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TRPKOVICI MELINDA (PÉCSI BELVÁROSI ÁLTALÁNOS ISKOLA), PÁLVÖLGYI ÁGNES, ÁCS PONGRÁC (PÉCSI TUDOMÁNYEGYETEM)

INVESTIGATING THE RELATIONSHIP BETWEEN COACH-ATHLETE ATTACHMENT AND PERCEIVED AUTONOMY SUPPORT

EDZŐ SPORTOLÓ KÖTŐDÉS ÉS AZ ÉSZLELT AUTONÓMIA TÁMOGATÁS KAPCSOLATÁNAK VIZSGÁLATA

Abstract

Introduction: Athletic performance is not only influenced by intrapersonal factors, but also interpersonal factors such as the quality of the coach -athlete relationship. The emotional atmosphere of the training largely determines the coach-athlete relationship. This relationship is stronger when the emotional atmosphere is supportive. The autonomy support is an important component of the motivational atmosphere. The coaching behaviour has an impact on the motivation of the athlete which affects the performance. In the study we examined the relation between the autonomy support and attachment style, and we also examined the differences between the attachment style of the individual and team athletes.

Material and methods: 150 elite athletes participated in our research, 85 female and 65 male, and consist of 85 individual and 65 team athletes. Average age was 24,13. The participants completed the questionnaires (Coach-Athlete Attachment Scale / CAAS/; Perceived Autonomy Support Scale for Exercise Settings /PASSES/) online. We used the SPSS.22 version for the statistics. The aim of the study is to investigate the correlation between the attachment style and the autonomy supportive strategies.

Results: We suppose a positive relationship between the secure attachment and perceived autonomy support, and a negative relationship between insecure attachment and perceived autonomy support. The results confirmed our hypothesis. In addition we found significante difference between the individual and team athletes in point of the attachment. The psychological mechanism of the perceived autonomy support, and the secure attachment are very similar which can be account for the results.

Keywords: motivation, attachment, autonomy support, coach-athlete relationship, self-determination

Absztrakt

Bevezetés: A sportteljesítményt nem csak intraperszonális tényezők befolyásolják, hanem interperszonális tényezők is, mint például a sportoló-edző kapcsolatának minősége.
A sportoló és edző közti viszonyt meghatározza a légkör, amelyben az edzésmunka folyik. A támogató légkörben a sportoló és edző között mélyebb kapcsolat figyelhető meg. Az autonómia támogatás fontos eleme a motivációs légkörnek. Az edzői viselkedés hatással van a sportoló motivációjára, ami befolyásolja a teljesítményt. Kutatásunkban az autonómia támogatás és a kötődési stílusok kapcsolatát, valamint az egyéni és csapatsportolók közti különbséget vizsgáltuk a kötődés tekintetében.

Anyag és módszerek: A vizsgálatban 150 versenyszintű sportoló vett részt, melyből 85 nő, 65 férfi volt. A személyek átlagéletkora 24,13 volt. A mintából 85 személy egyéni, 65 csapatszinten sportol. A vizsgálati személyek egy online kérdőívcsomagot töltöttek ki, mely tartalmazta az Edző-Sportoló Kötődés (Coach-Athlete Attachment Scale /CAAS/) és az Észlelt Autonómia Támogatás (Perceived Autonomy Support Scale for Exercise Settings / PASSES/) kérdőívet. Az eredményeket az SPSS.22. verziójával elemeztük.
Eredmények: A vizsgálatban pozitív kapcsolatot feltételezünk a biztonságos kötődés és az észlelt autonómia támogatás között, és negatív összefüggést a bizonytalan kötődéssel. Az eredmények ezeket a feltevéseket alátámasztották. A kötődést vizsgálva különbség mutatható ki az egyéni és a csapatsportot űzők között. Az észlelt autonómia támogatás és a biztonságos kötődés hátterében hasonló pszichológiai mechanizmusok húzódnak, amellyel a kapott eredményeket magyarázni tudjuk.

Kulcsszavak: motiváció, kötődés, autonómia támogatás, edző-sportoló kapcsolat, szelf-detereminácio

Introduction

In the literature, we can find many studies (eg.: Davis and Jowett, 2010; Mageau and Vallerand, 2003; Hampson and Jowett, 2014) which investigate the coach-sports relationship. There are a number of researches dealing with this topic, but the topic of attachment between athlete and coach is a less-researched area within sports psychology. Its goal is to understand interpersonal relationships in sports, such as the quality of the coach-athlete's relationship, and how the quality of the relationship influences performance. This research examines the relationship between the coach-athlete's attachment patterns with the perceived autonomy support. For the explanation of the athlete-coach's attachment, it is necessary to present the basics of attachment theory. According to the attachment theory (Bowlby, 1969)

the quality of attachment determines the attitude towards the environment. This is also an emotional relationship which will be based on the quality of relationships that will be established in later life stages (Atkinson, 1995), that is, the child will be attached to a person who provides security to the discovery of the world (Cole and Cole, 2006). In the Strange Situation Study (Ainsworth et al., 1978) a child creates a stressful situation which activates the attachment behavioral system. Based on the response patterns shown in the study, children can be classified into three types (type A, B and C) which later suplemented with type D (Cole and Cole, 2006). However, the article does not exclude this because this type of sports performance is irrelevant. Secure attachment (Group B): When the mother / carer is consistently available, attentive, responsive and supportive of her child, a secure attachment is created. In this case, the mother provides protection and the child enabling the environment to be mapped safely (Davis and Jowett, 2013).

Insecure avoidant attachment (Group A): when the caregiver is leaving, the child feel stressed. The other person can calm down them. In this case, the mother is not responsive, standoffish. For the child the caretaker does not provide security and protection when needed. Insecure-ambivalent / resistant / anxious attachment (Group C): This children are near their mother, but in the presence of a mother they are also stressed. When the mother leaves, this uneasiness is even more intense and does not calm down after the return. They are constantly insecure and anxious. For the child the caretaker is unpredictable and incoherent in her behavior (Cole and Cole, 2006). There may be more people in the child's life to behave towards attachment behavior (Bowlby, 1969). The coach as a potential attachment figure may appear in the athlete's life. Davis and Jowett (2010) found that the coach is an important attachment person for the athlete. The quality of attachment manifests in a stressful state.

It means in a sport context that in the case of stress or problem (eg, competitive match, injury, failure) the quality of attachment will be playing a role in processing and solving a problem. Attachment patterns play a role in attention-and-emotion regulation as well as in competitive anxiety. We can not talk about ingrained behavioral patterns, so the relationships with a coach can create changes in the existing patterns. Davis and Jowett (2013) found that the secure attachment with a coach related a higher level of perceived relationship satisfaction, and sports satisfaction. In contrast, insecure attachment (anxious, avoidant) has a negative relationship with relationship satisfaction and sports satisfaction. Insecure attachment can lead to higher levels of dysfunctionality, which is manifested in interaction with the coach and participation in sports. Within the literature of sports psychology, several theories deal with the relationship between a coach and athlete (Wyllemann, 2000; Davis and Jowett, 2010; Megeau and

Vallerrand, 2003). Athletes who have been in contact with their coach for a long time now report a much deeper relationship. Over the past few years, more and more research has been carried out on the relationship between athlete and coach, as it has been shown that relationship quality greatly influences sports performance (Hampson and Jowett, 2014). In team sports research, it was found that the quality of the coach-athlete relationship is able to predict team cohesion (a sense of belonging) and collective effectiveness (Jowett and Shanmugam, 2016). The longer-lasting relationship and the relationship of the same gender are related to higher level of relationship satisfaction (Révész et al., 2013). Compared to individual and team athletes, individual athletes were more satisfied with the relationship, reported closer relationships, and more committed to their coach (Rhind et al., 2012; Jowett and Shanmugam, 2016). Most athletes highlighted the motivating role of coach as the most important factor in coaching roles. Literature also emphasizes the maintenance / development of motivation as one of the most important factors from the point of view of performance (Megeau and Vallerand, 2003). The coach's task is to promote the intrinsic motivation of athlete in addition to teaching technical skills (Gyömbér and Kovács, 2012). If the external cause of the action is internalized and accepted by the person, then the extrinsic motivation becomes self-determined, so the person is committed to the action. In contrast, we talking about non-self-determined extrinsic motivations when a person feels that it is a pressure or compulsion which forces to act. This pressure can be external, eg.: coach or internal, eg.: fear of punishment. Research has shown that intrinsic motivation and the self-determined form of extrinsic motivation are equally influencing persistence and performance.

There are many factors which can influence this two motivational types, but the athlete-coach relationship is one of the most prominent in all (Megeau and Vallerand, 2003). According to the self-determination theory, the purpose of the individual is to maintain an integrated self-concept and does activities which are necessary for a sense of psychic well-being and satisfy their needs (Deci and Ryan, 1985). According to the psychological needs theory, there are three basic needs: The competence need, the autonomy need, which is the central concept of self-determination theory and relatedness need. La Guardia et al. (2000, cited by Felton and Jowett, 2013) found that if these needs are satisfied within a relationship, it leads to greater well-being. In sports psychology, Gagné et al. (2003, cited by Felton and Jowett, 2013), showed that gymnasts with basic needs satisfied had higher self-esteem and positive affections. (Felton and Jowett, 2013). If sport satisfies the need for competence, autonomy, and relatedness it implies greater internal motivation and involvement. Motivation determines the activity and the coach has an important role to support

it. Researches shows (eg, Black and Deci, 2000; Deci et al., 1991; cited by Hagger et al., 2007) that if a leader (eg. coach) provides autonomy in tasks, it implies greater persistence, commitment, enjoyment. The perceived autonomy support promotes the belief in the athlete that the coach provides independent initiative, decision-making opportunities, independent problem solving, and recognizes the role of emotions in decision-making, avoiding demands and pressure (Hagger et al., 2007). Autonomy support has a positive relationship with the satisfaction of basic psychological needs, self-determined motivation, perseverance and negative correlation with demotivation and physical symptoms. (Vallerand, Brière, 2001; cited, Conroy and Coatsworth, 2007). Autonomy supporting behavior is derived from the self-determination theory and is an important factor in the motivational atmosphere. In this atmosphere, the athlete feels that the activity what he/she is doing is not the result of an external pressure, but the result from inside, which promotes greater internal motivation, creativity, cognitive flexibility, higher self-esteem, perceived competence and confidence. Coaches can take steps to contribute to a supportive atmosphere (Conroy and Coatsworth, 2007). If the coach is able to take on the athlete's perspective and feelings, he or she provides the freedom of choice while minimizing pressure, meaning that sees him/her as an independent individual. Thus, the person who supports the autonomy ensures the right to choose within specific rules and frameworks, providing logical tasks, limits and rules. In addition, this person is interested in and acknowledges the feelings of others, provides opportunities for initiative and independent work, avoids open regulation, guilty criticism, directional statements, material rewards. This enhances the person's sense of autonomy and competence (Megeau and Vallerand, 2003).

Hypotheses

1. Our research is expected to confirm our assumption that there is a correlation between attachment styles and autonomy supporting behavior.
2. We assume positive relationship between secure attachment and autonomy-supporting behavior.
3. We assume negative relationship between the uncertain attachment style and autonomy-supporting behavior.
4. We assume that there is a difference between individual and team athletes with regard to attachment.

Material and methods

The sample consisted of 150 athletes, out of which 85 were women and 65 men. The average age of people was 24, 13. The questionnaire contains answers from athletes who are currently at competition level and have participated in National Championships (93 persons), European Championships (31 persons), World Cup (4 persons), World Championships (17 persons) or Olympics (5 persons). Testimonials have reported their highest ranking in the most prestigious competition. The

sample includes a variety of sports, both individual (85) and team sports (65pcs).

In our research, we used two questionnaires, and asked some demographic questions. Completing the questionnaires was completely anonymous and voluntary. In the study, we used the hungarian adapted version of the Coach-Athlete Attachment Scale (CAAS) developed by Davis and Jowett (2013). The questionnaire is self-reported and measures the basic attachment aspects of the coach-athlete in the dyadic context. It contains 19 items and measures 3 factors: secure, anxious, avoidant attachment styles. Responses should be given on Likert scale ranging from 1 to 7, where 1 means "I totally disagree" and 7 is "fully agree". The Perceived Autonomy Support Scale for Exercise Settings (PASSES), developed by Hagger et al. (2007), is able to exploring athletes' perceived autonomy. The questionnaire contains 12 item. The people had to evaluate them on a seven-grade Likert scale. The Hungarian adaptation of the test was made by Soós and Karsai (2006). The data was processed and evaluated by SPSS Version 22. The significance level is 0.05; the lower values were considered significant.

Results

By examining Pearson's correlation, we have found that there is a relationship between autonomy-supporting behavior and the three attachemnt styles. The secure attachment has a positive correlation ($r = 0.904$, $p < 0.05$), the avoidant ($r = -0.622$, $p < 0.05$) and the anxiety type ($r = -0.700$, $p < 0.05$) has a negative relationship with the autonomy-supporting behavior.

Nearly (6%) there was a significant relationship between sport age and anxiety. The relationship between the two variables is negative. The person who doing sport a longer time, he/she reached a lower score on the anxiety attachment style score. This was verified by Spearman's correlation. ($r = -0.153$, $p = 0.062$)

Based on the results of an independent t-test, it can be stated that no gender difference in the total score of attachment and autonomy-supporting behavior ($P > 0.05$). By examining an independent t-test to determine there is any difference in the team between athletes or individual athletes in the attachment style, we have found that there is a higher rate of avoidant attachment athletes among the team sport athletes than among individual athletes. ($t(148) = 2.209$, $p < 0.05$)

Table 1: Correlation of autonomy supporting behavior and attachment styles

Correlations		Aut.sup.	Avoidant	Anxiety	Secure
Autonomy support	Pearson Correlation	1	-,622**	-,700**	,904**
	Sig. (2-tailed)		,000	,000	,000
	Sample size		150	150	150
Avoidant	Pearson Correlation	-,622**	1	,358**	-,570**
	Sig. (2-tailed)	,000		,000	,000
	Sample size		150	150	150
Anxiety	Pearson Correlation	-,700**	,358**	1	-,698**
	Sig. (2-tailed)	,000	,000		,000
	Sample size		150	150	150
Secure	Pearson Correlation	,904**	-,570**	-,698**	1
	Sig. (2-tailed)	,000	,000	,000	
	Sample size		150	150	150
**. Correlation is significant at the 0,01 level (2-tailed).					

