Original Article

Impact of Sedentary Behaviors on Sleep and Academic Performance

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Abstract:

Introduction: Screen time, particularly video games and spending time on mobile devices has significantly decreased physical activity among youth. Sedentary behaviors and sleep patterns are both a cause of concern for adolescents. The objectives of this study were: 1) To compare sedentary behaviors with sleep patterns 2) Compare sleep patterns with academic performance. Methods: Data from the national Youth Risk Behavior Survey from the year 2015 were analyzed in this study. The sample included 15,624 across the United States. Variables included sleep patterns and academic performance. Other variables included were sedentary behaviors among adolescents from grades 9th-12th from 2015. Analyses included Pearson chi-squares and gamma coefficients to determine significant findings. Results: Results indicated a strong correlation between television watching, screen time with sleep and academic performance. Those students reporting > 5 hours per day of television or screen time activities were least likely to get good sleep (> 7 hours a day) and were most likely to obtain failing grades (D's and F's) ($p < 0.01$ for all analyses). Conclusions: It is important for students to get adequate amount of sleep needed. Parents should consider assimilating bedtimes for students on a typical school night. Placing a time limit on sedentary behaviors is critical. Having moderate amount of combined screen-time (<2 hours of day of television and other screen time) may lead to better sleep patterns and increase academic performance.

Keywords: Grades, Screen-Time, Sleep Pattern, TV

Introduction

Triathlon falls into the category of endurance sports. In addition to the time of racing load, it shares common or at least similar methods, means and style of training with endurance sport as well as the division of the all-year season and its respective conditioning. The basis of the training consists in dosing load intensity and volume in cycles that will, after a period of time, result in the permanent adaptation of the body and thus enhance endurance (Formánek – Horčic, 2003; Misárošová – Mandžák, 2003).

Cross triathlon is a summer sport so the season's peak is equally planned for the summer. The preparatory phase begins in October and continues until the first race at the end of April. The peak of the season is represented by the World, European and Slovak Championships. Other races serve to control the level of an athlete's physical fitness and are a good training method during ATC.

As in most endurance sports, the development of basic endurance (BE) is essential also for cross triathlon and it represents 60-85% of the total training volume. The basic endurance zone comprises 75-85% of the individual maximum, i.e. aerobic metabolism. Continuous training methods are considered to be the most appropriate ones (Neumann et al., 2005).

The basic endurance zone is interconnected with the aero-anaerobic zone, i.e. special race endurance that ranges from 85% up to 95% of the individual speed maximum. It covers 10-25% of the training plan. To develop basic endurance, the continuous intensive and alternating methods as well as an extensive form of the interval method are used.

Strength development is one of the crucial elements in endurance training. Specialised trainings help to develop the appropriate and most loaded muscular areas during the performance. The employed training means should correspond to the structure of the performance (Neumann et al., 2005).

One should bear in mind physiological indicators and the race calendar while planning a long-term training. The realisation of ATC should lead to the planned changes in the body and the development of physical strength. Body adaptation abilities to a given load are limited as each body has its own limits. The greatest task is to choose the appropriate load individually in order to improve fitness and achieve the planned training effect. During training it is essential to gradually increase the load and alternate loading and resting phases, i.e. recovery mesocycles where the load is reduced in order to restore energy. It is impossible for an athlete to deliver the best performances six or more months in a year (Viru, 1986).

Sports periodization - round training loading is inseparable from the recovery of an athlete's body. Fatigue (physical, psychological, overall, peripheral) as a natural consequence of musculoskeletal loading will

reduce the activity of the individual functions of the body and therefore lower endurance performance (Dantas, 2003).

Actually, we are dealing here with periodization in long-term sports training. In general, periodization is a detailed time planning in accordance with the firmly fixed objectives of the training and respecting the scientific standards fixed in physical exercises (Dantas, 2003).

