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AN EVALUATION OF THE COMPLEX PROGRAMME OF REHABILITATION FOR THE PATIENTS WITH LATE 'WHIPLASH' SYNDROME FOLLOWING NECK INJURIES

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Background:

Material/ Methods:

Results:

Conclusions:

SUMMARY

Worldwide there is still a search for modern methods for the rehabilitation of patients with late 'whiplash' syndrome following neck injuries; these being long-term patients of physiotherapy clinics and those involved with disability social security claims. The aim of the research was an evaluation of the effectiveness of a strategic approach to the problem, aimed at enhancing treatment with elements of Tai-Chi exercises in the course of a physiotherapy programme conducted on patients with late 'whiplash' syndrome following injury to the neck.

The research encompassed 46 patients with late 'whiplash' syndrome following neck injury, undergoing physiotherapy treatment at the Krzeszowice Rehabilitation Centre; involving a complex programme of physiotherapy based on Microgenetic Theory, utilising a strategic goal directed approach. The patients were divided into two equal groups: an experimental one E (n=23) as well as a Control group C (n=23). In Group E elements of Tai-Chi exercises were additionally used within the framework of the experiment. The research methods involved documentation analysis, a clinical interview, neuropsychological screening tests, selected scales from the Life Quality Evaluation Test rated according to the FIM Scale. Two tests were conducted: before the commencement of rehabilitation and after 8 weeks of its duration.

The structure of the points in 3 categories of psycho-physical comfort: chronic pain, sleep disorders and disturbance, and lowered (negative) mood in Test I was similar in all patients from the two groups and represents the appearance of psycho-physical discomfort. As a result of the rehabilitation conducted a difference in the improvement in psycho-physical comfort was obtained in both Group C and Group E across all the tested parameters of: chronic pain, sleep disturbance and mood control. The differences between the groups are statistically significant, to the benefit of Group E. The number of people from Group E that returned to work was almost four times larger than from Group C.

Enhancing and supplementing a complex rehabilitation programme with elements of Tai-Chi increases, in a statistically significant way, the psycho-physical comfort of patients with late 'whiplash' syndrome following neck injury, through a reduction in pain, sleep disturbance as well as in mood improvement; this equally having an influence on the effectiveness of professional physiotherapy.

Key words: medical rehabilitation, chronic pain, sleep disorders, mood

INTRODUCTION

The fundamental problem in all human activity is the striving to improve and maintain health and the psycho-physical and emotional condition (physical, mental and social well-being). In order for man to be able to live a full life he should be able to realise these in every, even the most taxingly difficult set of conditions (Lechowski, 1992). Individuals often find themselves in such conditions after spinal cord injuries of the 'whiplash' type resulting from a car accident (Pačalska, et al. 2000).

Injuries of the 'whiplash' type, which were described for the first time over 70 years ago (Crowe, 1928), occur almost exclusively as a result of traffic accidents in passengers (less often in drivers) subjected to the effect of sudden forces, often multi-directional, brought about by collision with a vehicle or some other obstacle/obstruction. (Gay & Abbott, 1953; Spitzer et al., 1995). The most common symptom of spinal cord damage is usually pain in the damaged area, often radiating out to the lower or upper limbs. Other symptoms depend on the localisation (level) of spinal damage, as equally on whether the damage is localised or involves the whole length of the spine.

The effect of a sudden acceleration in the trunk and lower limbs forward, together with the body of the car at the moment of impact, when the neck is unprotected, is that the head is forcibly 'thrown' initially forwards then violently backwards, and finally again forwards (hence the term 'whiplash'). The application of forms of protection in the form of headrests mounted in the front seats of cars reduces but rarely eradicates completely the possibility for such injuries to occur (Baranowski, 2000). Ettlin et al., (Ettlin et al., 1992) have claimed that injury of the 'whiplash' type generally involves an excessive bending forwards (hyperflexion), hyperextension or rotation with repositioning (hyperlateroversion) of the neck spine resulting in pain and possibly other complications, although most frequently not to such a degree that they result in actual damage to the muscle tissue or bones. (Baranowski, 2000; Barnsley et al., 1994, 1995; Berstad et al., 1975)

Consequently it is accepted that if there is not ascertained in a patient following such an accident on complaining of pain in the area of the neck and shoulders any external injury to the head, spine (Baranowski, 2000) or a loss in consciousness then injury of the 'whiplash' type is diagnosed (Lechowski, 1992; Spitzer et al., 1995; Malleon, 2002).