(Source: own contruction/ author/ own data, own research)

Table 2: Correlation between sport age and anxiety attachment style

Correlations						
			avoidant	anxiety	secure	sport age
Spearman's rho	Sport age	Correlation coefficient	-,095	-,153	,105	1,000
		Sig. (2-tailed)	,245	,062	,203	.
		Sample size	150	150	150	150
**. Correlation is significant at the 0,01 level (2-tailed).						

(Source: own contruction/ author/ own data, own research)

Discussion and conclusions

The results shows that there is a link between autonomy-supporting behavior and the three attachment styles. Secure attachment has a positive correlation with autonomy-supporting behavior. The avoidant and anxious type is negatively correlated with autonomy-supporting behavior. These results confirmed our first, second and third hypothesis. From the results we can conclude that a secure-attached athlete has a supported relationship with his/her coach. In the autonomy supporting atmosphere, the primary goal is the individual development (Ryan and Deci, 1987). It is possible that a controlling atmosphere does not allow the secure attachment. In the controlling atmosphere the emphasis is on performance

enhancement, the coach gives instructions and less attention to the athlete's individual opinion and needs. It is also possible that the early relationship pattern does not allow the personal relationship with the coach, and the supportive atmosphere. At 6%, there is a significant relationship between sport age and anxious attachment. The relationship between the two variables is negative. This means that who have been doing a sport for a long time, less tipical the anxious attachment with his/her coach. Research has shown that the higher sporting age is related a deeper relationship between the athletes and their coaches (Révész et al., 2013). Based on this, we can conclude that over time the occurence of insecure attachment may be decrease. For a positive change, it is necessary to the coach provides continuous support, and the confidence is also important. Overall, autonomy support has a positive relationship with the satisfaction of basic psychological needs, self-determined motivation, perseverance and negative correlation with motivation and physical symptoms. If intrinsic motivation is high, performance will be better. (Vallerand and Brière; 2001; Conroy and Coatsworth, 2007). Therefore, the autonomy supporting is an important element of the motivational atmosphere.

We have assumed that there is a difference between individual and team sport athletes in attachment styles. Our results show that there is a higher rate of athletes in a team sport compared to individual athletes who have avoidant attachment style. In team sports the coach's attention is directed to multiple targets, less able to deal with the needs of the individual. It may also possible that the coach evaluates the team's overall performance, less the individual. Team performance more emphased and less the personal performance. (Rhind et al., 2012; Jowett and Shanmugam, 2016) found that individual athletes were more satisfied with their relationship with their coach, against the athletes in the team. They reported a deeper relationship and showed greater commitment to their coach. It is important to emphasize the importance of quality of athlete-coach relationship which predicts team cohesion and collective effectiveness (Hampson and Jowett, 2014).

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CSILLA FILO, TAMÁS NAGY

EFFECT OF PHYSICAL ACTIVITY TO LABOUR MARKET ACTIVITY IN THE SOUTH TRANSDANUBIAN REGION

A FIZIKAI AKTIVITÁS HATÁSA A GAZDASÁGI AKTIVITÁSRA A DÉL-DUNÁNTÚLI RÉGIÓBAN

Abstract

Introduction: We started our research in the spring of 2018. We surveyed the physical activity and labour market activity of the inhabitants of the Southern Transdanubian region. (N=551). The aim of our research is to justify the hypothesis that it is related to the physical activity of people and their labor market activity.

Material and methods: An on-line questionnaire was completed on a regionally representative sample. After processing the data, hypotheses were verified by correlation t-teszt, cross-table analysis and correspondence analysis.

Results: After statistical analyzes ($p < 0.05$) we found significant correlations between physical activity, income, education, leisure time, recreation, residence, body mass index and labour market activity. After the analysis, multidimensional scaling resulted in groups in the population living in the area.

Conclusions: Labour market activity is influenced by several factors. In particular, education, physical condition, health and residence.

Keywords: labour market, physical activity, correlation, heath, leisure time

Absztrakt

Bevezetés: Kutatásunkat 2018 tavaszán kezdtük. A Dél-dunántúli régió lakosságának fizikai aktivitását és munkaerő-piaci aktivitását vizsgáltuk. (N = 551) Kutatásunk célja annak igazolása, hogy az ember fizikai aktivitásával és munkaerő-piaci aktivitássa befolyással van egymásra.

Anyag és módszer: A regionálisan reprezentatív mintán online kérdőívet készítettek. Az adatok feldolgozása után a hipotéziseket korrelációs elemzéssel t próbával, kereszt-táblázatelemzéssel és korrespondencia analízissel igazoltuk.

Eredmények: Statisztikai elemzések után ($p < 0,05$) szignifikáns összefüggést találtunk a fizikai aktivitás, a jöve-

delem, az oktatás, a szabadidő, a szabadidő, a lakóhely, a testtömeg-index és a munkaerő-piaci aktivitás között. Az elemzés után a korrespondencia analízis több módos fejleszthető csoportokat mutatott a területen élők körében.

Következtetéseket: A munkaerő-piaci aktivitást számos tényező befolyásolja. Ezek közül az oktatás, a fizikai állapot, a mozgás az egészség és a lakóhely a meghatározók.

Kulcsszavak: munkaerőpiac, fizikai aktivitás, korreláció, egészség, szabadidő

Introdution

There have been several important changes in the labour market in recent years. These transformations follow different patterns in each country, but their dynamics are closely related.

Technological progress, globalization, new and old media, demographic change, new production, health care and new economic systems: these are all key factors in the ongoing process of transformation, both the labour market and society as a whole touch.

In additional the Fourth Industrial Revolution is interacting with other socio-economic and demographic factors to create a perfect storm of business model change in all industries, resulting in major disruptions to labour markets. Besides new categories of jobs will emerge, partly or wholly displacing others. The skill sets required in both old and new occupations will change in most industries and transform how and where people work. It may also affect female and male workers differently and transform the dynamics of the industry gender gap.

The main thesis of my study is how sport activity influences labour market activity. I look for the next question as to whether there is a connection between the human capital and the cognitive competences in a knowledge-based society. Sports activities can be used in the labour market. Increased regular physical activity is the income.

Literature review

More and more studies and research have analyzed the relationships between physical activity and labour market activity in the past decades. We see that the long-term preservation of workers' health becomes an increasingly important priority. Godoy and Triches (2017) have written the about Brasilien labour market, where the research has shown the differences between sedentary and physically active workers quite clear. Physically active employees displayed better social and economic indicators compared to sedentary personnel. The findings also show that the prevalence of sedentary lifestyles tends to be higher in women than in men. Econometric tests give a positive relationship between level of schooling and earnings for both sexes, with greater impacts for men.

Lechner and Sari (2014) investigated the medium and long term effects of sports and exercise on labour market

outcome for working age adults. The empirical analysis is based on Canadian panel data that are particularly suitable for such an analysis because they are unusually informative about sports and exercise, about potential confounding variables such as health and life style, and they contain labour market outcomes as well. The informative data set is used with a research design based on stratification and semi-parametric matching estimation that arguably allows the causal interpretation of the resulting estimates. They find robust positive earnings effects that increase to more than 10% after some years, which broadly compares to the returns of one to two years of schooling. Interestingly, an important heterogeneity appears in the sense that only increasing the level of sports and exercise activity to a level higher than the one recommended by national and international health organizations has this clear-cut impact. Smaller increases appear to have only a minor impact that is hard to pin with the sample sizes available in this study. Interesting further research may address this heterogeneity issue: A possible, but of course speculative, explanation of this heterogeneity may be that activity is measured subjectively.

Kari (2018) examined the associations between income and physical activity among Finnish adults. This study extended the previous literature by including self-reported and pedometer-based physical activity in the analysis. There were two significant results in this study. The first, higher income was associated with higher self-reported leisure-time physical activity for women and men. Second, the pedometer-based results differed by gender: The association was negative or non-existent for men and positive for women. The study suggests that the measurement type of physical activity should be taken into account when possible income effects of physical activity are analyzed.

Cabane (2013) examined the relation of sport activity and unemployment. She observed practising sports during unemployment is highly and positively correlated to the probability of finding a job in t for people who experience at leat two unemployment spells over the period (25 years) and who were not involved in sports participation, in volunteering, in politics or in religious practice weekly when they were employed (in the last 2 years). The estimations which lead to these results take into account a part of the endogeneity due to unobservables confounders (by including shared frailty). Controlling for the health satisfaction does not affect the coefficients thus the health is less likely to be a channel at work. Since the impact is greater for people who have three years or less of work experience it leads to attribute part of the effect to the additional information sent out by this practice. Other activities have a negative impact on the transition from unemployment to employment. This means that somehow –in terms of networks and noncognitive skills– sporting activities are different, they are rewarded on the labour-market. Results

from the competing risk model should help to precise the relationship.

Lechner and Downward (2017) presented their study that the sport is now widely discussed in government policy and particularly in connection with its potential impact on social welfare and the health of a nation's citizens. This paper provides new insights into the human capital impacts of sports participation, recognising that its effects could be mediated through related health and social capital impacts, by signalling higher potential individual productivity and perhaps related to team work and networking. A further important innovation and novel feature of this paper is that it investigates these impacts for different types of sports. The analysis is undertaken based on a unique composite dataset drawing upon three major surveys and supplemented by official statistics on population. A matching estimator, supplemented by a formal sensitivity analysis, is employed, in which several of the important confounding factors connected with sports participation and labour market outcomes are controlled for. The results are also disaggregated to examine both men and women, and those aged between 26 to 45 years and those aged 46 to 64 years. The results indicate large positive associations of sports participation with earnings, which appear to be largest for fitness and outdoor sports. Furthermore, there is a negative relation to unemployment, particularly for men. Interestingly, this reduction goes together with higher employment rates for younger men and higher retirement rates for older men. Comparing the different sports against each other reveals that team sports can contribute most to employability, perhaps by signalling teamwork, but that this varies by age across the genders, such that older women might need to accrue these skills; and that outdoor activities contribute most to income when sports are directly compared. There appears to be, therefore, a link between sports participation and the structure of the labour market connected to initial access to employment and then higher income opportunities with ageing that are associated with a career ladder.

Challange of labour market activity

Technology is creating a fourth industrial revolution. Evidence is widespread and varied. The effect of automating and replacing human labor with machines is the first consideration we have come to expect: these phenomena have often been recorded and analyzed in the past, but something has changed in recent years. Automation is no longer limited to routine and repetitive tasks; effects on non-routine tasks. Scientists are trying to predict what will happen: what will be the effect of skilled workers. Moreover, we are currently faced with the polarization of work: medium wage, erosion of intermediate jobs and high wages, highly skilled jobs, and low wage and low-skilled jobs. The question is whether there will be enough work for future generations of workers. Another question is whether education and training

increase job security, or whether it is a chimeric dream.

The transformation of work is characterized by "new geographic work". The process of globalization leads to global competition. In several cases, the theory of transfer relocation revealed that there was a hypothetical threat that reduced working conditions among companies in the most advanced economies. This dynamics started in the manufacturing industry. The proliferation of new technologies and the dematerialisation of work have created new opportunities for companies to relocate to areas with low labour standards. The outsourced outsourcing of several companies alone provides full services, and even a single project can be divided into small and simple tasks that workers from anywhere in the world can perform and coordinate, monitor, and assemble for final product.

The aging workforce also has implications for employee productivity, health conditions and skills. Due to the frequent advancements and changes in technologies and organizations, skills are quickly outdated. It is necessary for workers to provide workers with skills that will be relevant throughout their lives and at the same time allow them to re-enable their skills against new working methods.

Model of human resource

The new model exemplify the mission is to raise both the competency of individuals and the quality of life through investments in human capital, innovative technology, state-of-the-art facilities, and partnerships with elite international organizations (3. figure). We have to defining three levels (micro, middle, macro) on the quality of this development and look 3 terms (short-term, mid-term, long-term). The micro level is a personal level for individual education, skills and physical renewal. On the macro level we have to developing the access to institutions (school, practice places, recreation possibility) and create a skill demand and job monitor system, what predicts the changing of new vocational and job challenges and all levels and terms facilitate the transition to the labor market. On macro level the society must give new roles in social care system. These responsibilities are directly attached to individuals, labor- market relations being, of course, reintegrated into a relationship to specific social rights. The system of social protection exists within the framework of a requirement for “individual responsibility” that implies strong participation in the labor market.

On the middle level the workplaces (enterprises, administrations, etc.) give redirections to new competences, retraining and support creations of home-office. The home office will be a new opportunity in work life balance mainly frame of women employee.

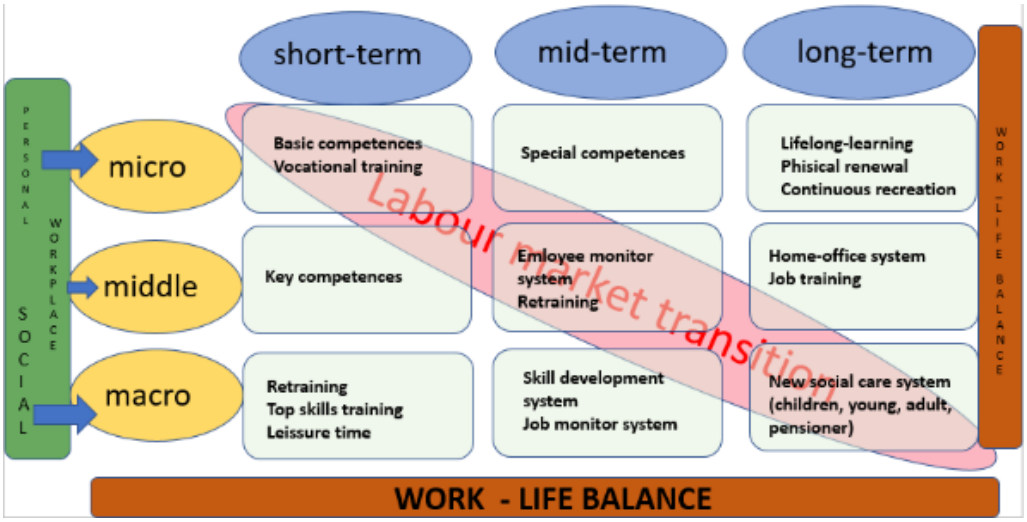

Figure 1: Model of skill system
(Source: own contruction/ author/ own data, own research)

Physical activity and health

More and more researchers observed that "the labour force status of an individual will be affected by his health" (Bowen, Finegan 2015). New research should pay more attention to health differences across the mix of sociodemographic groups in the work force, the future occupational composition of employment, and the role of employer demand in accommodating impaired workers.

