Saturday	morning warm up and stretching exercise 15 minutes	half day trip by bicycle house work and work in the garden
Sunday	morning warm up and stretching exercise 15 minutes	half day trip by foot

COMPARISON OF PHYSICAL ACTIVITY BETWEEN OLOMOUC AND BEIJING UNIVERSITY STUDENTS USING AN INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

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Regular physical activity (PA) reduces the risk of morbidity and mortality from a number of chronic diseases; however, the PA of a majority of adults does not meet minimal health related recommendations. University students' PA patterns had carryover effects on PA in their adulthood. The purpose of this study was to identify the differences in physical activity (PA) between Olomouc and Beijing university students. Methods – the International Physical Activity Questionnaire, which is long and in a self-administered format, was used to test the PA of Olomouc students (n = 482, 291 females and 191 males) and Beijing university students (n = 199, 84 females and 115 males). Basic descriptive statistics and the Mann-Whitney U test were applied to describe and compare the PA levels. Results – the prevalence of physical inactivity was 5.8% in the Olomouc university population and 15% in the Beijing university population. Male students in Olomouc reported as follows: (Mdn = 5682; M = 6456 MET – min/week), followed by Olomouc female students in Olomouc (Mdn = 3903; M = 5296 MET – min/week). In the Beijing sample, male students reported (Mdn = 2274; M = 2843 MET – min/week) which was also higher than the results of their female students (Mdn = 1504; M = 1981 MET – min/week). Most students in Olomouc (66.8%) are highly physically active, while most students (52.5%) in Beijing are moderately active. Conclusion – Olomouc students are more physically active than Beijing university students. Future research should develop intervention strategies to help more Chinese students adapt an active lifestyle. There should be a cultural modification of the questionnaire and a test-retest of the Chinese version of the IPAQ questionnaire.

Keywords: IPAQ, MET – min/week, walking, moderate and vigorous physical activity, physical activity preferences.

INTRODUCTION

It is widely accepted that regular physical activity (PA) reduces the risk of morbidity and mortality from a number of chronic diseases (Biddle, Gorely, & Stensel, 2004; Blair, Cheng, & Holder, 2001; Bouchard, Shepard, & Stephens, 1994; Kesaniemi et al., 2001; Strong et al., 2005). However, evidence shows that the contemporary design of working and living environments has significantly reduced demand for PA. Modernization has caused a new kind of human being: the sedentary being. Our sedentary lifestyle has produced a dramatic increase in overweight and obese individuals, thus creating a high risk for their poor health. There is a comprehensive list of health conditions whose risk is increased by an inactive lifestyle. For example: coronary heart disease, type II diabetes, hypertension, colon cancer, depression, and osteoporosis.

However, for the majority of adults, the amount of PA required while performing daily occupational and personal activities is no longer sufficient for maintaining sound fitness. Meanwhile, there is little doubt that the majority of people do not meet minimal recommendations for PA, and what is even worse, a significant minority reports very little or no physical activity at all (USDHHS, 1996; WHO, 2000). Public health professionals have been making tremendous efforts to promote PA in the general population to combat diseases related to physical inactivity. Unfortunately, significant increases in PA levels within the general population still remain to be seen. Changing the general population's PA behavior seems to be a battle that cannot be easily won.

Research results have indicated that university students' PA patterns have had carryover effects on PA in their adulthood (Calfas, Sallis, Lovato, & Campbell, 1994). Researchers found that 84.7% of those who exercised regularly at university were still physically active 5 or 10 years later. Researchers also found the same trend among those who were inactive – 81.3% of those who were physically inactive as university students also maintained a sedentary lifestyle afterwards (Sparling &

Snow, 2002). However, university students' PA levels are not higher than those of the general population. Therefore, having a clear picture of university students' PA patterns is crucial for intervening to change their PA lifestyles.

The Czech Republic and China represent different cultures. There are a lot of differences between these two countries, from their geography and history to their political status, economic development, attitudes toward religion, and their educational systems. All these factors can affect the PA among university students. Knowing the differences will help us to learn from each country's strong points to offset their weaknesses.

However, if we go through the international literature on PA, most of the researches have been from the USA, the UK, Canada, and other Western industrialized countries, but only a very few have been from the Czech Republic and China, and even fewer have focused on the university population. Therefore, it is very important to describe PA patterns among the Czech and Chinese university populations. The present study would be the first study that investigates the similarity and difference of PA between Olomouc and Beijing university students.