For the majority of patients with 'whiplash' type injuries all of the complications usually disappear on their own in a period of 2 to 3 months after the standard symptom treatment. There remain still, however, a large number of patients who complain about the continuation of various symptoms, in particular manifestations of pain (even half a year or more after the event), resulting in a long-term inability to work, a deterioration in quality of life and even attempts to receive disability allowance. For this latter case American authors introduced the designation for these disturbances of 'late whiplash syndrome' (Spitzer et al., 1995; Stovner, 1996).

One may find within the subject literature many articles devoted to various aspects of 'whiplash' type injuries (Gay & Abbott, 1953; Spitzer et al., 1995; Barnsley et al., 1995; Malleson, 2002; Di Stefano & Radanov, 1995, 1996; Fischer et al., 1995, 1997; Fisher, 1982; Kessels et al., 2000; Hall et al., 2009), which still arouse controversy. Ronnen et al. (Kischka et al., 1991), as well as Voyvodick (Ronnen et al., 1996) emphasise that there is an absence of objective data which would confirm in a concrete case the diagnosis of 'whiplash' syndrome. For 'whiplash' syndrome does not involve serious injuries to the body such as breakages and fractures, spinal injuries and those to the **medullar roots**, but exclusively relate to slight injuries to the muscle tissue. It covers micro injuries, sprains, lesions with a possible limited amount of bleeding in the area of the ligaments or muscle system, or of small peripheral nerves.

Neuroimaging methods of the CT and MRI type most often do not show damage to the brain or spine; in a small number of cases where limited damage is confirmed, the focus is small, barely visible in MRI (Pąchalska et al., 2000; Spitzer et al., 1995; Malleson, 2002). Clear cut ligament damage and to other muscle tissues of the neck are only confirmed in a few patients (Pąchalska et al., 2000). Some authors even suggest that the term 'whiplash syndrome' serves merely as a pretext for various forms of claims, including financial ones (Pearce, 1999).

The overwhelming majority of authors claim that 'late whiplash syndrome' is a burdensome problem for the patient, for it is connected to pain syndrome (Voyvodick et al., 1997; Obelieniene et al., 1999; Kużdżał, 2010; Kiwerski et al., 1997), sleep disorders and a lowering in mood (Pąchalska et al., 2000; Malleson, 2002). These symptoms are, in accordance with the International Standards of the Neurological and Functional Classification of Spinal Cord Injury (the ASIA Scale), reasons for significant psychic discomfort (Pąchalska et al., 2000; Baranowski, 2000).

Patients manifesting 'late whiplash syndrome' have a noticeably lowered life comfort level, which is difficult to rectify through the application of standard rehabilitation approaches (Pąchalska et al., 2000). As a consequence there occurs an unfavourable change in their quality of life. The improvement in the life quality of these people depends on the development and implementation of new therapeutic methods. This is a world-wide tendency, while in Polish rehabilitation there are specific achievements. Innovative methods in physiotherapy, ones based on microgenetic theory, are especially characterised by their high level of therapeutic effectiveness. These methods include, for example, a strategic approach directed towards a goal, enhanced by elements of Tai Chi, which is increasingly successfully applied not only with patients with spinal pain syndromes, degenerative joint disease, but also in the rehabilitation of patients following a stroke (Lee 2008; Tomaszewski et al., 2012).

The aim of the research was an evaluation of the effectiveness of rehabilitation using a strategic goal orientated approach enhanced by elements of Tai Chi in patients with late 'whiplash' syndrome following neck injury.

MATERIALS AND METHODS

The research covered 46 patients with late 'whiplash' syndrome after neck injury as a result of a traffic accident, who were subject to rehabilitation at the Krzeszowice Rehabilitation Centre, where a complex rehabilitation programme with the application of a strategic goal-orientated approach, based on microgenetic theory (Pąchalska et al., 2000; Pąchalska, 2007), hereafter referred to as programme A, was conducted. The patients were divided into two equal groups: an experimental group E (n=23) and a control group C (n=23) employing a pair method. In the control group C (n = 23; in which there were 12 men and 11 women) programme A was applied, while in the experimental group E (n = 23, in which there were 13 men and 10 women) in addition to programme A there were introduced, within the framework of the experiment, selected elements of Tai-Chi exercises (programme B). Such group selection was decided on by the need to verify the new programme B in clinical conditions through a comparison of the effects obtained during the process of rehabilitating the patients from group C and E conducted according to the same A programme of complex physiotherapy, where additionally in Group E, within the framework of the experiment, elements of Tai-Chi were incorporated i.e., programme B.