Science shows that physical activity can reduce the risk of dying early from the leading causes of death, like heart disease and some cancers. This is remarkable in two ways:

Only a few lifestyle choices have as large an impact on the health as physical activity. People who are physically active for about 7 hours a week have a 40 percent lower risk of dying early than those who are active for less than 30 minutes a week.

It doesn't have to do high amounts of activity or vigorous-intensity activity to reduce your risk of premature death. In this research action, we measured the region human activity to observe the people approach to theire health and physical conditions what influence to status of labour market.

Research methods of physical activities and labor market activities in the South Transdanubian region

- Period: March of 2018
- Item number: 551pers
- Venue: South Transdanubian region (Baranya, Somogy, Tolna County)
- Methods: Validated questionnaire (sport consumption) Correlation, regression, cross table analyzis, T-test (IBMSPSS 22) sig $p<0,05$
- Research crtiteria:
  - Under 18 years excluded
  - 0,1% inhabitants in the region
  - Representative sampling

- variables:
  - GENDER
  - AGE (18-25, 26-35, 36-45, 46-55, 56-65, 66-)
  - BMI (Underweight, Normal, Overweight, Obese Class I (Moderately obese), Obese Class II (Severely obese)
  - EDUCATION (unschooled, elementary, vocational training, graduate, degree)
  - ACTIVITY (student, workers, unemployee, pensioner, inactive)
  - INACTIVITY
  - TRANSPORT (walking, bicycle, public transport, car)
  - WORKHOURS (part-time, full-time, over-time)
  - ACTIVE FREETIME (turism, wellness, walking)
  - INCOMING (0-
  - RECREATION COST
  - SPORTS ACTIVITY

Hypotheses

H_1: Relation between Body Mass Index and sport activity

H_2: Relation between Body Mass Index and recreation

H_3: Relation between labour market activity and sport activity

H_4: Relation between age, education and activity and sports

H_5: The inactives and actives sports activities are different

H_6: Relation between labour market activity and active freetime.

H_7: Relation between incoming and recreation cost

H_8: In the examined population, we will find a class that has a high sport activity and a class with low sport activity.

Results

Relation between Body Mass Index and sport activity

Table 1: Correlation between BMI and sport weekly

		BMI	Sports Weekly
BMI	Pearson Correlation	1	-.067
	Sig. (1-tailed)		.049
	N	551	551
Sports_Weekly	Pearson Correlation	-.067	1
	Sig. (1-tailed)	.049	
	N	551	551

(Source: own contruction/ author/ own data, own research)

Between the body mass index and sport activity there is a medium-strength relationship that results in a significant correlation between the two variables.

Relation between Body Mass Index and recreation

Table 2: Correlation between BMI and activity

		BMI	Activity
BMI	Pearson Correlation	1	.172
	Sig. (1-tailed)		.000
	N	551	551
Activity	Pearson Correlation	.172	1
	Sig. (1-tailed)	.000	
	N	551	551

(Source: own contruction/ author/ own data, own research)

Between BMI and activity, we also could a week relation, but this linkage is significant.

Relation between labour market activity and sport activity

Table 3: Correlations between labour market activity and sport activity

		Activity	Sports Weekly
Activity	Pearson Correlation	1	-.256
	Sig. (1-tailed)		.000
	N	551	551
Sports Weekly	Pearson Correlation	-.256	1
	Sig. (1-tailed)	.000	
	N	551	551

(Source: own contruction/ author/ own data, own research)

The correlation between work activity and regular sports is significant, indicating that the economically active population emphasizes physical activity.

Relation between age, education and activity and sports

Table 4: Cross table analysis

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	737.988	30	.000
Likelihood Ratio	629.519	30	.000
Linear-by-Linear Association	263.077	1	.000
N of Valid Cases	551		
Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	.382	.000
	Cramer's V	.156	.000
N of Valid Cases		551	

(Source: own contruction/ author/ own data, own research)

Based on the cross-table analysis, the Cramer indicator shows a weak relationship between age, qualification, labour market activity and sports activity, but the relationship indicates a significance.

The inactivity and sports activities are different

Table 5: T test for equality of variances

		Leneve's Test for Uquality of Variances		
			95% Confidence Interval of the Difference	
Sports_Weekly	Equal Variances assumed	Sig.	Lower	Upper
		0.33	-.238	.320

(Source: own contruction/ author/ own data, own research)

We tested the inactivity and sports activity with an equal variance T test, where there was a significant difference between the variables.

Relation between labour market activity and active freetime

Table 6: Correlations of labor market activity and active freetime

		Activity	Freetime
Activity	Pearson Correlation	1	,370
	Sig. (1-tailed)		.000
	N	551	551
Freetime	Pearson Correlation	,370	1
	Sig. (1-tailed)	.000	
	N	551	551

(Source: own contruction/ author/ own data, own research)

There is a significant correlation between labour market activity and active leisure spending, which proves that the active population is involved in recreational programs.

Relation between incoming and recreation cost

Table 7: Correlation of incoming and recreation cost

		Incoming	Recreation Cost
Incoming	Pearson Correlation	1	,511
	Sig. (1-tailed)		.000
	N	551	551
Recreation Cost	Pearson Correlation	,511	1
	Sig. (1-tailed)	.000	
	N	551	551

(Source: own contruction/ author/ own data, own research)

There is also a significant correlation between income and recreational costs.

Classess of sports activities

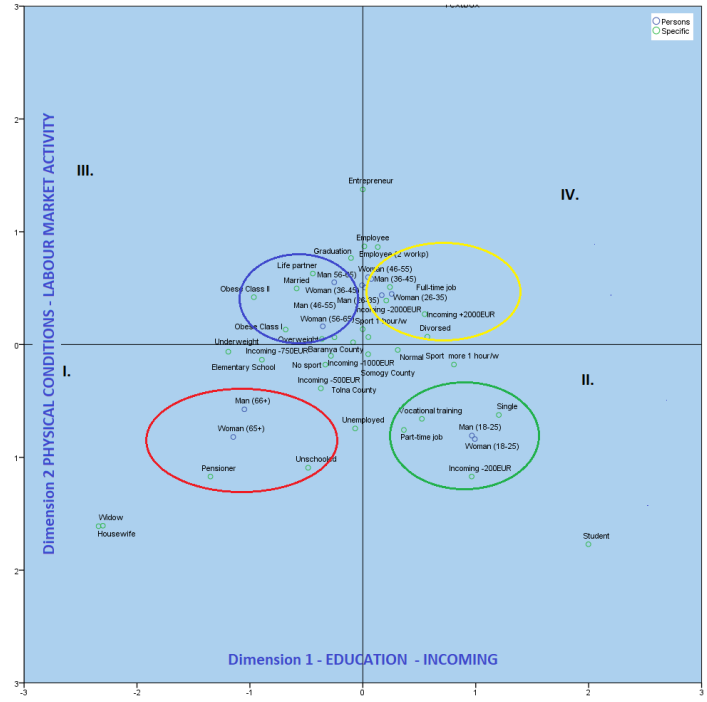

Figure 2: Correspondence analysis (N=551)
(Source: own contruction/ author/ own data, own research)

We found four main groups based on statistics. The first group (I.) is the elderly low-educated people districts. The second group (II.) is the young generations who are part-time workers. The third group (III.) people with poorer physical states. The fourth group (IV.) people with good physical conditions and high level income. The horizontal dimension is determined by education and income. The vertical dimension is determined by the physical state and the labor market position. Based on this classification can be made to suggestions for development.

Conclusion

Man was created for movement. The comfortable achievements of civilization and urbanization, however, exclude physical activity from our everyday life. Physical work is replaced by machines, transport is limited to driving, resting passive hours before TV, we can already make a significant part of the purchase on the Internet.

It is estimated that some years ago, physical inactivity was approx. 600 000 deaths in the European Union, more recent findings in the world say that 5 million people die each year due to the lack of mobility. According to classic epidemiological studies, physical activity is inversely related to general mortality. Physical inactivity is a serious concern in Hungary as well. According to various reports, the population is approx. 20% of them sport regularly, 53% of the population is not at all.

Studies of the past decade have revealed a relationship between physical activity and labour market activity. I based my research on this fact in the South-Transdanubian region. It can be seen that the long-term preservation of workers' health becomes an increasingly important priority. Physically active workers have shown better social and economic indicators than inactive staff. The effect of physical activity also decreases in income levels. Studies confirm the correlation between sporting activity and unemployment.

After the data analysis, it proved to be the human resource effects of athletic participation, recognizing that its effects can be transmitted through related health and social capital effects, signaling greater potential productivity, and perhaps teamwork and networking.

This research action has indicated these are relationship between physical activity and labour market activity in South Transdanubian region. We have examined these relationships from several aspects. We found a significant correlation between the Body Mass Index and sport activity; Body mass index and recreation; labour market activities and sports activities; activity and active leisure; incoming and recreational costs. The age is related to qualification, labour market activity and sports activities. We found a difference between the sports and recreational activities of the inactive.

Our research shows similar results to other research as physical activity influences labour market activity.

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ASSESSMENT THE PHYSICAL ACTIVITY OF HEART FAILURE PATIENTS BY TELEMETRY DATA

SZÍVELÉGTELENSÉGBEN SZENVEDŐ BETEGEK FIZIKAI AKTIVITÁSÁNAK ÉRTÉKELÉSE TELEMETRIÁS ADATOK ALAPJÁN

Abstract

Introduction: In our study we examined the physical activity with Actigraph GT3X+ movement sensor simultaneously with the implanted CRT device to validate the internal sensors, and estimate the result of the physical performance reached in the 6-minute walking test (6MWT) based on the PA%.

Material and methods: Biotronik CRT-P or CRT-D was implanted in all patients included in the study. The 6MWT and the physical activity data from CRT-P or CRT-D and Actigraph were collected for a week. SPSS 23 statistical package and Excel program were used for data processing. We used descriptive statistics, correlation analysis, Bland–Altman test and linear regression to evaluate the findings.

Results: The Bland-Altman plots showed furthermore that there is correlation between the mean and the difference, with higher means resulting in larger (negative) differences (R2=0.109; F=4.665; p=0.037; Beta=-0.362; p=0.037) between the Actigraph GT3X+ and the built-in device activity datas. Compared the physical activity time spent in a day's % from the Actigraph (Acti %) versus the results of 6MWT, where a moderate significant correlation among the variables (r=0.338; 0.031) was found. The analysis of the 6MWT and the PA% data revealed correlation with a linear regression (F= 6.126; p= 0.018).

Conclusion: The CRT activity sensors data showed higher values than the Actigraph did but both sensor data values are moving similarly.

Keywords: heart failure, physical activity, ActiGraph, remote control, resynchronization device

Absztrakt

Bevezetés
Vizsgálatunkban egyidejűleg vizsgáltuk a betegek fizikai aktivitását Actig-

raph GT3X+ mozgásérzékelővel és a beültetett CRT eszközzel annak érdekében, hogy a beültetett eszköz aktivitásmérőjét validáljuk, továbbá megbecsültük a 6 perces séta teszt (6MWT) eredményét a PA% alapján.

Anyag és módszer

A vizsgálatba bevont valamennyi betegbe Biotronik CRT-P vagy a CRT-D eszköz került beültetésre. A 6MWT járástávolságát egy alkalommal, a beültetett eszközök és az Actigraph fizikai aktivitásra vonatkozó adatait egy héten át gyűjtöttük össze. Az adatfeldolgozáshoz SPSS 23 statisztikai csomagot és Excel programot használtunk. Az eredmények értékeléséhez leíró statisztikát, korrelációs elemzést, Bland – Altman tesztet és lineáris regressziót használtunk.

Eredmények

A Bland-Altman plot alapján megállapítottuk (negatív) kapcsolat áll fenn az Actigraph GT3X+ és a beépített eszközadatok között ($R2 = 0,109$; $F = 4,665$; $p = 0,037$; Béta = -0,362; $p = 0,037$). Összehasonlítva a napi fizikai aktivitási időt százalékban megadva az Actigraph és a 6MWT eredményei között közepes kapcsolat szorosságot találtunk ($r = 0,388$; 0,031). A 6MWT és a PA% adatok elemzése lineáris regresszióval korrelációt mutatott ($F = 6,126$; $p = 0,018$).

Következtetések

A statisztikai elemzés alapján negatív korrelációt találtunk Actigraph fizikai aktivitásra vonatkozó adata és a beépített készülék PA% adat közti különbségek között, ami alátámasztja azt a tényt, hogy a fizikai aktivitást kissé túlbecsülte a beépített eszköz szenzora. Ennek alapján további vizsgálatra van szükség a CRT készülék gyorsulásmérőjével és az abból generált PA% kapcsolatban. A PA% adatok a 6MWT járás távolságának becsléséhez alkalmazható.

Kulcsszavak: szívelégtelenség, fizikai aktivitás, ActiGraph, távmonitorozás, reszinkronizáló eszköz

Introduction

In patients suffering from systolic heart failure Cardiac Resynchronization Therapy (CRT) is the most efficient device therapy described by the European Society of Cardiology (ESC) in its recommendation (EHRA/HRS guideline, 2012; Brignole, 2013). Ricci et al. emphasized that CRT devices filter arrhythmia with the efficiency of over 90% but they show relatively low efficiency (58.8%) in forecasting the deterioration of the patients' health status (Ricci, 2013). Several studies have justified the efficacy of Biotronik Home Monitoring (HM) and its role in reducing hospitalization and mortality (Varma, 2010; Hindricks, 2014). In this way, the physician can analyze the values in percentage for daily activity.