The objective of this study was to identify the differences of physical activity between Olomouc and Beijing university students. It was hypothesized that there is no difference in the PA of Olomouc and Beijing university students. Another aim of this study was to find the most preferred kinds of PA of these students.

METHODS

Population studied

The samples in this study were from Beijing and Olomouc. The participants in the Chinese sample (n = 199, 84 females and 115 males who are sophomores) were randomly selected from 4 universities in Beijing. Students who majored in physical education and sports were excluded, because according to their curriculum, they have training and sports related classes at least 4 times a week which made them much more physically active than normal university students. All the data was collected in March 2007. All Beijing students were provided the Chinese version of the IPAQ, which has a long, self-administered format. There is no standardized Chinese version of the IPAQ. The IPAQ used was a version, the translation of which was organised by Qu and Li in the year 2004. At that time a test of the validity and reliability of the IPAQ was done on the Chinese university population (Qu & Li, 2004).

The participants belonging to the Olomouc sample (n = 482, 291 females and 191 males aged 17–22) were selected based on a national survey "The physical activity and inactivity of the inhabitants of the Czech Republic in the context of behavioral changes, no: 6198959221" (Frömel et al., 2005). Years of education and body mass index were used as inclusive criteria (TABLE 1). All Olomouc students were provided the standardized Czech version of the questionnaires.

This comparative study was approved by the Institutional research ethics committee of Palacký University. The study was voluntary and no incentives were paid to the participants.

Data collection

The general characteristics of the participants were asked for in this part. The participants were to voluntarily answer questions about their gender, age, height, weight, years of education and organized sports participation status.

The long version of the International Physical Activity Questionnaire (IPAQ) was used to assess PA and can be used internationally to obtain comparable estimates of PA. It also has been tested for reliability and validity and used in a number of international research projects (Craig et al., 2003). There are two versions of the questionnaire: the short version and the long version. The long version provides the more detailed information often required in research work or for evaluation purposes.

TABLE 1
The characteristics of Olomouc and Chinese samples

	♀ – Olomouc (n = 291)		♀ – Beijing (n = 84)		♂ – Olomouc (n = 191)		♂ – Beijing (n = 115)	
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Age (years)	19.71	1.48	19.95	1.00	20.10	1.39	20.45	0.93
Height (cm)	165.59	6.37	163.49	5.62	177.58	6.38	174.36	5.33
Weight (kg)	56.75	5.95	53.17	6.04	69.62	6.80	63.57	7.48
BMI (kg/m²)	20.70	1.91	19.86	1.65	22.07	1.77	20.88	1.96

Legend
M – mean
SD – standard deviation
BMI – Body Mass Index

The IPAQ measures the frequency, duration, and level of intensity of physical activity in the preceding seven days. With the IPAQ, metabolic equivalents (METs) over the preceding seven days can be calculated. PA in the contexts of work, transportation, at home and for recreation or leisure is covered by the IPAQ. What's more, the IPAQ long version assesses an estimate of sitting done on a typical weekday, weekend day and time spent sitting during travel.

PA level (high, moderate and low) was calculated following guidelines that have been set out by the IPAQ executive committee for the preceding 7 days in the long version (www.ipaq.ki.se). Following these guidelines, individuals are considered to be moderately active if they have performed a minimum of 3 days of vigorous PA for at least 20 minutes per day, or a minimum of 5 days of moderate PA or walking of a least 30 minutes per day, or a minimum of 5 days of any combination of walking, moderate or vigorous PA accumulating a total of at least 600 MET – min/week (IPAQ scoring protocol – www.ipaq.ki.se). Individuals are highly active if they have performed vigorous PA for a minimum of 3 days, accumulating at least 1,500 MET – min/week, or a minimum of 7 days of any combination of walking, moderate or vigorous PA accumulating a total of at least 3,000 MET – min/week. Individuals that do not meet these criteria are low on the scale of activity.

Questions regarding PA preference were placed in the form of open questions such as: "What sports activity do you participate in most regularly?" and "Which sport would you like to participate in if given the opportunity?"