The research methods involve analysis of documentation, a clinical interview, neuropsychological screening tests, selected scales from the Life Quality Evaluation Test rated according to the FIM Scale.

The biographical and clinical characteristics of the tested patients

In Table 1 are presented the demographic characteristics of the tested patients.

The average patient age did not differ in a statistically significant way. The overriding majority of those tested were young people, within the age bracket of 19 to 37. The average age in Group C was for men: 31.7 (SD = 2.3), while for women, 29.3 (SD = 3.1), while in Group E 32.8 for men (SD = 3.2), and for women 30.4 (SD = 3.7) (see: Table 1).

Table. 1. Demographical data

Characteristics	Group C		Group E	
	Male (n = 12)	Female (n = 11)	Male (n = 12)	Female (n = 11)
31.7 ± 8.3 ± 3.2	31.7 ± 2.3	29.3 ± 3.1	32.8 ± 3.2	30.4 ± 3.7
Education* (mean; range)	1.8 ± 3.7	1.4 ± 3.6	1.9 ± 3.5	1.5 ± 3.8
Years since accident (mean; range)	6.7 ± 2.8	6.4 ± 3.1	6.5 ± 2.8	6.2 ± 3.1
Weeks of rehabilitation (mean; range)	7.5 ± 0.7	7.6 ± 0.5	7.7 ± 0.3	7.8 ± 0.2
No. of patients who returned to work or other pre-accident occupations (e.g. studies)	4 (33.3%)	3 (27.3%)	12 (100%)	11 (100%)

* measured in years of post-primary education

The direct cause of spinal injury was in all of those tested, both in Group C as in Group E, a traffic accident. In Group C – 8 had suffered injury as a driver while 15 had been car passengers, while in Group E – 9 had been injured while driving and 14 individuals had been passengers in cars.

In the patients tested, both in Group C and in Group E there occurred various neurological problems. And so in Group C severe, chronic headaches occurred in 19 patients. Disturbances to sight and dizziness affected 19 patients. In turn in Group E, severe headaches, disturbances in sight and dizziness occurred in all 23 patients tested.

Neuropsychological tests were conducted on all patients before the beginning of the experiment, which had as its aim the establishment of speech disturbances of the aphasia type or dysarthria, disturbances in memory and attention, emotional-motivational disturbances as well as those in performance functioning.

Criteria excluding individuals from the research

The experiment excluded those individuals who had undergone past operations connected with whiplash injury, in particular taking into consideration patients who had had operations on the lower limbs, as well as patients with depression and dementia. This fact was connected with the need for patient participation in certain stages of the rehabilitation process utilising the strategic goal-orientated approach.

COMPLEX REHABILITATION PROGRAMME UTILISING THE STRATEGIC GOAL-ORIENTATED APPROACH – PROGRAMME A

The complex rehabilitation programme utilising the strategic goal-orientated approach developed at the beginning of the 21st century at the Cracow Rehabilitation Centre by Pačalska et al. (Pačalska et al., 2001), is based on:

1. *Microgenetic Theory*, in which emphasis is placed on the role:
 - a. *Of the working of the nerve-muscle system* as a systematic whole which is subjected to disorganisation as a result of damage: for the aim of rehabilitation is a return of the inherent 'order and harmony',
 - b. *Polymodal stimulation*, that is concurrent stimulation of the nerve system through all possible channels, intensive and directed therapeutic intervention.
2. The latest trends in the management of enterprises, which include:
 - a. Management By Objectives,
 - b. SWOT analysis [Strengths-Weaknesses-Opportunities-Threats].

There have been developed in rehabilitation models for the learning of problem solving strategies which involve, among other things: the creation of an effective hierarchy of aims and needs as well as a consistent, concrete timetable for the realisation of clearly determined tasks designated for concrete individuals.

3. A special algorithm of exercises: a goal-orientated strategic approach contains

sets of varied, individual and group therapeutic methods in various sections/divisions, suitably modified and adapted for the needs of patients. These have been described in detail in another work (Pąchalska, 2007).

The selection and/or modification of these sets is developed individually for the needs of each patient as a result of a five-stage process. This includes:

1. A complex analysis of the current situation of the patient

At this stage a SWOT analysis is employed i.e., a detailed form of listing of not only the problems and limitations of a patient but also their maintained abilities to adapt and compensate within the existing situation. Disturbed or lost functions may be aided and supplemented for by means of special equipment, the training of carers, the adapting of the environment etc., (the mechanism of adaptation), and what the patient is able to do in a different way (the mechanism of compensation).

