DE GRUYTER OPEN

LASE Journal of Sport Science
2014 Vol 5, No. 1, Pages 46-56

DOI: 10.1515/ljss-2016-0025
p-ISSN: 1691-7669/e-ISSN: 1691-9912/ISO 3297
http://journal.lspa.lv/

REVIEW PAPER

NORDIC WALKING – A VERSATILE PHYSICAL ACTIVITY FIT FOR EVERYONE (A LITERATURE REVIEW)

Krzysztof Piech[1], Jakub Piech[2], Juris Grants[3]

[1]Josef Pilsudski University of Physical Education in Warsaw,
Faculty of Physical Education and Sport in Biała Podlaska
Address: ul Akademicka 2, 21-500 Biała Podlaska, Poland
Phone: +48-607381070
E-mail: krzysztofpiech@wp.pl

[2]Janusz Korczak Lower Secondary School in Cracow
Address: al. Kijowska 3, 30-079 Kraków, Poland
Phone: +48-605317056
E-mail: piechk@tlen.pl

[3]Latvian Academy of Sport Education
Address: 333 Brivibas gatve, Riga LV-1006, Latvia
Phone: +371-67543412
E-mail: Juris.Grants@lspa.lv

Abstract

The topic of Nordic walking shows the main points of scientific interest concerning form of physical exercise. Existing research mainly focuses on presenting it as beneficial for the elderly. The authors of the topic are presenting the advantages of pole walking for distinctive age groups. There are a number of publications concerning elderly women specifically. Nordic walking is also an object of interest in biomechanical studies. There is an apparent shortage of publications on the utility of this kind of physical activity for children and the young. This seems to be a frequent shortcoming of the research methodology, as it is difficult to deduce whether the study is based on the correct Nordic walking technique or rather on walking with poles as a bracing device. At the same time there is no data concerning Nordic walking as a competitive sport which has been developing dynamically.

Key words: *Nordic walking, physical activity, biomechanical studies, sport for all.*

Introduction

In the past, men were forced to look for food, travel and exhibit stamina and other skills associated with movement in order to survive. The progress of civilization in most societies of the world has led to elimination of physical effort in most societies. Nowadays, there is no need to expend large amounts of energy to get nutrition. We minimize the amount of energy spent on a physical activity, which results in an energy imbalance. Health problems of industrialized countries stem from swaying from an energy regime set by our ancestors (Piech, Raczyńska 2010). Restoring energy balance is a challenge for modern societies and may be achieved by maintaining a satisfactory level of physical activity throughout life. Developing the habit of an active lifestyle during childhood, adolescence as well as among adults and senior citizens seems to be vital. Research shows that adults who have been more active in childhood demonstrate better parameters for the capacity of the cardiovascular, respiratory and skeletal systems. It is, therefore, important to develop a liking for motor activities from an early age. There are a number of people who can play a significant role in this process: family, physical education teachers, schools, physical culture individuals, self-governments, doctors. It is crucial that all of the people able to act in this area can cooperate to highlight the significance of the problem and undertake actions in order to neutralize negative phenomena. The growing absence of children and teenagers in physical education classes in recent years is worrying. It is necessary to find ways to engage various social groups in physical activities. One of the possibilities is to showcase a diverse choice of sport activities available for different age groups. The wider the choice, the greater the chance of finding a perfect sport activity for life. The dynamic development of various forms of sport activities engaging more and more people only supports the statement. The expansion of Nordic walking is a perfect example of this phenomenon.

Material and methods

Nordic walking – a sport for anyone and everyone

Nordic walking refers to a Scandinavian walking with poles, or in other words a physical activity based on walking and a special technique of pushing off with specifically matched poles. Its characteristic features are prolonged footstep as well as alternating movements of arms and legs. This kind of leisure activity strengthens the upper body and arms and enhances shoulders' mobility. Because of the poles we feel less tired and can, therefore, walk for a longer period of time. People suffering from osteoporosis strengthen their bones and muscles by walking with poles.