The development of miniaturization, electronics, computer technology, and telecommunications has enabled the installation of integrated sensors in implantable electrical devices (CIEDs). These sensors are designed to monitor the operation of implanted devices (pacemaker, defibrillator resynchronization PM, ICD) from shock to shock, ECG variations (ST phase changes), heart rhythm disorders, AF, ventricular and other arrhythmias. A new direction is the use of these sensors to monitor heart failure. In addition, it is possible to measure intraventricular impedance changes through the electrodes using a sensor integrated in a special electrode to monitor the left ventricular function, to measure the pressure conditions in the heart cavities, to control the hemodynamic status (Sorin SonR). It is also possible to continuously monitor chest impedance, and to control frequency response (MV) and to monitor changes in the physical activity of the patients (Ellenbogen, 2011). Data can be transferred from devices to built-in antennas and remotely processed (HM, CareLink, Merlin, Boston) (Slotwiener, 2015). The first fully automatic remote monitoring system was the Biotronik Home Monitoring launched in 2001 (Theuns, 2003). Caló reported on the economic benefits of remote control (Caló, 2013). The clinical benefits of Remote Control (HM) have been reported by Varma (Trust study) and Ricci. Hindricks (IN-TIME study) examined the mortality-reducing effect of HM control (Hindricks, 2014). Sack reported the potential value of the daily screening of cardiac resynchronization therapy defibrillator diagnostics for predicting major cardiovascular events in results of Home-CARE study (Sack, 2011). A number of studies and one meta-analysis have reported on the follow-up of patients' physical activity (Rosman, 2018). According to this latter study, physical activity is a predictive value for long-term heart failure patients. However, it is noted that the accuracy and specificity of physical activity require standardization of accelerometer detection and prospective randomized studies. The reason for the high standard deviation of validation studies is keeping the Actigraph GT3X+ triaxial (3D), as opposed to the one-way motion detection of the built-in accelerometer. The built-in accelerometer 2 forms - piezoelectric and piezoresist accelerometers - senses the body's up-slope / downslope position after the threshold is reached, sensing the longitudinal movement of the body. In the non-frequency response mode, the accelerometer indicates the physical activity of patients in precentages or duration of a given day without a response rate (Ellenbogen, 2011). The beneficial effect of physical activity on health is well-known in the healthy population. According to several types of studies, physical activity is essential for patients with heart disease. A secondary preventive effect of physical activity has been detected in patients with heart disease following sedentary lifestyle (Dua, 2007; Dua, 2010; Evenson, 2014; Flynn, 2009; O'Connor, 2009; Jehn, 2009). We have

little information on the accuracy of PA%, and the change in the condition of heart failure patients with remote control has not been solved so far. The aim of the study was to validate data from the Biotronik Home Monitoring system (patient's daily physical activity - PA%) with an external activity sensor (Actigraph GT3X+). The study was meant to estimate the walking distance of 6MWT by using PA%, and, using this information, to demonstrate the changes in the condition of heart failure patients with remote control.

Material and methods

This study was a longitudinal design. The patients wore the Actigraph for a week, and the Home Monitoring data collection covered a year.

Patient population

A total of 42 CRT patients from the Heart Clinic of the University of Pécs were enrolled. The local Medical Ethics Committees of the University of Pécs approved the study protocol (research ethics approval number: 6142).

The inclusion criteria were:

- Patients who met the criteria recommended by the European Society of Cardiology
  - Systolic heart failure EF< 35 %,
  - Left bundle brach block (LBBB) > 130 ms
  - Clinical stage NYHA II-III
- Implanted Biotronik CRTP or CRTD device with Home Monitoring (HM) system
- Continuous use of the HM system
- Age >18 years, enduring sinus rhythm
- Written informed consent with signature

Exclusion criteria were:

- Clinical stage NYHA IV
- Refusal of the use of Home Monitoring
- Walking disability which excludes the fulfillment of 6MWT
- Patients with long-lasting atrial fibrillation
- Lack of compliance

Study design

All patients underwent history taking and physical examination, medication evaluation, 12-lead electrocardiogram and echocardiogram at baseline. Each patient walked a six-minute-walk test (6MWT) in a sport center.

The patients' activity (PA%) is based on measurements from an accelerometer sensor located in the device and an Actigraph GT3X+ activity sensor worn on their right side waist can.

Mean average data from the three variables (PA%, the 6MWT distance (m) and activity class from Actigraph) were recorded in the devices on a daily basis. Changes were classified as increases or decreases. For a better comparison of the PA% and Actigraph's physical activity category data, we transformed the Actigraph's minute data to percentage (Acti %), counted from light, moderate, vigorous and very vigorous activity category.

Data collection and statistics

Data originated from two sources: from the built-in devices which sent the daily telemetric data to the BIOTRONIK Home Monitoring® service center where all event and trend reports could be accessed and reviewed through a secure website by a physician. These datasets among others included daily Patient Activity (PA%) based on the internal accelerometer. In cases of using the built-in device's accelerometer we used the official setting. The Actigraph® GT3X+ appliance measures movements in 3-axis and fixes their time intervals. The sample rates are in 30-100 Hertz. This device allowed us to assess daily activities precisely and classify them into categories according to the Freedson formula (Freedson 1998), assigned oxygen consumption amounts to beat/minute data. Our subjects permanently wore the sensor except for persistent stay in water (washing and swimming). Analyzing the data of Actigraph GT3X+, we set five epoch time intervals (sampling density in five-second units).

We differentiated the following activity levels on evaluation:

- Sitting (sedentary) accounts for under 0-99 beats/minute
- Light activity accounts for 100-1951 beats/min. ≤ 3 MET
- Moderate activity accounts for 1952-5724 beats/min. ≥ 3 MET and < 6 MET
- Vigorous activity accounts for 5725-9498 beats/min. ≥ 6 and < 9 MET
- Very vigorous activity accounts for > 9498 beats/min. ≥ 9 MET. (Freedson 1998)

Measurements started with a preliminary six-minute-long walking test (6MWT). Before the test, patients were given information on performing the task. They were supposed to walk as quickly as they could, but slow down or stop if it was necessary. The six-minute-long walking test was performed on an open, 20-meter-long field. At each end, chairs were available for the patients to have a rest. A Biotronik device ensured data transfer to a mobile phone by a built-in aerial in each patient.

SPSS ver. 23 statistical package and Microsoft Excel 2013 program were used for data processing. We used descriptive statistics, Spearman's rank correlation analysis, and linear regression in the study. The gender differences was calculated by Mann-Whitney U test. The level of significance was set at 0.05.

Results

Patient demographics

Main baseline characteristics are displayed in Table 1. The vast majority were male patients. The patients represent a typical CRT-D cohort with respect to age, gender, and aetiology.

Table 1: Characteristics of the sample

Male / Female	33 (78.6%) / 9 (21.4%)
Mean age (years)	62.67 ± 11.33
NICM	15 (35.7%)
ICM	17 (40.5%)
Valvular HD	3 (7.1%)
NYHA II.	24 (57.1%)
NYHA III.	18 (42.9%)
HBP	21 (50%)
Diabetes	11 (26.2%)
Infarct	10 (23.8%)
Heart valve replacement	2 (4.8%)
VT/VF	14 (33.3%)
AF	2 (4.8%)
Asthma	2 (4.8%)
ACBG	8 (19%)
PTCA	6 (14.1%)
COPD	2 (4.8%)
Abbreviations NICM: NonIschemic Cardio Myopathy; ICM: Ischemic Cardio Myopathy; Valvular HD: Heart valve disease; VT/VF: Ventricular Tachycardia/ Ventricular Fibrillation; AF: Atrial Fibrillation; ACBG: Aorto-Coronary Bypass Graft; PTCA: Percutaneous Transluminal Coronary Angioplasty; COPD: Chronic Obstructive Pulmonary Disease	

(Source: own contruction/ author/ own data, own research)

As it can be seen in Table 2. participants in the sample typicaly led a sedentary way of life with low physical activity. The average BMI for all participants was 30.57± 5.05 kg/m2 with no significant difference between the gender groups (p=0.970). The two sample t-test based on gender has shown differences between males' and females' activity. Females' sedentary period was significantly lower than males' (p=0.028).

Table 2: The data of physical activity of the sample

	Gender											
	Male				Female				Total			
	Mean	Total N	Std. Deviation	Median	Mean	Total N	Std. Deviation	Median	Mean	Total N	Std. Deviation	Median
METs	1,09	33	0,06	1,08	1,09	9	0,04	1,10	1,09	42	0,05	1,08
Sedentary	9547,40	33	486,89	9618,33	9122,46	9	530,98	9235,83	9456,34	42	520,75	9509,08
Light	1045,64	33	344,15	1006,17	1293,89	9	273,82	1295,67	1098,84	42	343,08	1126,92
Moderate	180,68	33	131,97	146,67	204,73	9	120,30	225,00	185,83	42	128,51	154,00
Vigorous	3,19	33	5,43	1,67	3,64	9	5,03	1,33	3,29	42	5,29	1,67
Very Vigorous	0,12	33	0,26	0,00	0,11	9	0,16	0,00	0,12	42	0,24	0,00
Total MVPA	189,11	32	134,26	158,21	223,50	9	120,77	245,33	195,99	42	130,92	171,29
6MWT/m	374,18	33	73,19	374,00	341,22	9	73,16	360,00	367,12	42	73,57	373,50
PA%	14,53	32	4,76	13,94	14,28	9	4,83	12,88	14,47	42	4,72	13,75
Acti%	10,67	33	3,82	10,37	12,35	8	2,31	12,64	11,00	42	3,62	11,27
BMI	30,55	33	5,32	30,93	30,63	9	4,16	31,01	30,57	42	5,05	30,97

(Source: own contruction/ author/ own data, own research)

To reach one of our aims we used a correlation to compare PA% and Acti %. Figure 1 shows the comparison of the PA% from the built-in devices and the Acti % from Actigraph. As it can be seen, the two series of data scattered similarly. The comparison has shown moderate relationship (r=0.562; p=0.000) between the variables.

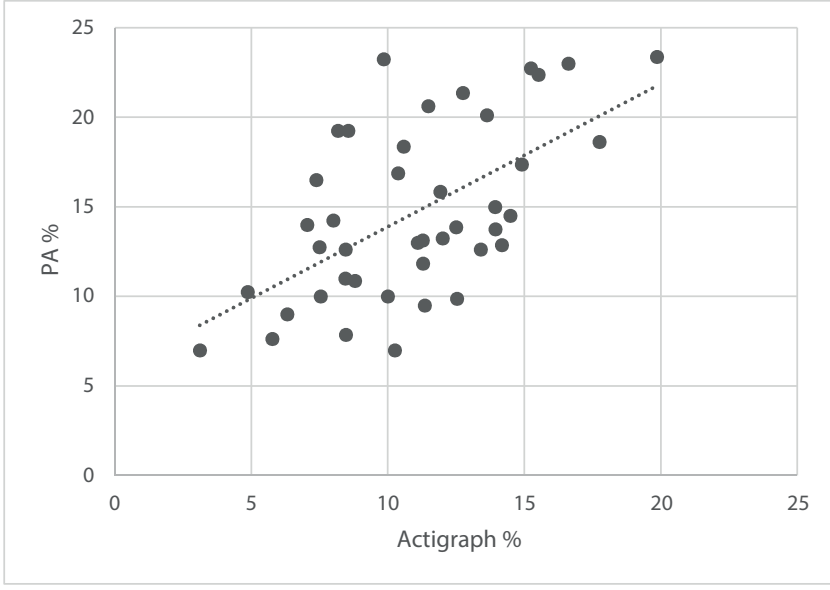

Figure 1: PA% and Actigraph PA% comparison
(Source: own contruction/ author/ own data, own research)

Then we continued the statistical analysis to compare the Actigraph (Acti %) and built-in device's PA% data with Bland-Altman plot. The Bland–Altman plots for the agreement of data assessed with Actigraph GT3X+ and with the PA% from the built-in device. We found negative differences between the Actigraph (Acti %) and built-in device's PA%. The plots showed furthermore that there is an association between the mean and the difference, with higher means resulting in larger (negative) differences (R2=0.109; F=4.665; p=0.037; Beta=-0.362; p=0.037) (Figure 2). Figure 2 illustrates the agreement in the values of Acti% per day and PA% (Mean difference = - 3.73 min/week, 95% limit of agreement= - 4.13 – (- 11.58).

On further statistical analysis we compared PA% (from built-in device) versus results of 6MWT where the relationship was moderate tightness between the variables (r=0.368; p=0.018). We compared the physical activity time that was spent in a day's % the Actigraph (Acti %) versus the results of 6MWT, where also a moderate significant correlation among the variables (r=0.338; 0.031) was found.
The analysis of the 6MWT and the PA% data revealed correlation with a linear regression (F= 6.126; p= 0.018), shown at Figure 3. With this regression equation the assessing distance of the 6MWT can be estimated. The equation: 6MWT/m= 285.029 + 5.370 * PA%.

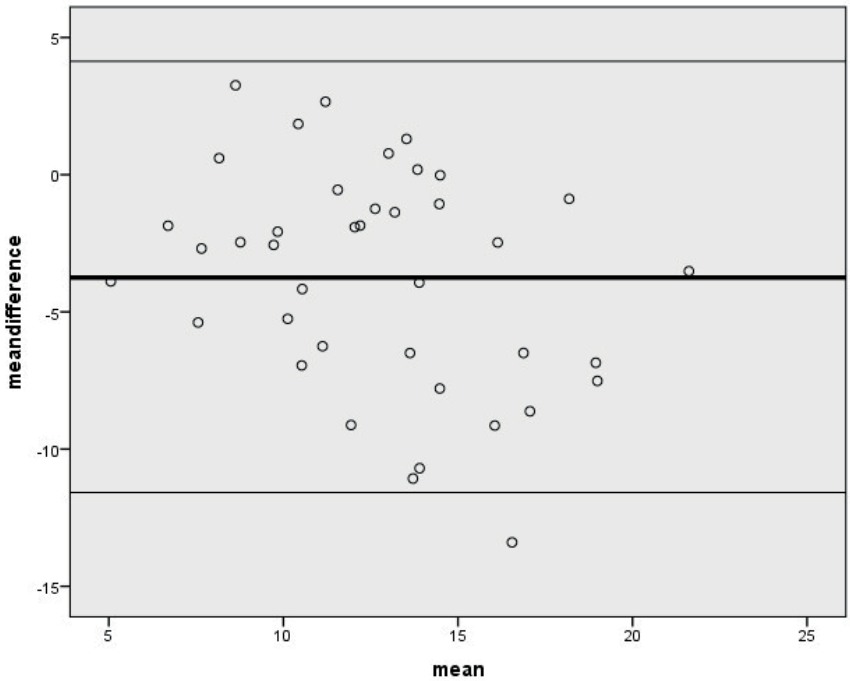

Figure 2: Bland-Altman plot
(Source: own contruction/ author/ own data, own research)

