

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 maintain-

ing 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 organized 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/m ²)	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 ♀ ×	Beijing ♀ ×	Olomouc ♀ ×	Olomouc ♂ ×
	Olomouc ♂	Beijing ♂	Beijing ♀	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 participate. 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
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DOTAZNÍKU K POHYBOVÉ AKTIVITĚ**

(Souhrn anglického textu)

Optimální pohybová aktivita (PA) se podílí na snižování reálného rizika nemoci 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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