The information needed to carry out such an analysis should be collected from all possible sources, including: medical documentation, an interview with the patient, carer, family, hospital staff. It may result from one's own observations. The most important thing is that the collected information creates a reliable, real image of the current state of the patient.

2. Establishment of the situation goal by means of negotiation (chief goal)

Following the process of SWOT analysis by means of a therapist it follows to ascertain with the patient, possibly with the participation of the family and guardians, the chief goal of the rehabilitation for the period of physiotherapy treatment. After acquainting the patient with the results of the SWOT analysis it follows to ask: how the form should look in your view – within realistic parameters – within a month, a year? What should change and what not?

As a result of these discussions there appears a picture of the goal situation, which as a rule is different from the actual picture of events. Here it follows to avoid making two fundamental mistakes which could constitute patient failure:

- **The setting of overly ambitious or difficult goals**, which initially may strongly motivate a patient to increased effort yet finally often results in a breakdown when the result of unavoidable failure makes itself known to the patient, and they realise that such a goal is unattainable. In such a situation the patient may consider the matter as a lost cause and give up on all attempts to improve their situation, considering that the *status quo* simply cannot be changed,
- **The setting of too easy a set of goals**, which are not much higher than the existing situation, thereby not motivating the patient to act, while the satisfaction that the patient feels from the obtainment of such goals is on the whole short-lived and fallacious. In viewing the matter as already a lost cause the patient equally in this situation gives up on any further effort.

As has been mentioned above the final decisions as to the establishment of the overriding goals should belong to the patient themselves. Nonetheless the role of the therapist at this stage involves being able to help the patient designate goals which are at the same time significant and possible for realisation.

3) the selection of subsidiary goals leading systematically to the realisation of the main goal.

At this stage, in conjunction with the patient, we establish subsidiary goals i.e., the subsequent steps leading systematically from the present and real situation to that of the goal. In each place in the questionnaire where there is a visible difference between the patient's current state and that of the goal, it follows to ask the question: what can be done and should be done in order to change the current situation in the direction of the goal? Subsidiary goals should be concrete and measureable (parametrically) so that it is known when and how they will be achieved.

4) establishment of a timetable for the realisation of subsidiary goals

Having the overriding goal and its subsidiaries defined and agreed to, it follows to draw up a realistic timetable of exercises and verifying measurements. We also establish within the timetable who will be responsible for the individual activities listed in the timetable.

5) Regular monitoring of the goals achieved with potential modifications and improvements

Extremely important is the process of monitoring the level at which the devised plan has been realised within the framework of the first four stages so that both the patient and the physiotherapy team are aware of whether the patient has made progress towards the established goal or not. It is important, particularly in the case of confirming the failure to obtain this goal to re-evaluate the situation and to take a decision as to whether to verify the goals set or rather to change the methods applied in order to accelerate goal realisation.

THE STRUCTURE OF PROGRAMME

Programme A covers the entirety of therapeutic procedures from the moment the patient is admitted to the Krzeszowice Rehabilitation Centre, to the moment the programme ends, evaluated both by the individual responsible for the whole process as equally by the injured party, within the scope of regaining psycho-physical abilities understood in the aspect of independence of action.

All patients from Group C and E taking part in the comprehensive rehabilitation program had the same procedure algorithm applied to them:

1. Balneotherapy:

- Sulphur baths (daily for 20 minutes, the first treatment lasts 7 minutes, the next 14 and subsequent ones 20 minutes each).
- Mud compresses (the compresses were applied for 20 minutes every day for the whole duration of the rehabilitation programme).

2. Physiotherapy:

- Healing currents (everyday iontotherapy with the application of non-steroid anti-inflammatory and analgesic drugs, 15 minutes, **TENS** for 10 minutes).

- Underwater vibratory massage of the upper and lower limbs (for 15 minutes the lower or upper limbs depending on the location of the degenerative changes).
- Ultrasound (daily, depending on localisation, from 6 to 10 minutes).
- Magnetotherapy (daily for 20 minutes).

3. Kinesiotherapy:

- Active exercises in burdening (by means of suspended weights/ pulley systems, riding a cycloergometer without loading).
- Free exercises (strengthening the postural muscles: stomach, gluteal and dorsal).
- Individual exercises (using neurophysiological methods individually adapted for functional deficiency) conducted by certified therapists.
- The exercises were done daily for a one hour period.