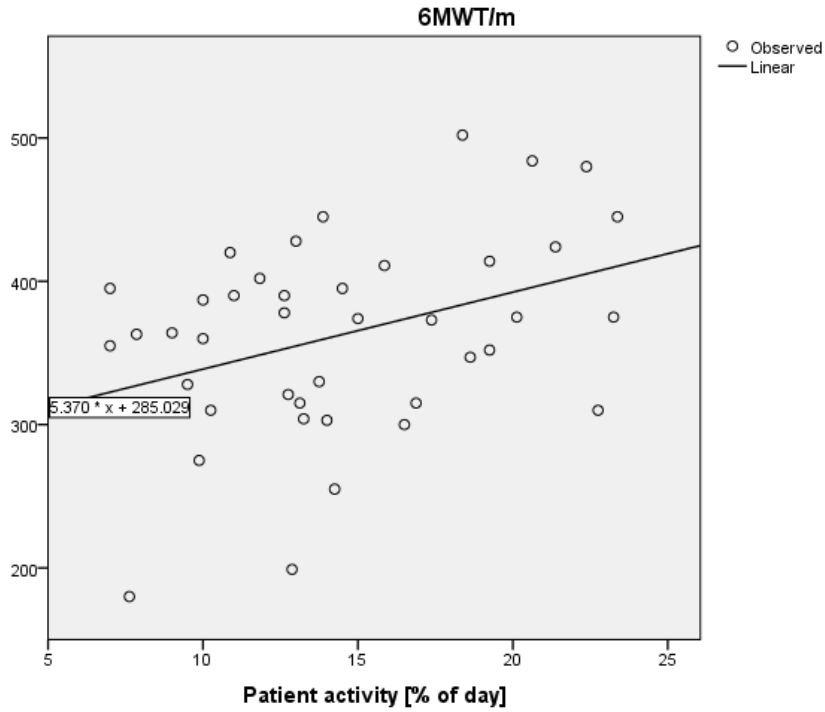

Figure 3: Linear regression of the 6MWT and PA%
(Source: own contruction/ author/ own data, own research)

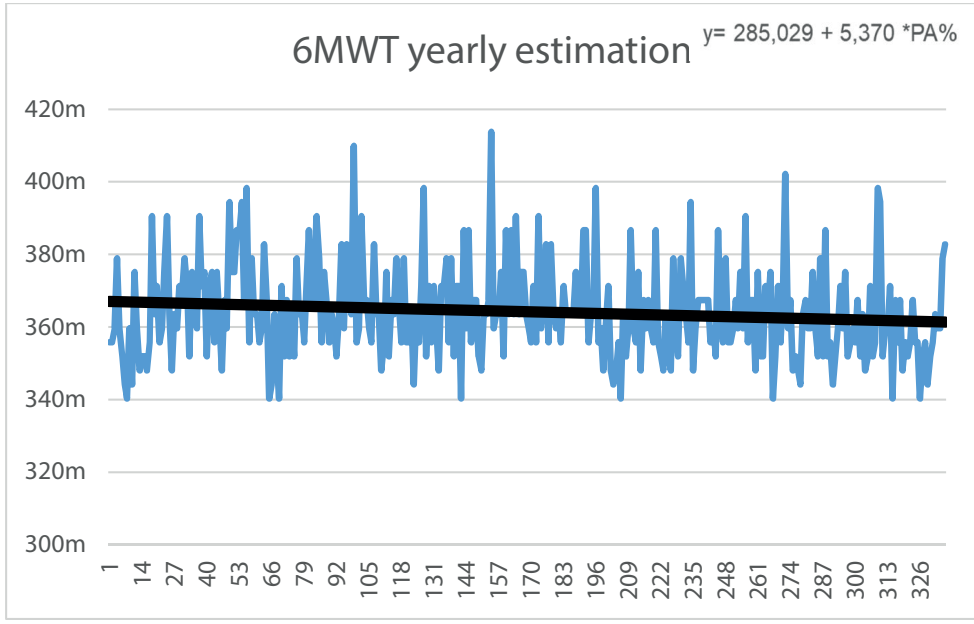

Figure 4: A patient's yearly trend based on the estimated 6MWT distance
(Source: own contruction/ author/ own data, own research)

Using the equation mentioned above we can estimate the 6MWT walking distance based on the PA% (Figure 4.).

Discussion

Several studies have demonstrated that heart disease can account for 0.4 to 2 % of morbidity in developed countries. This value is about 1% at the age of 40; then it increases up to 10% above the age of 75 years (Dickstein, 2008). Its incidence is 2-4/1000 persons, while its four-year-mortality is 50% following the diagnosis (Roger, 2010). Based on the research conducted by Tomcsányi in 2012, the prevalence of the disease in Hungary is 1.6% accounting for 160.000 patients. Its incidence varies with 30.000-40.000 patients yearly (Tomcsányi, 2012). The individuals affected belong to the age category between 60 and 80 years. In the EuroHeart Failure survey, 36% of those who had LV function assessed had an LVEF ≤ 35% and, of these, 41% had a QRS duration ≥120 ms; 7% had RBBB, 34% had LBBB or other intraventricular conduction delay (IVCD) and 17% had QRS ≥150 m (Rao, 2007). Sub-analyses from randomized clinical trials suggest that the beneficial effects of CRT on morbidity and mortality and LV function may be greater in females (Baker, 2002). Class I indication for CRT implantation is LBBB QRS> 150 ms, EF: <- 35%, NYHA II-III, with adequate medication. Our patients were from this group. Successful surgery was performed with ECG12 and echocardiography (6 months). The goal was to achieve almost 100% BiV stimulation according to the ESC recommendation. In our patients this value was checked during remote monitoring. ESC's 2013 guidelines recommend the possibility of remote control with indication IIa class and evidence of A level. The clinical evidence, collected over the last 15 years, establishes CRT as an important heart failure therapy in a broad range of patients with systolic heart failure, reduced LV function, and QRS delay (Daubert, 2012).

The present study was conducted to investigate and validate the CRT device's accelerometry data (PA%) with an external activity monitor (Actigraph GT3X+). We were also curious as to whether the result of the 6MWT test could be estimated using PA% from Home Monitoring. Moreover, we wished to clarify the possibility of using this information for sensing the changes in the condition of heart failure patients with remote control.

Today's technological platform for automatic daily remote screening of device diagnostic data provides an exciting opportunity to design and constantly optimize increasingly sophisticated multiparameter predictive algorithms, and to prospectively evaluate their impact on patient outcomes, clinical burden, and health economic burden. The subjects of the sample live a sedentary way of life which had already been reported in several articles, but females' activity in this sample was higher than males'. They spent more time on light, moderate and also vigorous activities but that did not

show significant differences between the genders. In the period monitored, the members of the sample had spent on average 9456.34 ± 520.75 minutes on the sedentary category. Females spent significantly less time on the sedentary category than males (p=0.028). It seems that physical activity was less than would be necessary to maintain their quality of life. These results suggest that women's health-consciousness is stronger than men's. Moreover, men should do regular conducted physiotherapy to maintain their health status.

Previous studies provide relatively few technical details about how specific CIED accelerometers detect, analyze, and interpret activity data, and the information available suggests that activity sensor thresholds and signal processing algorithms differ considerably among manufacturers. Addressing these issues is critical for strengthening the evidence base for device-measured physical activity (D-PA) and supporting future clinical applications of this technology (Rosman, 2018). The following facts were found on examining the results of the CIED accelerometer's data: The PA % has shown higher values than the Acti%. The comparison of the PA% and the Acti % has shown moderate relationship (r=0.562; p=0.000) between the variables. The following analyses of these two data sets was done with Bland–Altman plots, where negative differences between the Actigraph (Acti %) and built-in device's PA% were found. This fact supported that the physical activity were slightly overestimated by the built-in device.

Remote monitoring of cardiac implantable electronic devices (CIEDs) has been suggested as a new standard for patient follow-up and it has been accepted as an alternative to the majority of scheduled follow-up visits in the international guidelines. The HomeGuide Registry is an Italian multicentre study, designed to provide an organizational model for implementing remote monitoring of CIEDs in daily clinical practice. HM allowed early reaction mainly to asymptomatic events which could have led to serious adverse events if missed or detected late. Ricci et al. emphasized that CRT devices filter arrhythmia with the efficiency of over 90% but show relatively low efficiency (58.8%) in forecasting the deterioration of patients' health status (Ricci, 2013). On further correlation analysis we compared PA% with the results of 6MWT/m where the relationship was of moderate tightness between the variables (r=0368; p=0,018). This fact confirmed our hipothesys that based on the PA % the walking distance of the 6MWT can be estimated. For the count we set up a linear regression model (F= 6.126; p= 0.018) and an equatation was given: 6MWT/m= 285.029 + 5.370 * PA%. By this equation the walking distance of the 6MWT can be calculated, which helps the physician with remote monitoring the patient's health status/ physical activity, and it could be a predictor of the worsening health status.

Conclusion

In this study physical activity of patients suffering from heart failure and living with Biotronik CRT-P or CRT-D devices was examined. We downloaded the Patient Activity % (PA%) from the Home Monitoring and compared it with validated physical activity data from Actigraph GT3X+ activity monitor. Based on the statistical analisys we found negative correlation in mean differences between the accelerometer PA% and built-in device's PA%, which supports the fact that the physical activity was slightly overestimated by the built-in PA%. Based on this fact, further investigation is required about the CRT device's accelerometer and that of the PA%. The PA% result is applicable in estimating the walking distance of 6MWT. We suggest using this equation to estimate patients' health status/ physical activity monitoring, as it could be a predictor of the worsening health status.

Future direction

Further studies in this field need to be conducted on larger and more diverse patient samples and they should focus on examining a wide range of patient activities, using devices from multiple manufacturers.

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Ethics approval and consent to participate

The local Medical Ethics Committees of the University of Pécs approved the study protocol (research ethics approval number: 6142), and all study participants gave written informed consent.

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EVALUATION AND DEVELOPMENT OF KNOWLEDGE OF SPINAL FUNCTION AND POSTURE WITH BACK SCHOOL PROGRAM AMONG PRIMARY SCHOOL CHILDREN

ÁLTALÁNOS ISKOLÁS GYERMEKEK GERINCHASZNÁLATTAL KAPCSOLATOS TUDÁSÁNAK ÉS TESTTARTÁSÁNAK VIZGSÁLATA ÉS FEJLESZTÉSE GERINCISKOLA PROGRAMMAL

Abstract

Introduction: To assess the knowledge of spinal function and posture of primary school-aged children. To develop and apply an educational curriculum, exercise program and workbook for children, who can not read or write yet. To examine the efficiency of the 10-week child back school program.

Material and methods: 48 primary school first-grader children (23 boys, 25 girls) were chosen for our prospective research. Knowledge of spinal function was examined by self-designed questionnaire, habitual posture and posture deemed correct by photogrammetry test. The statistical analysis was performed with SPSS software version 22.0. The results were considered significant, at $p<0.05$ level.

Results: The complete knowledge of spinal function ($p<0.001$), habitual posture ($p<0.001$) and posture deemed correct ($p<0.001$) significantly improved after the implementation of the back school program.

Conclusions: The child back school program improves the preventative awareness of spinal conditions and the posture among school-aged children. Primary school first-grader children without writing and reading skills need a specifically developed theoretical educational curriculum, exercise program and workbook. The back school program should also be further tested in kindergarten.

Keywords: primary school children, spine- back school, knowledge of spinal function, posture

Absztrakt

Célkitűzés: Felmérni az általános iskoláskorú gyermekek gerinchasználattal kapcsolatos tudását és testtartását. Kialakítani és alkalmazni egy oktatási tananyagot, egy mozgásanyagot és egy munkafüzetet még írni, olvasni nem tudó gyermekek számára. Vizsgálni a 10 hetes gyermek gerinciskola program hatásosságát.

Anyag és módszerek: 48 általános iskolás, első osztályos gyermek (23 fiú, 25 lány) került a prospektív kutatásba. A gerinchasználattal kapcsolatos tudást saját szerkesztésű kérdőívvel, a habituális és helyesnek vélt testtartást fotogrammetriás teszttel vizsgáltuk. A statisztikai számításokat SPSS szoftver 22.0-es verziójával végeztük. Az eredményeket akkor tekintettük szignifikánsnak, ha $p<0,05$.

Eredmények: A gerinchasználattal kapcsolatos tudás összpontszáma ($p<0,001$), a habituális ($p<0,001$) és helyesnek vélt testtartás ($p<0,001$) szignifikánsan javult a programot követően.

Következtetések: A gyermek gerinciskola program javítja az általános iskolás gyermekek preventív, gerinchasználattal kapcsolatos tudását és testtartását. Az első osztályos még írni-olvasni nem tudó gyermekek számára kidolgozott elméleti oktatási tananyag, mozgásanyag és munkafüzet szükséges. A kidolgozott program óvodában is használhatóvá válhat.

Kulcsszavak: általános iskoláskorú gyermekek, gerinciskola, gerinchasználattal kapcsolatos tudás, testtartás

Introduction

Children around the world have been developing postural deformities due to lack of physical activity for decades. However little is known about the interventions that promote both proper posture and develop knowledge in school age children who are not able to read or write yet. An early report of postural deformities in Hungary by Peller appeared in 1977, putting the prevalence of posture deformities to 62% in preschool age children, which has not decreased much in later decades either (Peller, 1977). In the same year, Seyffarth also made a holistic musculoskeletal examination among primary school children (1-7. classes), he found posture problems at 80% of the children (Seyffarth, 1977). Based on a report by Fejérdy in 1999, 88% of primary school age children have suffered from postural deformities and other orthopedic abnormalities (Fejérdy, 2001). In recent reports by Somhegyi et al. (2014) in 2009-2010 among 530 children (aged: 7-12 years), posture problems occured in 64,5% of the examined children. Internationally the situation is not better either, in 2004 Weiss found in 60% of German preschool children musculoskeletal weakness (Weiss et al., 2004). Recent research around the world in 2015 and 2016 showed similar results. In primary school age children, the prevalence

of of spinal problems and posture deformities continues at a high rate, 50-65% (Yamaguchi et al., 2016; Motylewski et al., 2015; Selma et al., 2016). The back school program for children is a primary prevention program developed as an educational intervention, with a goal of developing a lifestyle favorable to spine protection, promotion of the correct posture (Tóthné et al., 2015). Back school programs mostly consist of either theoretical knowledge related to the function of the spine or exercise, but rarely both. The theoretical part contains anatomy, ergonomics and biomechanics, which are presented to the children in playful form. The exercise includes primarily muscle strengthening and muscle stretching exercises as well as posture improvement exercises (Leszek et al., 2004; Tóth et al., 2007). According to Hungarian and international researches, in order to prevent spine deformities and damage at a later age, we need to raise awareness of correct spine use at a younger age, in which the back school programs can have a prominent role (Günter, 1998; Somhegyi et al., 2003; Tóth et al., 1998).