Among additional advantages we can list: enhancing the balance of the body, improving the work of respiratory and cardiovascular systems, increasing in the oxygen intake and lowering the resting heart rate. Nordic walking is an outdoor activity that can be practiced all year round. Regulating the frequency of physical exercise varies for each person and there are no counter-indications. Currently, Nordic walking is a relatively new activity; hence the ongoing research to find the optimal walking technique and teaching method, taking into consideration various age groups. So far, we can differentiate three levels of advancement: health, fitness and sport. The most frequently recommended technique to learn Nordic walking involves 10 "steps". Mastering properly all 10 steps is crucial for acquiring correct walking technique. Nordic walking on a sport level has been developed dynamically in order to form new groups for walking with poles. It is focused mainly on intensive physical exercises (strength training, athletic activities, running etc.) as well as on various competition systems. It is a chance to engage a larger group of young people and school-age students in the activity.

Benefits of practicing Nordic walking

Pole walking has been an object of scientific interest since the beginning of the 1990s. The first research was done in 1992 at the University of Wisconsin – La Crosse in the United States. It shown that after a 12 week training with poles the level of VO_2max increased by 8% on average and the muscle endurance increased by 37%, while in the group walking without poles saw an increase of only 14% (Stoughton. 1992), (Larkin, 1992) and (Karavan, 1992). Further research confirmed the beneficial influence of pole walking on the human body. Hendrickson (1993) examined 16 fit men and women on an athletic treadmill and found out that the oxygen intake; heart rate and energy expenditure have risen by around 20% while walking with poles, as opposed to without. Porcari et al. (1997) had similar outcomes after examining 32 healthy men and women, also on an athletic treadmill. He indicated that using poles leads to the increases in oxygen intake (23% on average), heart rate (16%) and energy expenditure (22%), in comparison to people walking without poles. Rogers et al. (1995) noticed that 24 year old healthy women walking with poles during a 30 minutes submaximal session exhibit higher level of VO_2max than during the same session without poles (21 to 18ml/kg/min). The heart rate raises as well, 133 to 122 heartbeats. Moreover, women walking with poles burnt more calories during a 30 minutes session (174 to 141 kcal during a session without poles). Gullstrand and Svedenhag (2001) and

Aigner et al. (2004) obtained similar results with regards to the same parameters. They also noticed the increase of lactic acid during pole walking, which indicates a more intense physical exercise.

Kamień (2007) got interesting results while working on a research programme "Nordic walking as a promoting healthy lifestyle new activity fit for everyone". The study was conducted in two groups, one of which was walking with poles and the other took part in March and run training. The positive impact of health training, visible in the overall improvement of physical function, was observed after just two months of systematic physical activity in both groups. More profitable results of research with regards to anatomic and physiological parameters were obtained by the participants practicing Nordic walking.

The study of the influence of Nordic Walking on the human body was also conducted on patients with various afflictions. Walter et al. (1996) researched a group of men after angioplasty, bypass surgery or a heart attack. The results show that during pole walking the average energy expenditure increased by 21%, heart rate by 14 ud/min and the highest systolic and diastolic blood pressure increased on average by 16 and 4 mm Hg accordingly, in comparison with a standard walking without poles. The authors claim that marching with poles is a safe form of rehabilitation for patients suffering from heart diseases. The results of a research into patients with peripheral vascular disease by Collins et al. (2003) indicate that 30 minute pole walking sessions led to lengthening the distance and increasing the speed of walking. Furthermore, the researchers emphasize higher physical effort tolerance and the improvement of the quality of life of these patients. A similar study involved women after mastectomy and the influence of pole walking on the functioning of their arms. Sprod et al. (2005) demonstrated an increase in the endurance of the upper body among women exercising with poles in comparison with a group of women walking regularly without poles. This type of rehabilitation may, therefore, facilitate everyday activities and contribute to a faster return to an independent lifestyle. Another research focuses on the influence of Nordic walking on the rate of glycaemic index among elderly patients with type 2 DM. A group of 19 patients (6 women and 13 men), whose average age was 67 years, were walking with poles once or twice a week for 90 minutes throughout a whole year. As Nischwitz et al. (2006) show, all biochemical parameters relevant to diabetes improved. Nordic walking training also allowed the patients to take a lower dose of hypoglycaemic agents. The influence of pole walking on the reduction of body weight among a group of middle aged people was also researched. The group practiced Nordic walking regularly