After the fatigue phase, a recovery phase must naturally follow (passive or active recovery focused on the resynthesis of energy already during training) leading to the removal of the former. During recovery, not only consumed energy reserves are restored. According to Jakovlev et al. (1962) even greater supplies of energy are created during the supercompensation phase, exceeding the initial level of energetic potential.

There is a certain type of time hierarchy, according to the structure and order of the training load, lasting usually 6-8 weeks. That was also one of the reasons for changing the duration of the mesocycle in sports training in the 1990s. Initially, four weeks were considered to be the optimal duration of the monothematic mesocycle. Today, scientifically controlled trainings use different durations of mesocycles from two weeks to several months, depending on the calendar of competition. Attempting the optimal solution, 6-8 weeks is the minimal duration of the mesocycle in order to achieve more lasting structural changes in the transcription of genetic codes in the human body (Vanderka, 2010).

Top athletes get into shape in 18-22 weeks. This period should be followed by a break in the intensity and recovery phase (Verkhoshansky, 2007).

Matveyev (1992) calls it the basic principle in the training process. The transition phase, increased volume and reduced intensity during ATC are integral parts of ATC training structure.

Both authors agree on that, however, they both have their own theory of periodization in ATC.

Matveyev (1992) promotes one-peak season, the classic training model characterized by regular load increasing and reducing. ATC is divided into a preparatory, racing and transition period.

This model is useful in the Olympic and World Cup year, when the athlete is preparing exclusively for one event and other races are only part of the training process.

Contrary to this, Verkhoshansky's theory (2007) allows more peaks in a season, which is more practical and advantageous for today's athletes as they want to succeed in several championships. It is a training model divided into blocks or periods. ATC is divided into periods A, B and C. The first period is the accumulation phase. Period B is the transformation period and the last one is the racing period.

Plisk and Stone (2003) agree with the authors (Matveyev, 1992; Formánek, Horčic, 2003; Neumann et al., 2005; Verkhoshanski, 2007) in the training orientation. It is focused on alternating the phase of high volume with low intensity gradually changing into the phase of opposite character - low volume and high intensity. In general preparation, volume training predominates, receding in the racing period and continually decreasing (Fig. 2). At the beginning of special preparation the technique is progressively trained more and more until the active recovery phase (transition period). From the beginning of the racing period, intensity increases, reaching the maximum at the peak of the season. The next period is typical of a distinctive drop in intensity. After the season, in the period of active rest, all three components decline.

There is currently no universal structure of sports training and many leading experts (Fomes, 2003; Plisk – Stone, 2003; Verkhoshansky, 2007; Bompa – Haff, 2009; Verkhoshansky – Siff 2009) point to the defects of the theories from the 1960s as they were only partially verified by research.

In the short term, a classical linear periodization seems to be more suitable for beginners and youth.

Another model of ATC division is similar to Plisk – Stone's (2003). It is characterized by a predominance of the volume at the beginning of the preparatory period. It goes gradually down and yields to the intensity and technique of movement. Both practice indicators culminate in the transformation (racing) period. Approaching the transition period, they decline and join the level of volume load.

Bompa – Haff (2009) have a similar, one-peak training model. Throughout the training, the volume parameter (unbroken line) decreases towards the peak with mild rises. The highest volume load is in the preparatory period, mesocycle 3-4. On the contrary, the intensity increases until the racing period and decreases afterwards. The trainings with the highest intensity (maximum % of VO₂max) take place in the mesocycle 5-8, so 3-6 mesocycles before the peak of season.

The season with two peaks, in the winter and summer part of ATC, is slightly more complicated. The first preparatory period should last 3 months (Bompa – Haff, 2009). It helps the athlete to acquire general and consequently specific endurance. It is actually the period of accumulation and intensification, followed by the transformation period lasting two and a half month and aiming to prepare the athlete and "polish" his/her condition for the peak events in the winter part of ATC. The race is followed by a short transitional period lasting about 1-2 weeks. Afterwards, a two-month additional preparatory period (II) ensues, shorter than the first. Here the training is concentrated on more specifically as basic endurance shall have been acquired in the winter part of the preparation. The summer racing period is longer, lasting three and half months. During this time, the athlete should prepare him/herself for his/her second ATC peak.