Data analysis

The objective of the present study is to describe and compare the current status of PA among university students in both the Czech Republic and China. Analyses were stratified by gender and nationality. Descriptive statistic measures (mean, median, standard deviation and interquartile range) were applied to describe and compare the PA levels. The Mann-Whitney U test was used to find whether there were significant differences between Olomouc students and Beijing students in the total PA score (MET – min/week), walking, moderate and vigorous sub scores (MET – min/week), domain sub scores and sitting sub scores. According to the standards which were suggested by the IPAQ executive committee, the frequency categories used divided the PA level into three groups: low, moderate and high.

RESULTS

Physical activity level

The TABLE 2 shows the mean and SD for each score of PA covered by the IPAQ long vision. The highest value (median and mean) of the total PA score is reported for Olomouc' male students (Mdn = 5682; M = 6456 MET – min/week) followed by Olomouc female students (Mdn = 3903; M = 5296 MET – min/week). The

TABLE 2
Level of PA (MET – minutes/week) of Olomouc and Beijing university students aged 17–22

		♀ – Czech (n = 291)		♀ – Chinese (n = 84)		♂ – Czech (n = 191)		♂ – Chinese (n = 115)	
		Mdn	**IQR**	**Mdn**	**IQR**	**Mdn**	**IQR**	**Mdn**	**IQR**
Total physical activity score									
Total PA	(MET – min/week)	3903	5571	1504	1861	5682	6432	2274	3093
Walking, moderate and vigorous PA									
Walking	(MET – min/week)	683	2772	668	1306	1980	3366	825	2178
Moderate	(MET – min/week)	1020	2405	420	660	1380	3280	520	1000
Vigorous	(MET – min/week)	720	2160	0	420	1440	3420	180	720
Domain sub scores of PA									
Job related	(MET – min/week)	0	990	0	0	0	3086	0	0
Transportation	(MET – min/week)	897	1220	396	717	990	1616	594	1194
Home related	(MET – min/week)	375	1140	60	210	255	1215	70	210
Leisure time	(MET – min/week)	260	2302	638	793	1859	2677	960	1695
Sitting									
Sitting (weekdays)	min/day	360	1080	480	210	300	240	480	240
Sitting (weekend)	min/day	300	1200	360	960	240	240	480	3000

Legend
Mdn – median
IQR – interquartile range
PA – physical activity

same situation is shown in the Beijing sample, namely that males (Mdn = 2274; M = 2843 MET – min/week) are more physically active than females (Mdn = 1504; M = 1981 MET – min/week). However, both male and female Beijing students' total PA levels are relatively lower than those of Olomouc students. Even Olomouc females are much more active than male students in Beijing (TABLE 2).

As for walking, moderate and vigorous PA, Olomouc males are most active in all three of these sub categories of PA. Considering gender differences, statistics show that males are more active than females in both the Olomouc sample and the Beijing sample. As for differences by nationality, Olomouc data are higher than Beijing data in every sub score and the magnitude of the differences is large.

Regarding the sub scores according to domain, i.e. pertaining to job, transportation, home and leisure time PA, the PA scores of Olomouc participants in every domain are higher than Beijing participants. Males show a higher score of PA in each domain than females, except for Olomouc females (Mdn = 375; M = 883 MET – min/week) for whom is shown a slightly higher amount of home related PA than is the case for Olomouc males (Mdn = 255; M = 878 MET/week). The ranking of PA scores within these four domains of the Olomouc sample is as follows: leisure time PA, job related PA, transportation PA, and home related PA, while the ranking of the Beijing sample is in the following order: leisure time PA, transportation PA, job related PA, and home related PA.

As to the sitting time which is an additional indicator/variable and is not included as part of any summary score of physical activity: among all the samples, the means of weekday sitting time are higher than at the weekend, which differs from the results of a previous study in which it was demonstrated that university students spent less time sitting weekdays than over the weekend (Behrens & Dinger, 2003; Wang, Sun, & Dai, 2006). Beijing students spend more time sitting than Olomouc students both weekdays and at the weekend, regardless of gender. It is interesting to note that Beijing male students sit longer than their female counterparts both on weekdays and at the weekend.