4. Occupational therapy with health education (a daily meeting for around an hour).

5. Individual psychotherapy (1 hour sessions once a week).

The entirety of the basic programme applied in the algorithm was supplemented, in accordance with the strategic approach individually agreed upon with each of the patients, by a list of aims as well as being enhanced by analgesic and anti-inflammatory treatment (Diclofenac sodium) (Pąchalski i Mańko 2003). The programme duration was four weeks, which coincides with the re-funding available within the Polish National Health System (Narodowy Fundusz Zdrowia).

These exercises have been looked at in detail in another work (Tomaszewski et al., 2012).

A COMPLEX REHABILITATION PROGRAMME UTILISING A STRATEGY ORIENTATED GOAL APPROACH ENHANCED BY ELEMENTS OF TAI CHI – PROGRAMME B

The programme of complex rehabilitation utilising a strategy orientated goal approach enhanced by elements of Tai Chi – programme B was conducted in a large gymnasium as well as in parts of the historical park situated around the Centre.

TAI CHI SESSIONS

Tai Chi sessions were 40 minutes in duration, which included a warm-up and stretch, specific elements of Tai Chi and cool down and were taught by a certified instructor with a 2nd degree in Martial Art (certification was gained from the Polish Society of Kickboxing in Warsaw, Poland). This instructor had undergone additional training in Tai Chi for Health Programmes, created and performed by

Krzeszowice Rehabilitation Centre within the framework of the Programme for parish development and enhancing the position of the Małopolska Region, which was supported financially by European Union Funds. The instructor in the study also received a 2-weeks training course on how to use the elements of Tai Chi training techniques to teach each of the 20 sessions, which was supported by the Polish Society of Neuropsychology. Specific details of the Tai Chi exercises procedures as well as a complete description of the intervention components used in each of the 20 sessions can be found in the Tai Chi study instructor's manual (Manko, 2010). It is worthy to note, using the instructor's manual containing the plan for each Tai Chi session, the assurance that the intervention was standardized.

The patients from Group E received 20 Tai Chi sessions over 4 weeks (5 days a week, 40 minutes duration of each session). All Tai Chi sessions were conducted as group treatment.

Participants were asked to advise one of the investigators if they had an increase in pain for which they wished attention. In these cases, analgesic and anti-inflammatory treatment (Diclofenac sodium) was given and the patient was sent off with the therapist's assistant.

In all patients from Group E the same algorithm was applied for the physiotherapy conducted, this involving the classic simple arrangement of known movement positions designated as five animals: the arrangements and movement positions were referred to as follows:

- The bear
- The crane
- The deer
- The tiger
- The monkey

So called global movements were used in these exercises, which are later transferred into functional movements in everyday activities. Particular attention was paid in this form of rehabilitation to a strengthening of trunk activities through the simultaneous mobility and fluency of limb movements. An important component in the exercises was synchronized breathing which aids relaxation as well as fluidity in movement, also influencing pain management and control.

Research methods

The following research instruments were used in the tests:

1. *Documentation analysis* (illness history, test results – including MRI and KT) of patients treated at the Krzeszowice Rehabilitation Centre,
2. *Clinical interview* – this was appropriately directed towards the test aims. Especial emphasis was placed on:
 - The way of coping with the limitations resulting from the condition,
 - The patient's attitude, in particular considerations of self image and relations to one's future,Value hierarchies, particularly considering life goals.

3. *Selected scales from the quality of life test for the patients following spinal and brain injuries* (Pačalska and MacQueen 1998). An analysis of psycho-physical comfort indicating quality of life was conducted on the basis of an evaluation of:

- pain,
- sleep disorder,
- mood.

In each category evaluated were from 3 to 5 activities in relation to the estimated percentage participation by the patient in their realisation. The level of help required by the patient was established in points on the basis of the FIM scale adapted from the International Standards of the Neurological and Functional Classification of Spinal Cord Injury – the ASIA Scale (ASIA 1996, Baranowski 2000):

- 1 or 2 points: total dependence (patient participation: 0-25%),
- 3 to 5 points: limited independence (patient participation: 50%, 75% or independently yet under the supervision of a carer),
- 6 to 7 points: independence (patient participation: 100% with the help of adapted equipment or without),

The FIM Scale was used in order to be able to compare the variable characteristics in all the components of psycho-physical comfort.