for 4 months. The participants lost 4kg of their body weight on average and 6.6 cm of their waistline. Their aerobic capacity improved as well (Heikkilä et al. 2004). The beneficial influence of Nordic walking was also presented by Baatile et al. (2000), who were studying men with Parkinson's disease. Patients took part in three 60 minutes sessions per week, for 8 weeks. Researchers stated in conclusion that Nordic walking exercises contributed to higher perceived functional independence and the quality of life of the patients suffering from Parkinson disease.

Ossowski et al. (2010) studied the changes of the limbs' strength levels among elderly women that result from Nordic walking training.

The purpose of this study was to determine the changes of the strength level of arms and legs under Nordic Walking training in women aged 60-69 years.

31 women aged 60-69 years, were subject to this examination. In the conducted tests for measuring strength level 2 trials were used: getting up from the chair trial and arm bend with dumb-bell trial (Physical fitness Test for older people – Fullerton Functional Fitness Test).Nordic Walking training was a part of pedagogical experiment – comparing this special type of training with overall body training some important results were obtain. Research showed that this new type of training is more efficient than overall body training as far as the strength level of arms and legs is regarded in women aged 60-69 years.

Wiech M. et al. (2010) studied the changes of positive health indicators in the elderly after Nordic Walking training sessions.

The carried out examinations illustrate the effects of Nordic Walking physical activity on the elder women. The purpose of the examinations was to determine the changes of the body fat in women aged 60-75, who were subject to systematic health training. The carried out training program lasted 12 weeks, from 16 November 2009 to 5 February 2010. A group of 30 women was examined by selected measurements: skin folds thickness and body girths by means of standard tools. The conclusion indicates that Nordic Walking is an efficient way for weight loss, irrespective of age and season (the examinations lasted in winter, when amount of body fat increases and it concerned elder women whose muscle tissue is replaced by increased amount of body fat and connective tissue).

Ossowski and Kortas (2012) presented research results concerning the influence of recreational Nordic Walking training on the level of agility and balance in elderly women.

Science researches have proved that the main reason of postural instability is body balance disturbances. In the long term they often result in

falls. The aim of this article was to determine the changes in agility and body balance under Nordic Walking Training in older women. Subjects of this research were women aged 60-69 years. The women were divided in two age groups: 60-64 years and 65-69 years. Women took part in 6-month pedagogical experiment. This experiment had an aim to show the influence of overall training and Nordic Walking Training on the agility and body balance level. Agility trial and body balance trial from Fitness Trial for older people were applied (Fullerton Functional Fitness Test). The similar results on the agility and body balance level in older women after overall and Nordic Walking Training was stated. Women aged 60-64 years after Nordic Walking Training improved these abilities, moving in grade range from 75 to 85 centyl.

Piotrowska (2011) obtained interesting results while studying the assessment of physical capacity and body composition of boys leading a sedentary lifestyle. The author researched two groups of 17-18 years old boys. The first group of 46 boys regularly took part in physical education classes, while the second group (29 boys) avoided them. Boys from the second group were encouraged to engage in Nordic waking classes 3 times a week throughout the school year. The average differences observed in the Nordic walking group in comparison with the first group indicate a considerable advancement in their results. A significant improvement was observed in body weight, composition of the adipose tissue, 50m running ability, arm bending for pull-ups, crouching from a recumbent position and shuttle running 4x10m. No negative changes of somatic or functional parameters where observed.