The primary prevention program of the Hungarian Spine Society, contains special exercises and tests for controling and developing muscle strength and flexibility of the muscles responsible for biomechanically correct posture (Somhegyi et al., 2003). Porci Berci is Searching for Friends is a health preservation program aimed at schoolchildren, which contains six parts of theoretical knowledge and exercises, providing guidance to schoolchildren for the correct use of the spine (Tóth et al., 2000). The back school program named Conscious Seating for Primary Schoolchildren, is an another complementary back school program by the Hungarian Spine Society. The program provides instructions to primary school teachers on how to integrate proper seating techniques into the physical education curriculums. Tóthné et al. (2015)**,** Günter (1998) and Sabine (2001) authors of German child back school books have included theoretical knowledge, a practical exercise part and tests for muscle strength and flexibitlity responsible mainly for the muscles responsible for the posture (Tóthné et al., 2015; Günter, 1998; Sabine, 2001).

Several international researches have examined the efficacy of child back school programs provided for different time intervals. One such intervention was done by Elisabeth et al. examining the effect of a back education program at 2-year follow-up, among 94 youngsters aged 13–14 years, on back posture knowledge, fear-avoidance beliefs and self-reported pain. An other purpose of the study was to evaluate which aspects of postural behavior were integrated in youngsters' lifestyles (Elisabeth et al., 2007).

Although the research has addressed interventions aimed at spinal deformities in school age children, little was known about school age children who are not able to read and write yet and follow workbook instructions from the book.

Purpose

The purposes of the study was to measure the knowledge of spinal function, the habitual posture and posture deemed correct among primary school children ages 6-7 years. An addition the aim was to develop and test a back school program intervention, that consits of an educational curriculum, exercise program and workbook for children, who cannot read or write yet. Finally we wanted to assess the efficiency of the 10- week back school program on the development of posture and knowledge of spinal function.

Material and methods

Setting and subjects

The study was conducted in Pécs, Hungary at Apáczai Csere János Primary School No.1, at University of Pécs, Primary Elementary School, High School and Secondary Technical School- High School and Primary School of Deák Ferenc and was approved by IRB of the Regional Research Committee of the Clinical Center, Pécs, Hungary (No.: 6125). The director of the schools provided a Declaration of Support. All the parents received information about the purpose and advantages of the back school program and have provided a written consent permitting the children to participate in the study (special consents to examination, photography and videography were also obtained). The parents were assumed of the anonymity and confidentiality based on the Data Protection Act of Hungary. The back school program was completed between September of 2016-November of 2016.

Inclusion and exclusion criteria

Inclusion criteria: 6-7 years old primary school children.

Exclusion criteria: Congenital or acquired spinal cord disease, severe locomotor, internal or neurological illness, and non- mature child for school, certified athletes, sports club members, or non-Hungarian native speakers (Günter, 1998; Sabine et al., 2001).

Participants

We conducted a prospective, quantitative, longitudinal study. Schools and classes were randomly chosen, and classes were randomly divided to intervention and control groups. Data was collected at week 0 and 10 of the intervention. Fourty eight children (23 boys, 25 girls) participated in the research. There were 26 children (11 boys, 15 girls) in the intervention group, mean 6,8 (6,4-7,0) years. 22 children (12 boys, 10 girls) in the control group, mean age 6,7 (6,2-7,0) years.

Data collection

Questionnaire about knowledge of spinal function

The questionnaire was filled out by the children before the start of the intervention and after the completion of the back school program. We used a self-developed questionnaire. The questions were based on Hungarian and international questionnaires of spine use habit found in the literature

and adopted for school age children who are unable to read. Five questions addressed the anatomical and biomechanical properties of the spine, three questions were about spine utilization and ergonomics. In Hungary, primary school starts at the age of 6-7 years, when children begin to learn reading and writing. As the questionnaire was used for 6-7 years old children who couldn't read, the questions were illustrated by drawings, pictures and figures. For anatomical, biomechanical questions, we asked where the spine was, how long it was, it consisted of what, what kind of properties vertebra and disc had, and finally what was holding and moving the spine. For assessing knowledge of spine use and ergonomic issues, children had to find the right pictures, that represented the correct posture during watching TV and playing, as well as they had to recognize a correct lifting technique.

Scoring:

1. question: Children had to draw in the spine on five different pictures. A maximum 8 points could be scored in case of the spine was fully drawn from head to pelvis.
2. question: Children had to color 3 vertebrae blue, 2 discs red. A total of 5 points could be scored.
3. question: Children had to circle the correct body positions for TV watching. Two pictures were correct from five, so they could score a maximum of 2 points.
4. question: Children had to choose correct positions during playing. Four correct playing positions were hidden between seven pictures, so 4 points could be scored.
5. question: Children had to link vertebrae and discs with a toy, that has similar hardness properties. According to the task, three vertebrae needed to be linked with lego and 2 discs with ball, for a maximum of 5 points.
6. question: Children had to circle the picture, where the disc had enough place between the vertebrae, where the boy was demonstrating the correct movement, and where he performed lifting with straight back. One answer was right, so they could score a maximum 1 point.
7. question: We asked children to circle the drawing, showing what was holding and moving the spinal column. The correct answer was the muscle, thus 1 point could be scored.

The total possible score was 26 points, for anatomical and biomechanical questions (1,2,5,7) 19 points, for spine use and ergonomical questions (3,4,6) 7 points could be awarded (Tóth et al., 2000; Sabine et al., 2001; M Jordá et al., 2014; Elisabeth et al., 2007; Matias et al., 2017).

Examination of habitual posture and posture deemed correct

We made photos of children before and after the 10 week program. Three photos were taken, one from the front view and two from the side views. During the photo shooting, the subjects had to be barefoot, in close- fitting dress or tops and long hair should be tied off to avoid the cover of the neck and shoulders. The photos were taken in front of a symmetry grid, at a distance of 2 me-

ters, with NIKON D3400 digital camera. The height of the symmetry grid was 2 meters, width was 1 meter and each grid size was 6.5x6.5 centimeters. For showing habitual posture, we asked the subjects to stand in front of the symmetry grid, to show how they usually stand in everyday life.
For posture deemed correct, we asked the subjects to stand in front of the symmetry grid as they think it was correct (Kovácsné B. V. et al., 2016; Ormos et al., 2010; Penha et al., 2009; Babócsay et al., 2014).

Scoring:
For habitual posture and posture deemed correct, the same characteristics, curvatures and symmetries were examined, scored and accordingly evaluated. In the frontal plane, we cheked if the line of gravity crossed the nose, the navel and touched the ground in the center between the two feet, as well we examined the symmetry of the shoulders and the pelvis. In the sagittal plane we cheked if the line of gravity crossed the ear, the first and fifth lumbar vertebra and reached the lateral ankle and also checked the curvature of the cervical-thoracic-lumbar spine. 1 point was given for a parameter to be correct-good-physiologic, 2 points if it was not correct-not good-not physiologic and 3 points if it was extremely not correct-not good- not physicologic (before program) or it worsened (after program). If all values were physiologic, a total of 7 points were given (Kovácsné B. V. et al., 2016; Ormos et al., 2010; Penha et al., 2009; Babócsay et al., 2014).

Adapted back school program
Theoretical, educational curriculum
Children were provided with 15 minutes of theoretical curriculum each week, totalling, 150 minutes of theory during the 10 weeks. We started the lessons with easy introductory games, followed by theoretical knowledge, with the aid of devices designed for demonstration of spine functions. Children had to show the bony markers on themselves and each others through play. During the theoretical course we taught anatomical, biomechanical, ergonomical and spine-related knowledge to the children (Günter, 1998; Tóth et al., 1998; Greet et al., 2007; Anna et al., 2016).

Exercise program
The exercise sessions lasted 30 minutes each week, under the leadership of two physiotherapists. Additionally, children spent four times a week, 10 minutes with exercises connected to the back school program in physical education classes, under the leadership of the teacher. These exercises were designed by the physical therapists. Finally, seven times a week, we asked them to spend 10 minutes of exercisesing based on instructions included in the workbook (Günter, 1998; Tóth et al., 1998; Greet et al., 2007; Julia et al., 2015; Hock, 2015).

Home workbook
The home workbook included review questions from the theoretical curricu-

lum learned on the previous lesson, as well as the exercise material of games played during lessons. In the workbook, children had to indicate how many times a week, with how many repetitions and how many minutes they did each exercises. The wokbooks were checked by the physiotherapists.
The control group did not take part of the back school program, only the regular physical education classes.

Statistical analysis
SPSS software version 22 was used for statistical analyses. Based on to the results of the normalcy tests (the distribution of the variables could not be considered normal) nonparametric tests were used. Wilcoxon test to compare the values before and after the program and Mann Whitney U test to compare the intervention and control group. The results were considered significant at $p<0.05$ level.

Results
Results of knowledge of spinal function (Table 1).

Table 1: The results of knowledge of spinal function in the intervention and control groups

Median (point) (IQR)		Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
		p-value	Median (point) (IQR)	p-value	p-value	
Total score	week 0	1.500 (1.000-3.250)	<0.001	2.000 (1.750-2.250)	0.579	0.551
	week 10	22.000 (20.750-23.000)		1.000 (1.000-4.000)		<0.001
Anatomical, biomehanical	week 0	0.000 (0.000-1.250)	<0.001	1.000 (0.000-1.250)	0.832	0.172
	week 10	16.000 (14.750-17.250)		0.000 (0.000-2.000)		<0.001
Spine utilization, ergonomics	week 0	1.000 (1.000-2.000)	<0.001	1.000 (1.000-2.000)	0.896	0.757
	week 10	6.500 (5.000-7.000)		1.000 (1.000-2.000)		<0.001
1. question	week 0	0.000 (0.000-0.000)	<0.001	0.000 (0.000-1.000)	0.066	0.015
	week 10	5.500 (4.000-6.250)		0.000 (0.000-2.000)		<0.001

Median (point) (IQR)		Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
		p-value	Median (point) (IQR)	p-value	p-value	
2. question	week 0	0.000 (0.000-0.000)	<0.001	0.000 (0.000-0.000)	0.854	0.853
	week 10	5.000 (5.000-5.000)		0.000 (0.000-0.000)		<0.001
3. question	week 0	0.000 (0.000-0.000)	<0.001	0.000 (0.000-0.000)	0.564	0.798
	week 10	2.000 (1.000-2.000)		0.000 (0.000-0.000)		<0.001
4. question	week 0	0.000 (0.000-1.000)	<0.001	0.000 (0.000-1.000)	0.782	0.798
	week 10	4.000 (2.750-4.000)		0.000 (0.000-1.000)		<0.001
5. question	week 0	0.000 (0.000-0.500)	<0.001	0.000 (0.000-0.000)	0.655	0.273
	week 10	5.000 (4.750-5.000)		0.000 (0.000-0.000)		<0.001
6. question	week 0	1.000 (0.750-1.000)	<0.001	1.000 (0.000-1.000)	0.655	0.318
	week 10	1.000 (1.000-1.000)		1.000 (0.000-1.000)		0.025
7. question	week 0	0.000 (0.000-0.000)	<0.001	0.000 (0.000-0.000)	0.998	0.358
	week 10	1.000 (1.000-1.000)		0.000 (0.000-0.000)		<0.001

IQR: interquartile range

(Source: own contruction/ author/ own data, own research)

Results of posture measurements

After the competion of the program, the total score of posture deemed correct showed greater improvement than the habitual posture, which means, when we asked the children to stand as they think it was correct, more were able to do so, likely as a result of the posture improvement exercises (Table 2).

Table 2: The results of total score of habitual posture and posture deemed correct in the intervention and control groups

Median (point) (IQR)		Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
		p-value	Median (point) (IQR)	p-value	p-value	
Total score of habitual posture	week 0	14.000 (13.750-15.000)	0.001	14.000 (13.000-14.000)	0.028	0.013
	week 10	10.500 (7.000-11.000)		13.000 (12.000-14.000)		<0.001
Total score of posture deemed correct	week 0	16.500 (13.750-18.000)	<0.001	17.000 (15.500-18.000)	0.009	0.572
	week 10	8.000 (7.000-9.000)		13.500 (11.750-17.250)		<0.001

IQR: interquartile range

(Source: own contruction/author/ own data, own research)

Table 3 shows the mean percentages of normal parameters of posture in the intervention and control goups (Table 3).

Table 3: The mean percentage of normal parameters of habitual posture and posture deemed correct in the intervention and control groups

Frequency (%) (CI lower-upper) p-value			Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
			Frequency (%) (CI lower-upper)	p-value	p-value		
Habitual posture	Front view line of gravity	week 0	3.846 (1.070-6.622)	0.001	4.545 (1.539-7.552)	0.011	0.904
		week 10	53.846 (46.651-61.042)		40.909 (33.813-48.006)		0.371

Frequency (%) (CI lower-upper) p-value			Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
			Frequency (%) (CI lower-upper)	p-value	p-value		
Habitual posture	Front view shoulder symmetry	week 0	3.846 (1.070-6.622)	0.007	0.000 (0.000-0.000)	1.000	0.353
		week 10	61.538 (54.516-68.561)		0.000 (0.000-0.000)		<0.001
	Front view pelvis symmetry	week 0	3.846 (1.070-6.622)	<0.001	4.545 (1.539-7.552)	0.317	0.904
		week 10	61.538 (54.516-68.561)		13.636 (8.683-18.590)		0.001
	Side view line of gravity	week 0	11.538 (6.927-16.150)	<0.001	18.182 (12.615-23.749)	0.655	0.230
		week 10	73.077 (66.675-79.479)		13.636 (8.683-18.590)		<0.001
	Side view cervical part	week 0	23.077 (17.000-29.158)	0.197	9.091 (4.941-13.240)	0.198	0.195
		week 10	61.538 (54.516-68.561)		22.727 (16.679-28.776)		<0.001
	Side view thoracal part	week 0	0.000 (0.000-0.000)	<0.001	0.000 (0.000-0.000)	0.157	-
		week 10	61.538 (54.516-68.561)		9.091 (4.941-13.240)		<0.001
	Side view lumbar part	week 0	7.692 (3.846-11.538)	<0.001	4.545 (1.539-7.552)	0.317	0.654
		week 10	61.538 (54.516-68.561)		0.000 (0.000-0.000)		<0.001
Posture deemed correct	Front view line of gravity	week 0	42.308 (35.177-49.439)	0.002	36.364 (29.420-43.307)	0.808	0.790
		week 10	88.462 (83.850-93.073)		18.182 (12.615-23.749)		<0.001
	Front view shoulder symmetry	week 0	42.308 (35.177-49.439)	<0.001	31.818 (25.095-38.541)	0.101	0.536
		week 10	96.154 (93.378-98.930)		36.364 (29.420-43.307)		<0.001
	Front view pelvis symmetry	week 0	7.692 (3.846-11.538)	<0.001	4.545 (1.539-7.552)	0.013	0.901
		week 10	96.154 (93.378-98.930)		18.182 (12.615-23.749)		<0.001

Frequency (%) (CI lower-upper) p-value			Intervention group (n=26)		Control group (n=22)		Differences between the intervention and control groups
			Frequency (%) (CI lower-upper)	p-value	p-value		
Posture deemed correct	Side view line of gravity	week 0	15.385 (10.177-20.592)	<0.001	13.636 (8.683-18.590)	0.012	0.967
		week 10	73.077 (66.675-79.480)		18.182 (12.615-23.749)		<0.001
	Side view cervical part	week 0	30.769 (24.108-37.431)	<0.001	27.273 (20.844-33.701)	0.085	0.957
		week 10	88.462 (83.850-93.073)		36.364 (29.420-43.307)		0.001
	Side view thoracal part	week 0	23.077 (17.000-29.158)	<0.001	13.636 (8.683-18.590)	0.012	0.691
		week 10	76.923 (70.842-83.004)		18.182 (12.615-23.749)		<0.001
	Side view lumbar part	week 0	7.692 (3.846-11.538)	<0.001	18.182 (12.615-23.748)	0.015	0.253
		week 10	61.538 (54.516-68.561)		13.636 (8.683-18.590)		<0.001

CI: confidence interval

(Source: own contruction/ author/ own data, own research)

Discussion

A 10 week back shool program for children was conducted among 6-7 years old children. The efficacy of the back school program was measured by a questionnaire of knowledge of spinal function and by photogrammetric analysis of posture. Our results showed similar results to the improvements of the Hungarian and international back school programs.