The organisation and course of the research

The tests were conducted during the patients' stay at the Krzeszowice Rehabilitation Centre. The patients both from Group C as equally Group E took part in a complex programme of rehabilitation utilising a strategic goal-orientated approach. For patients in Group E there were additionally incorporated elements of Tai Chi exercises. Such a rehabilitation procedure and patient selection in groups was intentional and motivated by:

- The absence of a complex programme of rehabilitation utilising a strategic goal-orientated approach enhanced by elements of Tai Chi in the course of rehabilitation treatment in the control group (C);
- The need to verify a new programme in clinical conditions through the comparison of the effects obtained during the process of Group C and E patient rehabilitation conducted according to the same physiotherapy programme where in addition, within the experimental group, there is applied a strategic goal-orientated approach with the use of Tai Chi elements.

Physiotherapy exercises were conducted daily. The Tai Chi elements were conducted once a day for a period of 30 minutes under the supervision of a therapist.

All the tests were conducted by one and the same person, in similar conditions, locations and test situations, thereby allowing for a reliable evaluation of the results of treatment. The patients were tested twice – the initial tests were conducted prior to the commencement of rehabilitation, while the second round, after the eight weeks of rehabilitation.

CT and MRI test were conducted to ascertain the extent of brain injury and damage to the brain stem. The research methods were fully accepted by those tested. All the tested patients expressed in writing their full agreement to participate in the experiment. Permission for the conducting of the research was obtained from the Bioethics Commission.

RESULTS

In Table 2 are given the results structure of the three elements of psycho-physical comfort (pain reduction, reduction in sleep disorders and mood control) for the Groups C and E in Tests I and II, on the FIN evaluation scale. Equally the sum of the combined points has been calculated as well as the percentage of points gained taken as 100% of the maximum possible number of points.

An analysis of the results shows that the structure of points in the three comfort categories (pain reduction, reduction in sleep disorders and mood control) in the test groups (C and E) in Test I is similar. The number of points is from 60 to 76, while the percentage is from 35.4 to 47.2% of the maximum possible points available.

As a result of the rehabilitation conducted in Group C there occurred a small improvement within the aspects analysed. The number of points increased in the case of pain reduction from 66 to 76 i.e., by 6.21%, in the case of a reduction in sleep disorders from 76 to 83 i.e., by 5.59%, while in the case of mood control from 60 to 69 points i.e., by 4.35%.

While in Group E there occurred an extremely large improvement in the analysed aspects – the number of points increased in the case of pain reduction from 68 to 120 i.e., by 32.3%, in the case of a reduction in sleep disorders from 73 to 131, i.e., by 36%, while in the case of mood control from 57 to 107 points i.e., by 29%.

On the basis of the statistical analysis one may state that the differences between the results of Tests I and II are highly significant statistically ($\chi^2 = 42.074$;

Table 2. The results of tests on psycho-physical comfort in groups C and E

Gr.	Psychic Comfort	Test	Evaluation scale							n	Σ pts	% max points
			1	2	3	4	5	6	7			
E	Pain	I	6	4	5	4	1	3	0	23	68	42.23
	Reduction	II	0	1	2	4	5	6	5	23	120	74.53
	Reduction	I	5	5	4	3	3	2	1	23	73	45.34
	In sleep disorders	II	0	0	2	2	4	8	7	23	131	81.37
	Mood	I	7	5	5	5	1	0	0	23	57	35.40
	Control	II	0	0	2	6	5	6	4	23	107	66.46
C	Pain	I	5	6	5	3	2	2	0	23	66	40.99
	Reduction	II	5	4	4	3	4	2	1	23	76	47.20
	Reduction	I	4	5	5	3	2	3	1	23	76	47.20
	In sleep disorders	II	3	4	3	6	4	2	1	23	83	51.55
	Mood	I	6	6	5	4	1	1	0	23	60	37.27
	Control	II	4	5	6	4	3	1	0	23	69	42.86

Table 3. The results of tests on psycho-physical comfort in groups C and E

Group	Test	Evaluation scale							n	Differential significance
		1	2	3	4	5	6	7		
E	I	18	14	14	12	5	5	1	69	Chi ² = 0.016; df = 2; ns
C	I	15	17	15	10	5	6	1	69	
E	II	0	1	6	12	14	20	16	69	Chi ² = 42.074; df = 2; p = 0.0001
C	II	12	13	13	13	11	5	2	69	

*The analysis took into consideration the number of questions in the psycho-physical comfort evaluation (3 test questions) multiplied by the number of individuals tested.

p = 0.0001) in Group E, while in Group C the difference is statistically insignificant (Table 3). One may therefore state that the rehabilitation carried out in a significant way influenced an improvement in the psycho-physical comfort of the patients tested in Group E. The calculated value of the contingency coefficient is $C_{sk} = 0.8931$, which represents an extremely strong link and significant dependence between the rehabilitation carried out and the psycho-physical comfort of the patients.