The character of the volume and intensity of the load resembles stairs that change during the season.

According to Bondarchuck (1988), the intensity and volume load have a rather sinusoidal shape. Once the volume load decreases, the intensity climbs up to the peak of the season. After the summer part of ATC, the volume stays down and the intensity is no longer applied.

Tschien's (1989) ATC course has a constant sinusoidal shape. The volume alternates with the intensity. In the winter part of ATC, the volume curve is above the intensity curve and they have an identical shape. In summer preparation, the volume curve drops under the intensity curve but they still have the same shape, e.g. the greater the volume, the greater the intensity. This training model is not currently very efficient.

Many authors (Berger, 1980; Platonov, 1980; Žukov, 1983; Choutka – Dovalil, 1987; Košťál, 2001; Belás, 2006; Moravec, 2007; Šimonek, 2007; Killing – Rinder, 2009; Laczo, 2011; Laczo, 2012) discussed the issue of the intraindividual assessment of training load and its impact on performance. However, their works were based on interindividual research. They observed athletes differing in somatic and physiological parameters and tried to generalize the obtained results for a larger group of top athletes.

Berger (1980) and Schnabel (1982) point out the changes of the performance in relation to the training loading.

Pataki et al. (1982) compared intra-individual and inter-individual analysis with the result confirming the benefits of methods of intraindividual analysis concerning the peculiarities of performance.

In their studies, Havlíček (1977); Havlíček – Záhorec (1983); Hutňan (1987); Vindušková (1987); Kolčiter (1993) used correlation and regression in the analysis of time series. They watched the athletes "ex post facto". They found out that this method is suitable for modelling the training load.

Vavák et al. (2008) dealt with the "ex post facto" intraindividual assessment of a high jumper. They took into consideration only those general training indicators they had good access to. They correlated them with the performance.

Seidl – Pupiš - Suchý (2014) were interesting in Specific vs. non-specific performance tests in triathlon – swimming. They found very strong correlation between them.

Tirre – Raouf (1998) and Langendorfer – Robertson (2002) claim that differentiation between genetic factors and those that can be further developed does not guarantee their use in training practice.

Method

Participants

The sample consisted of 113 elderly people. It was formed according to the following selection criteria: 65 years old and older; living in a Long-term care institution; participating in a physical activity programs (PAP) and having given voluntarily and informed consent to participate in the study. Of the 113 elderly people, 81 people are female. The maximum age of the total sample is 97 years old and the minimum age is 65 years old (mean age 82.96 ± 7.03 years). With regard to marital status, 72.6% of all individuals in the sample are widowed. The educational level of the sample proved to be very low; most participants either did not attend school (46.0%) or did not complete primary education (36.3%). The data collection sites were long-term institutions that developed a PAP available to the population intended for the study. Were contacted 13 Long-term care institutions (public and private) in the district of Guarda, Portugal. Of the 13 institutions contacted, four institutions have not given consent and two did not meet one of the criteria established, develop a PAP.

Instruments

The main instrument used for data collection was the questionnaire with closed and open questions. This questionnaire was administered in a face-to-face interview and addressed to institutionalised elderly people. The questionnaire was organized into six different thematic categories; however for this particular study only the following three categories are of interest: "Socio-demographic identification"; "Perception of physical activity" and "Attitude towards exercise". With the exception of the last category, all of the others were created by the researcher. In the category for the understanding of the attitude towards PE the OPAPAEQ (Older Person Attitudes Toward Physical Activity and Physical Activity Questionnaire) was used. It is an instrument designed and validated by Terry et al (1997) and adapted for the Portuguese population by Oliveira & Duarte (1999). The OPAPAEQ has a total of 14 items of 4 different subcategories: tension relief (3, 6, 10, 12); promotion of health (2, 7, 11, 13); vigorous exercise: (5, 9, 14) and social benefits (1, 4, 8) (Terry, et al., 1997). The responses are scales according to the five-point Likert scale format, varying from "totally disagree" to "totally agree". This questionnaire was subject to a pilot test that consisted of surveying 4 individuals, with the same characteristics desired in the sample in order to test their understanding and logical reasoning.