Knowledge of spinal function

Tóthné and Tóth measured the knowledge of spinal prevention among 111 children, after the 8-month program, called Porci Berci. 79.33% of the children gave correct answers for theoretical spine prevention questions, 93% could give correct answer for questions about correct posture and 79.01% acquired the „spine friendly" movements (Tóthné et al., 2015; Tóth et al., 2000). Similarly Greet et al. (2007) condcuted a research with 190 children who took part in a back school program, containing theoretical back care and physical activity promoting program (complete), 193 children who only took part in theoretical back care program (partial) and 173 children were in the control group. In both intervention

groups the knowledge of back care and back care behavior were significantly ($p<0.001$) higher than in the control group. The increase of the total score of back behavior was significantly ($p<0.001$) higher in the back care group than in the complete group.

In the research of Fabiana et al. 392 students were included from 4th to 8th grade and 114 students were evaluated at follow-up. The 9 week back care program consisted of theoretical and practical parts, and 2 years passed between the end of the program and the follow-up. There was a significant difference ($p<0.001$) between the pre- and post-intervention scores and between the pre-intervention and follow-up scores ($p<0.001$) considering back care knowledge (Fabiana et al., 2012).

Posture

As a result of the „Porci Berci" program, between 1998-2009, 1138 children were measured with the Matthias test (posture test). According to the results in 1998, although 249 between the ages 8-10 years 30.52 % of the children could carry the test correctly, in 2004, 2005 and 2009 the repeated tests showed a constantly deteriorating tendency (Tóthné et al., 2015).

In the research of Somhegyi et al., during the school year of 2001/2002, 200 6-14 years old children took part in the primary prevention program of the Hungarian Spine Society and 213 in the control group. In the intervention group all the 12 muscle tests (responsible for posture) significantly ($p<0.01$) improved. In the control group in some of the abdominal and back muscle tests significant ($p<0.01$) improvement came to be, but this result significantly ($p<0.01$) lower than the improvement in the intervention group, 6 muscle tests have not been changed and 4 showed significant ($p<0.05$) decadence (Somhegyi et al., 2014).

Kayapinar tested the effectiveness of a back school program among 80 (40: intervention group, 40: control gorup) 5-7 years old children on the change of parameters on posture. In the intervention group most of the parameters showed significant ($p<0.05$) change, and most of the parameters measured after the program were significantly ($p<0.05$) better in the intervention group than in the control group (Fatma et al., 2012).

Kovácsné et al. examined the habitual posture of 30 (mean age: 12.7±2.2 years) ballet dancers and 32 (13.7±2.9 years) hip-hop dancers on the effect of a 3-month core stability training program. The posture measured after the program improved by a high percentage, in both groups of dancers (ballet 52.17%, hip-hop 37.5%) (Kovácsné B.V. et al., 2016).

Conclusions

The 10-week child back school program is an effective intervention for the development of spine prevention knowledge, and for improvement of habitual posture and posture deemed correct in 6-7 years old children. Howewer, the 10 weeks long intervention is be able to improve, but is not

able to change the habitual posture and posture deemed correct parameters into the normal range among the subjects. The workbooks have been shown useful in the education and reinforcement of the education of the children for the knowledge of spinal functions, exercises and correct body postures in children who are not able to read yet. For children who can't read or write yet, elaborated theoretical curriculum, practical part and home workbook are needed. The program should be taken for a whole school year. It is reccomended to be tested on preschool children.

Limitations

The research was conducted on a small size of population, a larger number of the population would allow more reliable conclusions.

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Conflict of interest statement

The authors declare no conflicts of interest.

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BENCE CSELIK, ERZSÉBET RÉTSÁGI, PONGRÁC ÁCS

IMPACT OF HEALTH DEVELOPMENT PROGRAM ON THE HEALTH BEHAVIOR OF PRIMARY SCHOOL STUDENTS

AZ EGÉSZSÉGFEJLESZTŐ PROGRAM HATÁSA ÁLTALÁNOS ISKOLÁS DIÁKOK ÉSZLELT EGÉSZSÉGI ÁLLAPOTÁRA

Abstract

Introduction: It is an old ambition to create the balance between nature and society (including the individual and the group of individuals).
Sports, daily exercises, regular exercises are so important to infuse social role and make a significant contribution to social welfare.
Our research mainly focuses on the elementary school children's health consciousness; its actuality can be proved by the growth of obesity at younger and younger age.

Material and methods: In the whole sample, 11–14 aged boys' and girls' data were collected. During the statistical analyses we used IBM SPSS Statistics Version 20 and Microsoft Excel 2010, moreover, thanks to the personal codes, which not only helped to compare, Children could fill out the questionnaires (mostly closed questions included) with the help of their parents -depending on their age- while staying anonymous.

Results: As a conclusion of the results it can be stated that half of the children do some sport activities for at least 2-3 times a week besides the PE classes. According to the BMI in our sample 13% of the children were overweight or obese. The difference between genders was not significant and we can also declare that the mixed and varied nutrition occurs in their everyday lives.

Conclusion: In connection with the survey it can be said, that the nutritional and physical habits were changed positively. We can also state that Children have deep knowledge about health and the importance of physical activities. Important: Children's regular, relative Body Mass based screening. Providing extra sports opportunities for obese and overweight children, furthermore, start to teach them healthy lifestyle in time.

Keywords: health education, physical activity, school health education program, BMI, body fat

Absztrakt

Bevezetés: A kutatásunk témája az általános iskolás egészségnevelés témakörébe tartozik. A méréseket több alapfokú oktatási intézményekben végeztük 2009 óta három évenként visszamérve (2012 és 2015). Aktualitását bizonyítja az egyre fiatalabb korban megjelenő elhízás mértékének növekedése.

Anyag és módszer: A kutatásban a pécsi Városközponti Iskola négy általános iskolájának 11-14 év közötti tanulója vett részt (886 fő). A mérőlapok szociodemográfiai, valamint mozgással és táplálkozással kapcsolatos kérdéseket tartalmaztak. Az egyes kérdőívek eredményeit legfőképpen az egészséges életmód két fő aspektusában (mozgás és táplálkozás) vizsgáltuk. A kérdések felváltva kapcsolódtak az egészség és a sport (mozgás) témaköreihez, a diákok és a vizsgált területek külső és belső környezeteihez. A végleges adatbázis az intézményi statisztikáiból, a védőnők által készített BMI és testzsír % adatokból, illetve az előző méréseink eredményeiből végeztük. A kutatási eredményeket összehasonlítottuk más hazai és nemzetközi mérésekkel is.

Eredmények: A felmérésről elmondható, hogy sikerült pozitív eredményeket elérni a táplálkozási és mozgási szokások terén. A vegyes, változatos táplálkozás, rendszeres testmozgás megjelenik a tanulók mindennapjaiban. Elmondhatjuk továbbá, hogy a Városközponti Iskola diákjai sokat tudnak az egészségről, a mozgás fontosságáról.

Következtetések: Az egészségnevelés céljainak mind teljesebb elérése érdekében lényeges az egészségtudatos magatartás kialakítása. A felnövekvő nemzedék egészsége érdekében már iskolás (akár már óvodás) korban el kell kezdeni az egészséges életmódra nevelést, hogy felnőtt korra szokássá, készséggé váljon ez a fajta egészségtudatos viselkedés. Az eredményekből is látszik, hogy mennyire fontos egy általános iskolában a jó egészségnevelő program, stratégia, amit az intézmények beépíthetnek az egészségnevelési stratégiába.

Kulcsszavak: egészségfejlesztés, egészségnevelés, fizikai aktivitás, iskolai egészségnevelő program, BMI

Introduction

This research focuses on the subject of health education in primary schools, the topicality of which is proven by an increase in obesity appearing at an ever younger age. Measurements have been carried out in several primary education institutions since 2009, with follow-ups every three years. One of our main objectives was to present a health strategy in a primary educational institution which would be re-assessed every three years in a series of follow-up studies. We wanted to provide information on the measurement results in different years and present a model to other institutions by proving

that with a strategy aimed at realistic and relevant short and long term goals, we can achieve positive results in public education institutions in the field of health education in a relatively short time.

In 2007, the City Center Educational District (hereinafter referred to as the CCED) was established, which consisted of 7 institutional units, including the Mezőszél Street Primary School. The head of the "Mezőszél" health education team created an institutional working committee representing the seven institutions and developed a long-term program. We were able to join this initiative in 2009 during the first measurements and then continued our involvement afterwards. We managed to examine the results in 2012 and 2015 as well. Since the last assessment, educational districts in Pécs have been abolished, so the follow-up measurements planned for this school year (2018/19) will be delayed, and the results are expected to be published in the summer of 2019.

First and foremost, we will try to get an answer as to what changes occurred in each member institution as a result of centralization and as a result of the establishment the new CCED health education working group. We are also looking forward to the results of the latest back-testing, where we can find out to what extent the former member institutions were able to carry on the health promotion efforts started under the aegis of the educational district.

1. It was assumed that the rate of physical activity among children outside physical education lessons decreased with age.
2. We hypothesized significant correlations between gender and health-conscious nutrition and regular exercise in our own samples
3. As a result of the years devoted to a consciously developed and implemented school health promotional program, results among the students of the City Center Educational District for varied nutrition and regular physical activity were hypothesized to be better than the national average and the proportion of overweight and obese children was assumed to be lower than the national average.
4. We predicted positive results in health education with the help of a well-designed strategy and due to the attitude of the participants in the program.
5. We also assumed that the health education and health promotion model taken over from the Mezőszél Street Primary School would have a positive effect on the results of the institutional units and that the positive results of the previous years can be retained.

Material and methods

The basis of the research was an anonymous self-administered questionnaire (survey) in each measurement year (also in this study). The content of the questionnaire was partly the same as the questionnaire used in the Hungarian adaptation - titled "Bring your best form Hungary" - of the international, "Shape-up" program. The questionnaire included multiple-choice and

open-ended questions. In some sections, we were also interested in the students' individual opinions. The questions are the same as those of the previous cycle for the sake of comparability. At the request of the school management, we changed the structure of the questionnaire in some places compared to previous years. The questionnaires were completed by the senior classes in the four member schools of the City Center Educational District (n = 886). All the students were aged between 11-14 attending grades 5 to 8, (average: 12.04 years, standard deviation: 1.51). Regarding the number of participants over time, we enjoyed a constant sample size when assessing body parameters and also in the number of responders to the questionnaire (886-886 persons). Furthermore, when the sample size is correlated to the population of Pécs, the surveys are even more uniform.

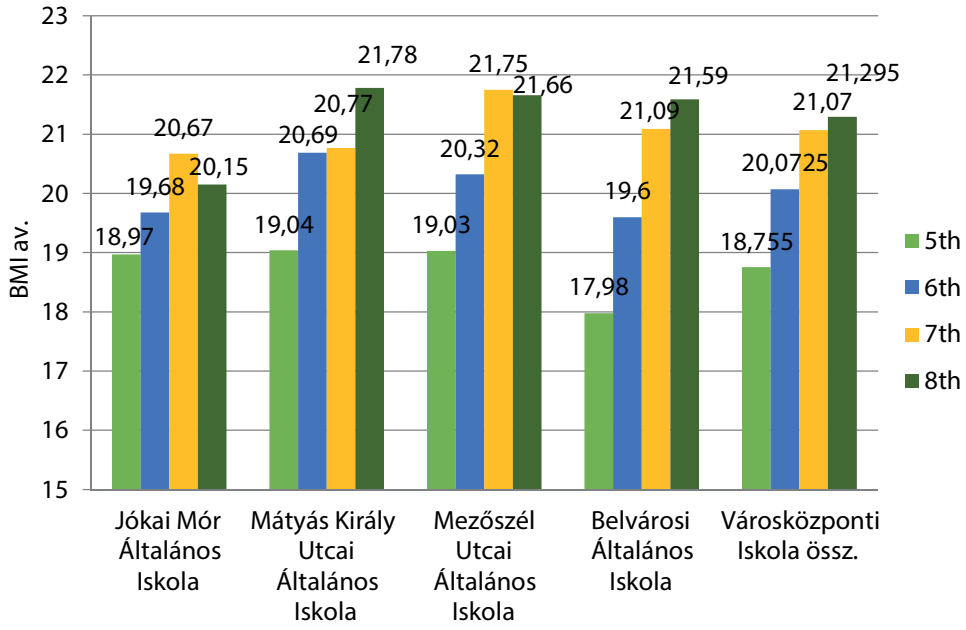
The questionnaires contained only questions related to exercise and nutrition. Thus, the results of each questionnaire were examined from the point of view of a healthy lifestyle (exercise and nutrition). The questions are alternately related to the topics of health and sports (physical activity) and to the outdoor and indoor environments of the students and the examined areas. We were also curious about the pupils' eating habits and their individual opinions about certain things (e.g.: what they think about healthy food, their eating habits, or whether they want more sports at school).