TABLE 3
Comparison of Mann-Whitney U test

	Olomouc ♀ × Olomouc ♂	**Beijing ♀ × Beijing ♂**	**Olomouc ♀ × Beijing ♀**	**Olomouc ♂ × Beijing ♂**
Total physical activity score				
Total	.000*	.006*	.000*	.000*
Intensity sub scores				
Walking	.386	.127	.000*	.000*
Moderate	.034*	.061	.000*	.000*
Vigorous	.001*	.064	.000*	.000*
Domain sub scores				
Job related physical activity	.156	.070	.028*	.029*
Transportation physical activity	.043*	.040*	.000*	.000*
Housework physical activity	.033*	.515	.000*	.000*
Leisure time physical activity	.003*	.010*	.000*	.000*
Sitting				
Sitting time (weekdays)	.002*	.522	.000*	.000*
Sitting time (weekend)	.017*	.109	.014*	.000*

Legend
* Statistically significant at the 0.5 level

TABLE 4
Portion of students (%) with low, moderate and high level of PA

	Olomouc			**Beijing**		
	♂ + ♀	♂ (n = 191)	♀ (n = 291)	♂ + ♀	♂ (n = 115)	♀ (n = 84)
Low PA	5.8%	5.2%	6.2%	15%	12.1%	19.0%
Moderate PA	27.4%	20.4%	32.0%	52.5%	47.4%	59.5%
High PA	66.8%	74.3%	61.9%	32.5%	40.5%	21.4%

The Mann-Whitney U test was used to test the differences between medians. According to TABLE 3, there are significant differences between Olomouc females and males in their PA level, except for the walking sub score and job related sub score. Within the Beijing sample, our statistics show significant differences between females and males in the total PA score, transportation score and weekend sitting score. Statistics also show significant differences between Olomouc females and Beijing females in all sub scores. These significant differences also are reported when Olomouc males are compared with Beijing males.

According to the IPAQ scoring protocol, there are three levels of physical activity proposed to classify populations: low, moderate and high. TABLE 4 shows the results of categorizing the PA level of Olomouc and Beijing university students. The prevalence of physical inactivity was 5.8% in the Olomouc population and 15% in the Beijing university population. About 27.4% of Olomouc students and 52.5% of Beijing students are moderately active during all 7 days, and 66.8% of Olomouc students are highly active, compared to 32.5% of Beijing students. What should be noticed is that 19% of Beijing female students are physically inactive.

Physical activity preferences

TABLE 5 shows the results of exercise preference which is another important indicator used to explain PA patterns. It is reported that Olomouc female students are used to participating in aerobics, jogging and fitness and wish to join in aerobics, dance and fitness if they have a chance. While football, basketball and cycling are the sports that Olomouc male students often participated in, what they want to do is football, swimming and floorball. For Beijing females, basketball, in-line skating and badminton are the sports that they often participated in. If they are given an opportunity, they would prefer swimming, jogging and tennis. As for Beijing male students, they usually participate in basketball, badminton and jogging, and if they had the opportunity, they would choose swimming, tennis and football.

DISCUSSION

The present survey represents the first attempt to estimate the physical activity pattern among Olomouc and Beijing university students. Our overall results indicate that the prevalence of physical inactivity was 5.8% in the Olomouc population and 15% in the Beijing university population. Czech university students are much more physically active than Chinese university students, and most Olomouc students are highly physically active, while most Beijing students are moderately active.

Before explaining these differences, some methodological issues need to be considered. In this study we used questionnaires to assess PA. The use for self-reporting may have biased our results because of over or under reporting on both topics. However, it is still not clear whether the IPAQ questionnaire is suitable for Chinese university students. There is still no official Chinese version of the IPAQ questionnaire, although the version which we used had been tested by other Chinese researchers (Qu & Li, 2004), and the results showed that it was suitable for the Chinese university population, but this result was based on small sample validity and reliability test, since only 39 university students participated in its validation. Moreover, cultural adaptations and modifications weren't carefully considered during the translation. Therefore, when the Chinese students took the questionnaires, many of them stated that they found it hard to fill in the IPAQ questionnaire, because they thought that the questionnaire was not close to their real life.