Nordic Walking in biochemical research

The last few years brought a number of biomechanical studies of the subject, focusing mainly on the analysis of the lower extremities load as well as on the bioelectric work of muscles during pole walking. Many of the most recent studies dispute the statements of Nordic walking advocates who claim pole walking lightens the load on the legs.

One of the few studies that confirms the theory that pole walking lightens the load on the legs, is the study conducted by Willson et al. (2001). The outcomes suggest that Nordic walking slightly lowers the average vertical ground reaction force and the vertical (compressing) knee joint reaction force.

The lack of valid statistical data on the differences between Nordic walking and walking without poles with reference to the vertical ground reaction force rates was mentioned in several studies by Jöllenbeck et al.

(2006), Thorwesten et al. (2006), Hansen et al. (2008), and Stief et al. (2008).

A slight, yet statistically relevant, decrease of the vertical ground reaction force during the second, lower, peak (push off phase) was observed by Kleindienst et al. (2006) and Hagen et al. (2006). It could have been caused by the active use of poles in this phase of foot contact with the ground (Kleindienst et al., 2006).

The results of studies by Brunelle and Miller (1998), Kleindiensta et al. (2006), indicate, however, higher vertical ground reaction force during landing while pole walking, in comparison to standard walking without poles at the same speed.

The absence of differences in the average vertical ground reaction force between Nordic walking and walking without poles was observed in their studies Jöllenbeck et al. (2006). Nevertheless, in most cases during the contact of the foot with the ground, these forces were higher, although irrelevant. Only in the middle support phase the minimal forces significantly lower.

Besides the second peak of the vertical ground reaction force, Nordic walking results in higher load rates and horizontal forces, along with higher recurrence and recurrence speed rates, compared with walking without poles.

Hansen et al. (2008) show an absence of differences in compression or shear forces that affect the knee joint during Nordic walking and walking without poles.

The results presented by Kleindiensta et al. (2006) and Stief et al. (2006) show a lack of lightening the load on lower extremities, moreover, they point to a higher load on the knee joint while "landing", which is caused by the distinctive technique of Nordic walking: a higher sole angle, higher sole angle velocity and a straighter knee while standing the heel, when compared to walking without poles (Kleindienst et al. 2006).

Yet another researched problem is the influence of poles on the load on lower extremities during Nordic walking up and down hill. Bohne and Abendroth-Smith (2007) studied the effects of using trekking poles while walking down hill with an external load (a backpack). The authors observed a significant reduction of the ground reaction force moment affecting the ankle, knee and hip joints (in the sagittal plane) while walking with poles, compared to walking without them.

Significant differences between downhill walking with and without hiking poles were observed for peak and average magnitudes of ground

reaction force, knee joint moment, and tibiofemoral compressive and shear forces (12-25%)

Schwameder et al. (1999) have shown that walking downhill with trekking poles, in opposition to walking without them, leads a reduction in peak and average magnitudes of ground reaction force, knee joint moment, and tibiofemoral compressive and shear forces (12-25%).

Conclusions

The analysis of the literature concerning Nordic walking shows the main points of scientific interest regarding this form of physical exercise. It shows that the existing research mainly focuses on presenting it as beneficial for the elderly. The authors are presenting the advantages of pole walking for this distinctive age group: improved capacity, endurance, and mental health among others. There are a number of publications concerning elderly women specifically. The second group of studies involves the disabled, people with various psychological and physical problems. Nordic walking is also an object of interest in biomechanical studies. There is an apparent shortage of publications on the utility of this kind of physical activity for children and the young. The existing research focuses on the techniques applied by the subjects examined only to a small extent. This seems to be a frequent shortcoming of the research methodology, as it is difficult to deduce whether the study is based on the correct Nordic walking technique or rather on walking with poles as a bracing device. Furthermore, there is no data concerning Nordic walking as a competitive sport which has been developing dynamically. As an example we may mention Polish Cup of Nordic Walking and a growing number of other highly competitive championships. It seems that this will become the main focus for further research in the nearest future.

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Submitted: January 8, 2014
Accepted: May 15, 2014