The decision to willingly participate in the study was formalised through the completion of a consent form by each participant. The anonymity of participants and institutions was achieved by substituting names for codes. The data were handled only by the researcher and were used strictly for research purposes, thus ensuring confidentiality.

Statistical analysis

The analysis of the data gathered was carried out with the support of the programme *Statistical Package for Social Sciences*, SPSS version 13.0. We used descriptive statistics (frequency, mean and standard deviation) for the overall analysis of data. The mean difference between the dependent variable "overall result of the Scale of Attitudes towards PE" and the independent variable "participation in PA" were studied. For independent

samples with a maximum of two categories (fall), we proceeded to the analysis of the difference of means and medians using parametric and non parametric tests, T Test and Mann-Whitney U Test, respectively. For samples with more than two categories (participation in PA) the parametric test used was ANOVA and the non-parametric test used was the Kruskal-Wallis Test. The parametric tests were used only on the samples which met three requirements: numeric variables, normal distribution of data and homogeneity of variance. The Tukey Test was used when wanting to compare all of the paired means and when a null hypothesis was rejected for a minimum significance level of $p \leq 0.05$.

Results

Participation in Physical Activity Programmes

In the data summarised in Fig. 1, the regular participation (Always) exceeded the non-participation (Never). However, its variation was tenuous, with a percentage difference of 3.5. The regular attendance, i.e. those who attend the PA "almost always", "sometimes" or "rarely" show lower values and percentages closer together.

Fig. 1. Percentages of frequency of participation in Physical Activity.

Motivations and Barriers to participating in physical activity

"Maintaining overall health" was the main reason marked for participating in PA by all of the individuals in the sample except for those who stated to never participating in PA (45.2%). "Physician's recommendation" was not marked by any of the participants in the sample; however the influence of others represented 30.6 % of the participants in their motives for participating in PA. For those who marked the influence of others as the main reason for participating in PA, 82.4% were influenced by the instructor or promoter of the PA. The primary barrier to participating in PA marked by those who did not regularly participate was "physical disability" (64.6%) followed by "lack of interest" (27.7%). Other barriers such as the "need to rest" and "fear of falling" were less marked by the sample, at 4.6% and 3.1%, respectively.

Attitude towards physical exercise

The total average assessment of the "Attitudes towards exercise" on a scale of 1 to 5 was 3.81 ± 0.75 , which is very close to the value of 4 indicating that the sample in general agree with all statements on attitudes towards exercise.

Items with the highest score, were the items "a" (exercising with others is good for socialising) and "h" (practicing physical activity is a good way to spend free time) with an average score of 3.90 ± 0.7 . These two items are related to the category of Social Benefits, (Table 1).

Table 1. Attitude towards physical exercise – mean and standard deviation.

Attitude towards exercise	
Categories	M $\pm$ SD
Promoting Health	3.82 $\pm$ 0.68
Releasing Tension	3.72 $\pm$ 0.73
Vigorous Exercise	3.85 $\pm$ 0.68
Social Benefits	3.90 $\pm$ 0.71
Total result	3.81 $\pm$ 0.75

"Physical activity is in some regards an excellent remedy for someone who is tense, irritable and anxious" (item "j") was the item which on average received the lowest score, 3.62 ± 0.87 , and is the answer least agreed upon by individuals in the entire sample. This item belongs to the category of Tension Release which received the lowest scores in comparison with the remaining categories, 3.72 ± 0.73 .