Besides the limitation of the questionnaire, first of all, the sport cultural differences might be one of the reasons which can explain the differences. Thomas and Yan (1995) and Yan and McCullagh (1999) found that

TABLE 5
Ranking of the most preferred types of physical activities

Rank	♀ – Olomouc (n = 291)		♂ – Olomouc (n = 191)		♀ – Beijing (n = 84)		♂ – Beijing (n = 115)	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**
1	Aerobics	Aerobics	Football	Football	Basketball	Swimming	Basketball	Swimming
2	Jogging	Dance	Basketball	Swimming	Skating	Jogging	Badminton	Tennis
3	Fitness	Fitness	Cycling	Floorball	Badminton	Tennis	Jogging	Football
4	Walking	Tennis	Walking	Basketball	Football	Table tennis	Skating	Aerobic
5	Dance	Floorball	Fitness	Fitness	Tennis	Basketball	Table tennis	Basketball
6	Tennis	Yoga	Football	Cycling	Jogging	Swimming	Teakwood	Badminton

Legend
A – What sports activity do you participate in most regularly?
B – Which sport would you like to participate in if given the opportunity?

differences in culture had an influence on youth's PA motivation and PA patterns. The Chinese sports tradition is deeply affected by Chinese traditional philosophy and culture with the aim of cultivating people's body and morality. The typical Chinese traditional exercises are gentle exercise, as in the case, for example, of Daoyin (physical and breathing exercises combined with self-massage), as well as Tai-Chi and Qigong which pursue the balance and unification of internality and externality, spirit and figure, dynamic and static principles as well as hardness and softness. To the contrary, the western sports tradition is built based on physics and anatomical science. Competitive and vigorous sports such as athletics, gymnastics, swimming, and ball games are the representative western sports which pursue "Citius, Altius, Fortius" (Li Liyan, 1992; Li Rong, 2002). Therefore, when Chinese students participate in physical activity, what they more focus on is the "internal" rather than the "physical" outcome (La Forge, 1997), whereas Czech students would prefer vigorous activity to build their bodies. Secondly, the more self-effacing and modest values in Chinese culture could also have an effect (Bond & Hwang, 1993). So, when Chinese students filled in the questionnaires, they might have avoided the extreme answers. However, some points indicate that when Czech people respond to the questionnaires, they would like to choose the positive answers (Frömel et al., 2004). Finally, faced with the same questions, Chinese students and Czech students might understand them differently, which may also affect their responses.

Environmental factors included facilities, the public transportation system, climate and campus safety are also considered to be important determinants of PA (Leslie, Sparling, & Owen, 2001; Nahas, Goldfine, & Collins, 2003; Spence & Re, 2002; Wallace & Buckworth, 2003). There are big differences in the living environment available to Czech as opposed to Chinese university students. 99% of the Chinese participants, are living at a university campus where classrooms, libraries, canteens, shops, dormitories and sports gymnasiums are all in one location. Students don't need to walk a lot and don't even need to use any particular means of transportation to get from one place to another. By contrast, there is no such campus in the Czech Republic, where classrooms, dormitories, libraries and sports facilities are located separately, students need to walk, use various means of transportation or cycle from dormitory to classroom, and between the library, gymnasium and supermarket. However, according to the IPAQ scoring protocol, walking and transportation are two main sub scores when calculating the total PA amount, especially the walking sub score, based on our results, which occupied the largest percentage of the total PA amount.

In spite of all these explanations, we need to recognize the reality that the physical activity level of Beijing university students allows us to feel no optimism, especially with regard to the female students there 19% of whom were reported to be physically inactive. The following strategies are recommended in order to change their physical activity behavior:

1) Researchers found that the nature of PA history was related to college students' PA levels (Wallace, Buckworth, Kirby, & Sherman, 2000). Those who had a positive PA history were more likely to continue their engagement in PA while involved in higher education (Hildebrand & Johnson, 2001). Organizing physical education permeates the entire education system and higher education in particular would help students maintain an active lifestyle. Also, the physical education curriculum can be adjusted according to students' interests.
2) Knowledge about activity and health is positively correlated to PA involvement. Emphasizing health education will help students know the benefits of PA and the harm caused by an inactive lifestyle.
3) Heavy academic study was considered to be one of the barriers associated with participation in PA among the university population, especially among Chinese university students (Tan, 2007). Lowering the academic burden will give students more time to participate in PA.
4) Social support was a significant contributor to PA for both male and female students (Buckworth & Nigg, 2004; Leslie, Sparling, & Owen, 2001; Wallace, Buckworth, Kirby, & Sherman, 2000). Support from the family was very important to female students, while, support from friends, on the other hand, was more useful for male students. Support from family and friends can be considered for inclusion into the intervention program.
5) Arranging university and community sports facilities also plays a crucial role in encouraging students to participate in PA. Because students usually do not have a typical 9 am to 5 pm schedule, their PA behavior may occur at different times on different days (Buckworth & Nigg, 2004). Therefore extending the opening times of facilities will make students' participation much easier. Meanwhile, if sports centers hired professionals to guide students' fitness activities, it would stimulate their participation.