For statistical analysis we used IBM SPSS Statistics Version 20 and Microsoft Excel 2010 software. In addition to descriptive statistics, we used inferential methods (correlation and variance analysis). The significance level was determined as $p < 0.05$. During statistical data representation, our aggregated data were plotted on statistical tables and graphs. In the course of the study, we focused mainly on cross-sectional results, because we wanted to provide a situation report on the institution, and we wanted to establish trends based on the data measured at different times. The final database was compiled from institutional statistics, BMI and body fat percentage data from school nurses, and the results of our previous measurements. We compared the research results with other domestic and international measurements.

Results

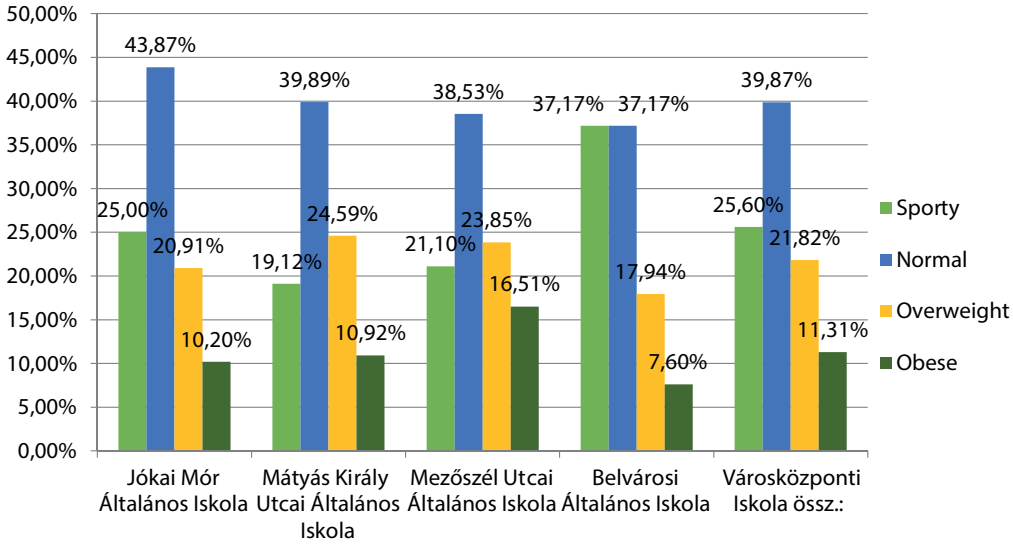
Based on the body mass index, the prevalence of overweight or obese children in our sample was 8.80%, which is better than in other domestic studies (Szomdis et al., 2014; HBSC, 2011; Valek OGYEI report 2014).

The BMI results show that there is no difference between genders among the students of the City Center Educational Ditrict. There are significant differences between the institutional units, but the overall results are in line with the institutional average. In this regard, the girls proved to be more attentive to a healthy lifestyle than boys ($p > 0.05$).



1. figure: BMI cathegories for students of VKI
(Source: own contruction/ author/ own data, own research)

At the same time, the proportion in this study of overweight or obese children was 21.82% and 11.31% respectively, which is less than in similar survey by Szmodis et al. (2014).

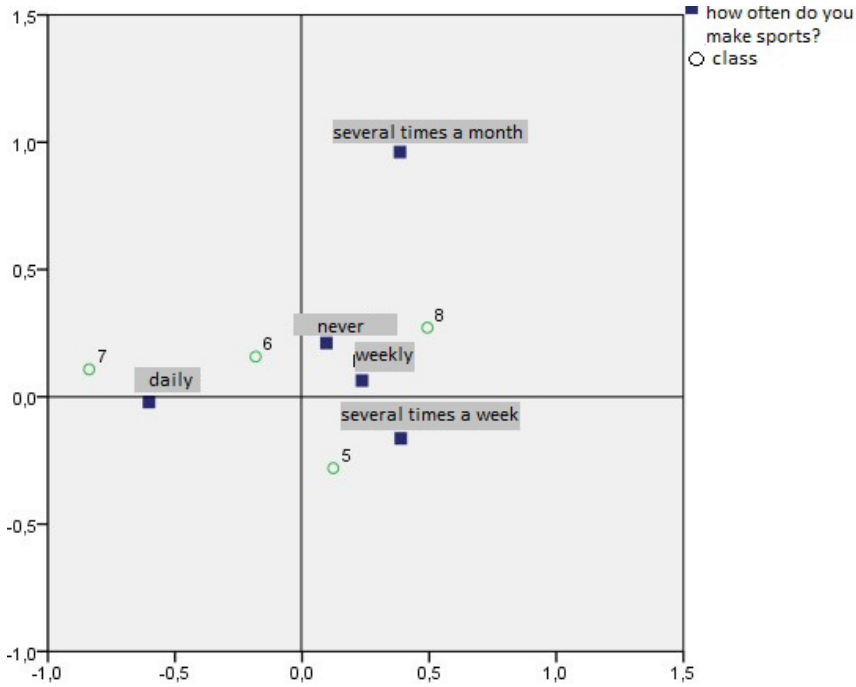


2. figure: Body Fat % cathegories for students of VKI
(Source: own contruction/ author/ own data, own research)

With the help of one-way variance analysis, we were able to quantitatively prove in our own sample that, in the case of girls, body fat percentage increased in parallel with age, and, in the case of boys, the adjacent age-group averages did not differ. Gender-specific relative (and absolute) fat loss was also demonstrated in this sample, with no significant difference ($p > 0.05$).

In terms of school grades, body fat percentages of grade 5 and 8 pupils differed significantly ($F = 3.18$; $p < 0.05$). Interpreting the results of boys and girls together, we divided students into four categories based on the McCarthy et al. classification. 16% of the girls between the ages of 11-14 fell into the lowest category – one that we labeled as "sporty". Values ranging from 16 to 28% are considered healthy or "normal". Among girls, those with a body fat index between 29% and 34% were consigned to the 'overweight' category, while any participants with values above this level were considered 'obese'. For boys, the lowest category among 11-14 year-olds is below 13%, and we labeled it as the "sporty" category. Values ranging from 13 to 23% are considered healthy or 'normal'. Among boys, 24-28% is considered to be 'overweight', while boys with values higher than this were assigned to the 'obese' category.

In the section of questions measuring physical activity levels we found significant correlation between 5th grade and non-daily physical activity, and 7th grade and daily physical activity regardless of the number of weekly physical education lessons.



3. figure: Graphic illustration of correspondence analysis
(Source: own contruction/ author/ own data, own research)

More than two-thirds (72.53%) of students at the City Center Educational Ditrict do some physical activity outside their physical education lessons. Interestingly, there was a greater negative increase in the proportion of non-athletes. We do not necessarily have to evaluate this negatively; this may be due to the appearance of everyday physical education, or due to parents thinking that their child undertakes physical activity in sufficient quantity and quality in physical education classes.

ty of nutrition deteriorated somewhat with age, but senior students typically eat less favorably. (Hungarian Society of Sport Science 2014) In contrast, in our research, over 40% of students consume vegetables while fruit is consumed by nearly 60%. These results go beyond the results of the above study.

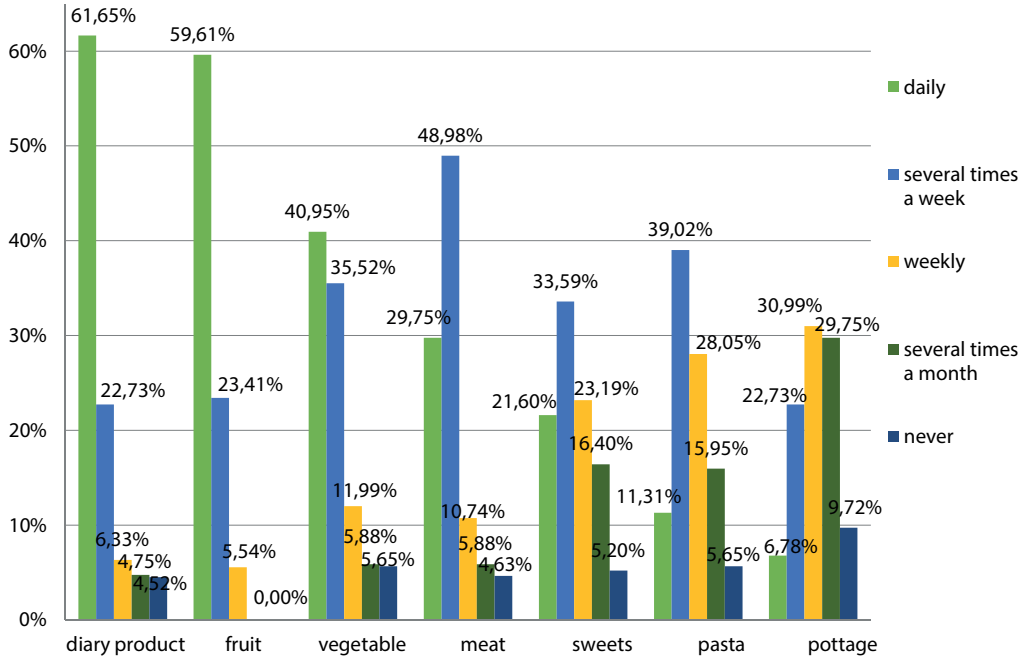
We also received favorable results regarding the consumption of dairy products, as 61.65% of the students of the City Central School consume dairy on a daily basis.

Table 1: Willingness to sport of studens, broken down by unit, in percentage

	DAILY	Several times a week	Weekly	Several times a month	NEVER
Belvárosi Általános Iskola	43,14%	33,87%	10,48%	4,83%	7,66%
Jókai Mór Általános Iskola	22,37%	49,15%	13,22%	5,42%	9,83%
Mátyás Király Utcai Általános Iskola	45,83%	29,16%	15,33%	10,11%	10,70%
Mezőszél Utcai Általános Iskola	35,02%	36,15%	13,56%	5,60%	9,60%
TOTAL	36,59%	37,08%	13,15%	6,49%	9,45%

(Source: own contruction/ author/ own data, own research)

According to the survey of the Hungarian Society of Sport Science in 2014, more than 30% of children consume fruit daily and almost 30% of them consume vegetables daily. In terms of dairy consumption, about half of the children consumed some sort of dairy product daily, especially milk. In terms of gender differences, the quali-



4. figure: Eating habits of the students by type of food
(Source: own contruction/ author/ own data, own research)

In terms of food type consumption, we found correlations in two places, between boys and daily meat consumption and between girls and consumption of meat several times a week. Regarding fruit consumption, there is a significant correlation between the 11-year-old age group and daily fruit consumption, as well as between the 13-year-old age group and consumption of fruit several times a week. It can be clearly seen that the daily consumption of sweets increases with age.

Discussion and conclusion

Based on our comprehensive interdisciplinary follow-up study involving 886 school children from Pécs, the following findings and recommendations can be formulated: More than two-thirds of the students were in the appropriate nutritional category based on body mass index (BMI). 3.28% of children were abnormally obese or anorexic. 8.80% of the participants were overweight or obese. In particular, when assigning students to the overweight category, and to better classify borderline cases, we also felt it justified to include body fat percentage as the body mass index alone is not necessarily sufficient to screen all children at risk.

Based on body fat percentages, more than 30% of children and adolescents had a relative body fat index that was no longer physiologically within healthy limits.

- Regularly screening children based on relative body fat content

is important. To this end, it is necessary to strengthen and develop relations between educational institutions and school physicians and nurses. It is also necessary to emphasize movement and nutrition prevention programs.

- It would be worthwhile to provide additional time for sports for overweight and obese children, possibly in the school sports clubs.
- We should pay special attention in health screening to students after class 7.

According to the questionnaire, more than 72% of the students do sports at least 2-3x a week outside physical education lessons. At the same time, the willingness to do sports decreases significantly with age, and the proportion of children doing sports on a daily basis in the 8th grade is significantly lower. Nearly 10% of children never do sports. School sports clubs are not really popular, with only 9.05% of children participating.

- Improving the range of school sports, the level of infrastructure and equipment in schools. Providing students with sports suited to their interests.
- In class 8, most students do sports at home or in fitness centers outside school. It would be important to incorporate PE sessions into the local curriculum from the 8th grade where learners can learn to compile a basic exercise regimen for themselves.

Nutritional habits are still favorable, the results indicate varied nutrition, and have actually improved in some places. The biggest problem is student satisfaction with the dishes offered by the school canteen.

- It is still important to promote a healthy lifestyle for both parents and children.
- Promote reform, health-conscious buffets in every school, even considering the wishes of the children as long as these are in line with healthy eating.

In the field of research, it would be worthwhile to extend such studies to the whole town (a representative town-wide measurement) at primary and secondary educational institutions. For this purpose, the Municipality of the City of Pécs and the Education Center, can provide assistance. We have already started negotiations with some institutions on this. We hope that the latest results expected for the summer of 2019 will underpin the above.

Our number one hypothesis was confirmed in that the rate of physical activity outside physical education lessons decreased with age. In our own samples there is a period after the 7th grade (increasing up to this age) when young people increasingly do less and less regular physical activity. Similar results can be seen in other domestic studies, such as research by Szmodis et al.

According to our preliminary assumptions, it was proven that mixed and varied nutrition and regular physical activity among the students of the City Central School were shown. It is also clear that we have achieved positive results with the adoption of the health education and health promotion program taken over from Mezőszél Street

Primary School and have kept these positive results during the years of measurement.

Gender has not been shown to play a significant role in health awareness in terms of exercise and diet. Only in terms of the regular consumption of cooked food and the quantity of food was there a significant correlation with gender. Based on BMI data, we also confirmed our assumption that the proportion of overweight and obese children is lower than the national average, but it is important to emphasize that based on body fat percentages there is still room for improvement to further reduce the proportion of overweight students.

In order to achieve the goals of health education more fully, it is essential to develop a health conscious behavior. The example set by teachers and their relationship with students both have a significant role to play in this. In our opinion, close collaboration between educators, regardless of qualifications, is essential for effective health education. It is also important for students to gather experience fist-hand on how health conscious behavior can be realized. This can be exemplified by excursions that build on common experiences in schools and study circles aimed at building cooperation, providing collaborative patterns and sporting activities suitable for group building. It is an essential task for educational institutions to develop the health conscious behavior of the upcoming generations, to develop and implement long-term prevention, health preservation and development strategies. Transferring the experiences of the member schools of the City Center Educational District and collaboration can lead to better results and we hope that it will positively affect the former member institutions of the now-dissolved district.

We would like to express our gratitude to the leaders and teachers of the participating schools for enabling students to participate and for providing effective help in our study. We would like to express our special thanks to the children and their parents who participated in the survey, for their active contribution to our work.

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