As a result of the rehabilitation conducted the improvement obtained also influenced the fact that many individuals in Groups C and E returned to work. In Group C 6 patients (26.1%), of which 4 were men and 2 women, while in Group E a full 22 patients (95.7%), of which 13 were men and 9 women, returned to work at either their old position or a new one. One may note that in Group E, where Programme B with elements of Tai Chi was used, the effects of professional rehabilitation are four times greater than in Group C, which employed the standard Programme A.

DISCUSSION

It is widely known that an individual finding themselves in conditions of psychic discomfort loses the drive to act. They complain that they are unable to change the difficult conditions and circumstances in which they live, for they have no hope whatsoever for any change at all (Lechowski, 1992).

The research carried out has shown that all the patients tested both in Group C as in Group E with late 'whiplash' syndrome after neck injury, complained about these very sort of conditions. They experienced a reduced level of psychic comfort as a result of chronic pain, sleep disorders and reduced (positive) mood. As a result of the anxiety connected with the above outlined situation they not only experienced symptoms connected with the initial consequences of the injury in the form of various pathologies within the central nervous system, but also secondary consequences, to which one may enumerate a loss of motivation to exercise and cooperate with a medical team. These factors intensified the psychic discomfort, which negatively affected their quality of life.

Existing programmes of rehabilitation were insufficiently effective in improving the psycho-physical comfort of these patients. One of the main reasons, as borne out by academic research (Tomaszewski et al., 2012; 2013; Pąchalska et al.,

2001), was the fact that a standard approach to planned physiotherapy treatment is often characterised by:

- **fragmentation**, for in such cases the main and subsidiary goals of treatment as well as the methods applied are not negotiated with the patients. Although therapists, who are in contact with a concrete patient, undertake their work as best they can there is often an absence of cooperation and coordination in these efforts with the patients themselves. The patient is not fully aware of the goals and in such a situation it is difficult to talk of conscious cooperation,
- **reactivity**, for given the absence of concrete plans the easiest is to react to the current situation that requires therapeutic intervention. This is obviously a therapeutic approach orientated exclusively to the problem, and more rarely to the whole situation in which the patient finds themselves. Both medical personnel, as equally the patient themselves simply wait for the appearance of the next problem in order to know and understand what should be undertaken.
- **rigidity**, in other words that lack of adaptation to the individual situation of a concrete patient. A patient with a specific type of physical injury receives a packet of exercises and forms of treatment taken from a previously devised scheme of action. One does not have to wait long for the result of such a situation. A patient, who following brain damage has already a sense of their own value being threatened, is in effect incapacitated. They become a faceless object of, as they perceive it, the random practices and treatments of various specialists, each of whom speaks, as if, a different language.

The lack of a clear designation of a strategic plan makes the effective process of directing the course of the rehabilitation impossible, and therefore the inability to provide the appropriate help for patients with late 'whiplash' syndrome following neck injury.

As a consequence the models and therapeutic approaches developed by the Cracow School of Rehabilitation (Tomaszewski et al., 2012; Pąchalska, 2007; Pąchalska et al., 2001) prefer a clear outlining of the strategic plan, which will condition the appropriate direction for the rehabilitation process. Especial attention should be here directed to the appropriate choice of exercises and therapeutic techniques, which enable the fastest possible realisation of the goal as well as the subsidiary goals, for they are appropriately chosen for:

- the health and financial possibilities of the patient, especially taking into consideration their needs, desires and dreams,
- the nature of the medical team and the treatment possibilities available.

This approach means that both the patient as equally the physiotherapist have a greater certainty that the rehabilitative actions carried out at a given moment are purposeful as well as that they should be continued. In a reverse situation they should be dropped or changed for a more appropriate form of treatment.