Attitude towards physical exercise vs. Frequency of participation

The purpose is to verify the existence of differences in means or medians between the dependent variable "Attitudes towards physical exercise" and the independent variables "Gender" and "Participation in PA." The average results from the "Attitudes towards exercise" showed no significant differences ($p \geq 0.05$) between the variable "Gender" (Table 2).

Kruskal-Wallis, the non-parametric test, verified that there is at least one frequency of participation that leads to a different attitude than the others. The multiple comparisons by the Tukey method resulted in the identification of two frequencies different from the others. Respondents who participate "sometimes" and "rarely" positively and negatively influence the attitude towards PE, respectively.

Table 2. Attitude towards physical exercise – mean difference.

	N	Attitude towards exercise - Overall result		Statistical Test
		M ± SD	Test P	
Gender				
Male	32	53,72 ± 6,65	t(df)= 0.69	Mann-Whitney U
Female	81	53,25 ± 9,50		
Participation in PA				
Always	46	56.35 ± 6.26	F(df1, df2)= 0.01*	Kruskal - Wallis
Almost always	9	54.67 ± 6.87		
Sometimes	10	58.10 ± 7.34		
Rarely	6	47.17 ± 11.46		
Never	42	49.62 ± 9.68		

* Level of significance $p \leq 0.01$

Discussion

The results about the frequency in PA showed that institutionalized elderly were highly inactive. Despite the inactive behaviour, it was not reflected in the general attitude towards PE, in fact the sample showed to have a positive attitude towards it. The positive attitude in all three categories assessed was not uniform; the category most valued was social benefits. The value attributed to social benefits, i.e. valuing socialising and having a good time, reinforces the results found on institutionalised elderly that "time" is hardly perceived as a barrier to participating in PA, as the elderly who live in long term institutions are lacking in activities (Gobbi et al., 2008).

The main reason for participating in physical activities is to maintain overall health. This motive deviates from the social category which was most valued and approaches the category of health promotion which was the second most valued. However, it is the value attributed to social benefits that more easily explains such a significant difference between the "attitude towards PE" and the "participation in PA". This study found that those attending PA "sometimes" have a more positive attitude than those who attend "always." According to Santos (2006), it is those who participate in PA who had the most positive attitude, as the greater the frequency the more positive the attitude (Santos, 2006). The valuing of social benefits can be enjoyed by both those who actively participate in PA and by those who participate more passively, as the latter can benefit from socialising and the dynamics of PA without direct interaction. This finding helps explain the more positive attitude of those who do not always participate in PA.

According to the results, the more negative attitudes fit the group of participants who attend PAP "rarely" and not the group that "never" attends, as expected by inverse comparison of the same study by Santos (2006). The barrier most noted by participants in our sample who attend PAP "sometimes" is physical disability, compared to the remaining participants with other levels of participation. Physical disability may be the primary reason for which they may not be able to participate in PA more frequently, despite valuing it. Caetano and Raposo (2005) refute Santos (2006), in other words, they contest that participation influences the overall attitude towards PA criticising that both participants and non-participants of PA can equally have a positive attitude towards it (Caetano & Raposo, 2005).

This study acknowledges some limitations from the choices and options chosen. The questionnaire is a method of data collection that does not allow deepening of responses. The quantitative study based on the mathematics analysis that does not allow establishing relationships. The method of sample collection, for convenience, is a type of non-probability sample that does not allow a reliable generalization of results for the institutionalized elderly

Conclusions

The elderly people in this study were found sedentary lifestyle, however they have a generally positive attitude towards PE. In addition to valuing the socialisation and excitement generated around PA, they also value the maintenance of general health, which is a major reason for their participation. What seems to hinder people to practice more PA is the physical disability. The frequency of participation seems to influence the attitude towards PE.

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