PA preference was another indicator for estimating PA patterns. This indicator is important because it can provide guidelines for future curriculum design for physical education programs to greatly facilitate students' participation in PA. Corbin (2002) pointed out that there was a huge gap between what students learned in physical education programs and what they preferred to use for maintaining their health. The present research identified the exercises in which students most com-

monly engaged and wish to participant. Researchers can attempt to modify university physical education programs using the results of university student exercise preferences.

CONCLUSION

Olomouc university students are more physically active than Beijing university students. The prevalence of physical inactivity was 5.8% in Olomouc' university population and 15% in Beijing university population. Olomouc male students reported the following: (Mdn = 5682; M = 6456 MET – min/week), followed by female students (Mdn = 3903; M = 5296 MET – min/week). While in the Beijing sample, male students reported (Mdn = 2274; M = 2843 MET – min/week) which also represents higher participation than that of female students (Mdn = 1504; M = 1981 MET – min/week). Most Olomouc students (66.8%) are highly physically active, while most Beijing students (52.5%) are moderately active. Further research should be done to develop intervention PA programs to help Chinese students increase their PA level. It is also recommended that future research be done to establish a version based on cultural modification and then test-retest the IPAQ questionnaire's Chinese version.

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SROVNÁNÍ POHYBOVÉ AKTIVITY UNIVERZITNÍCH STUDENTŮ Z OLOMOUCE A PEKINGU POMOCÍ MEZINÁRODNÍHO DOTAZNÍKU K POHYBOVÉ AKTIVITĚ

(Souhrn anglického textu)

Optimální pohybová aktivita (PA) se podílí na snižování reálného rizika nemocnosti a úmrtnosti, především u mnoha civilizačních a chronických chorob. Avšak úroveň pohybové aktivity většiny dospělých nedosahuje minimálních zdravotně orientovaných doporučení k realizaci PA. PA v mládí a dospívání mají významný vliv na PA prováděnou v dospělosti. Hlavním cílem této studie bylo najít rozdíly v PA olomouckých a pekingských univerzitních studentů. Ke sledování a hodnocení PA olomouckých (n = 482, 291 žen a 191 mužů) a pekingských studentů (n = 199, 84 žen a 115 mužů) byl použit IPAQ – mezinárodní dotazník k pohybové aktivitě (dlouhá administrativní verze). Pro analýzu a srovnání úrovně PA mezi olomouckými a pekingskými studenty byly použity základní statistické veličiny a Mann-Whitney U test. U pekingských studentů byl zjištěn vyšší výskyt pohybové inaktivity (15 %) než u studentů olomouckých (5,8 %). Olomoučtí studenti vykazují nejvyšší úroveň PA (Mdn = 5682; M = 6456 MET – min/týden), následují olomoucké studentky (Mdn = 3903; M = 5296 MET – min/týden), až pak studenti (Mdn = 2274; M = 2843 MET – min/týden) a studentky (Mdn = 1504; M = 1981 MET – min/týden) z Pekingu. Většina olomouckých studentů (66,8 %) je vysoce pohybově aktivní, zatímco pekingští studenti (52,5%) realizují spíše PA střední intenzity. Olomoučtí studenti jsou v průměru výrazně pohybově aktivnější než univerzitní studenti z Pekingu. Následující studie by se měly orientovat na tvorbu a ověřování intervenčních programů, napomáhajících čínským studentům osvojit si „aktivnější životní styl". Pozornost by měla být také věnována tvorbě a ověření modifikovaného IPAQ dotazníku (nebo dodatku ke stávajícímu dotazníku), respektujícího východní kulturní specifika.

Klíčová slova: IPAQ, MET – min/týden, chůze, střední a intenzivní pohybová aktivita, preference v oblasti pohybové aktivity.

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The Acta Universitatis Palackianae Olomucensis. Gymnica is an independent professional journal. The content of the magazine is focused on presentation of research notifications and theoretical studies connected with the problems of kinanthropology. The Editorial Board is looking forward to all manuscripts written on the above subject.

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The text is to be presented in MS Word editor and also as a printout.

All contributions are reviewed anonymously.

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