Within contemporary medical and social-occupational rehabilitation, which is orientated both for therapeutic and financial success, there is a constant search for methods of therapy which within a short time can lead to the successful fulfilment of tasks conducted in rehabilitation clinics and wards and, with the same,

raise the effects of therapeutic treatment. The drive towards improving the quality of services within the economic problem aspect existing within health services has resulted in the introduction of varied management and rehabilitation programmes. This situation also induces research into the effectiveness of therapy programmes and the selection of those deemed the most effective. Fragmentary help in the form of poorly coordinated efforts is insufficient here, even if conducted by the best experts from various disciplines. The patient who perceives the course of their own physiotherapy treatment as a random series of visits by various therapists who have been sent to them with the intention of achieving 'an unknown goal', one seen vaguely and without concrete direction, is not able to implement a personal contribution into the process of rehabilitation (Pąchal-ska, 2007). Each subsequent specialist starts, consequently, the process of physiotherapy from the beginning, often knowing little or nothing about their predecessors or the present treatment of other specialists, who are acting according to their own understanding derived from their specific specialisations and adopted scheme. The patient becomes the object for various treatments and therapeutic interactions which they often do not understand and consequently are unable to appreciate (Pąchal-ski & Mańko, 2003).

The inclusion within the complex programme of rehabilitation with a strategic goal, which was conducted at the Krzeszowice Rehabilitation Centre, of elements of Tai Chi preferred by the patients, brought about a heightened effectiveness in the rehabilitation of patients from Group E, in which the therapy was conducted according to this programme. The right selection and clear defining of the subsidiary and main aims of the physiotherapy treatment, thanks to cooperation with the patients themselves, enabled the therapists to propose appropriate strategies for Tai Chi exercises. This made cooperation with the therapists easier, as equally the coordination of the efforts of specialists from a host of fields all involved in the rehabilitation of a given patient. Tai Chi exercises turned out to be an attractive form of therapy and were well received by the patients themselves.

The application of Tai Chi exercise at the Rehabilitation Centre in Krzeszowice was made a lot easier by the fact that the centre possesses good facilities for such activities. As a result of the accessibility of a wooded park the Tai Chi programme could be conducted in the fresh air, something that made the sessions additionally attractive for the patients and which enhanced the rehabilitation programme. Tai Chi exercises, in a similar way to other illness groups (Tomaszewski et al., 2012; Pąchal-ski & Mańko, 2003; Mańko et al., 2010; Hall et al., 2009, 2011), enabled the patient to acquire possibilities not available through the application of other methods, which in the case of late 'whiplash' syndrome following neck injury allowed the periods of stagnation in therapy to be overcome as well as obtaining a noticeable reduction in the psycho-physical discomfort experienced in Group E. It also led to a return to professional, vocational work for almost four-times more patients from Group E than was the case with Group C. It should be here emphasised that only one person in Group E did not in fact return to work.

In summing up it follows to state that the introduction of elements of Tai Chi exercises to a programme of rehabilitation with the aim of reducing the psychic discomfort connected with chronic pain, sleep disorders and a poor mood, opens up a wide range of therapeutic possibilities for patients with late 'whiplash' syndrome after neck injury. The incorporation of Tai Chi as a method of working with a patient within a programme of strategic rehabilitation, with particular consideration being paid to the introduction of movement models adapted from animals, means that a person is first and foremost released from psychic tensions, and therefore from the emotional sphere. Thanks to the obtainment of psycho-physical comfort, the patient is favourably transported, allowing for the possibility to consolidate, improve and strengthen functional movement models while at the same time reducing pain sensations. The formulation by the patient, as a result of discussion with therapists, of a picture of the target situation, which is as a rule different from the current one, equally results in an increase in the sense of independence and subjectivity, which will transfer itself to an increased quality of life for the patient.

The complex programme of rehabilitation proposed with a strategic aim and the incorporation of elements of Tai Chi created broad possibilities to supplement patient therapy for those with late 'whiplash' syndrome following neck injury, and may be widely applied in health care units, under the condition that therapists have been appropriately trained (Tomaszewski, 2012).

CONCLUSIONS

1. Patients with late 'whiplash' syndrome have lowered psycho-physical comfort as a result of chronic pain, sleep disorders and a lower (positive) mood.
2. The enhancing of a programme of complex rehabilitation by elements of Tai Chi raises in a statistically significant way psycho-physical comfort through a reduction in pain, sleep disorder, and an improved mood as well as influencing the effectiveness of professional rehabilitation amongst patients with late 'whiplash' syndrome after neck injury.
3. Selected Tai Chi exercises constitute a novel supplementation to a comprehensive rehabilitation programme for patients with late 'whiplash' syndrome after neck injury, influencing and enhancing its effectiveness.

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