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The effect of selected elements of lifestyles on the sitting position

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Abstract

Background: According to the Lalonde's health field, health is determined in more than 50% by human lifestyles. Nowadays, the sedentary lifestyles are dominant and all types of physical activities discussed by Drozdowski are being gradually ousted from everyday life. This results in maladaptive sitting positions. Therefore, the goal of this study was to evaluate the effect of selected components of lifestyle on sitting position.

Material/Methods: The study examined 372 people who declared a healthy status. The research program involved the questionnaire which concerned selected components of lifestyles and measurements of spinal column to evaluate the sitting position.

Results: The study demonstrated a statistically significant positive effect of time of sitting during the day on the sitting position, i.e. the element of lifestyles which can be directly controlled by study participants.

Conclusions: Of the evaluated components of lifestyles, the most essential effect is from time of sitting during the day. The study demonstrated the need for promotion of healthy lifestyles.

Keywords: lifestyle; sitting position; health activity

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INTRODUCTION

Nowadays, it is believed that health, according to the Lalonde's health field, is determined in more than 50% by human lifestyles (Wysocki et al., 2003). Health is a dynamic process connected with interaction between adaptive mechanisms in human body, based to a large extent on physical activity and environmental effects. However, the unprecedented progress in media and information technology has transformed human lifestyles from active into passive (sedentary). Sitting position has dominated most work environments and leisure time activities (Varo et al. 2003; Drygas,2006; Matthews et al.,2008; Parry et al.,2013; Munir et al.,2015; Smith et al.,2015). Contemporary people sit almost all the time, everywhere and on every occasion. All types of physical activities discussed by Drozdowski (1999), such as professional physical activity, activities of self-care and recreational activity are being gradually ousted from everyday life. Therefore, the sedentary lifestyles have become competitive with respect to active and healthy lifestyles. The survey by Bridging East-West Health Gap showed that Poles occupy the first place in prevalence of sedentary lifestyles and the last one in physical activity among the European countries included in the survey (Drygas et al., 2001). According to the Multicentre Polish Survey of Health Status (WOBASZ, Wieloośrodkowe Ogólnopolskie Badanie Stanu Zdrowia), 40% of Poles work in the sitting position and over 60% spend their leisure time passively (Drygas et al., 2005). Prolonged sitting leads consequently to disturbances in the systems that stabilize individual body segments, especially body trunk (Panjabi 1992a). This results in maladaptive sitting position and losing the S-shaped spinal curvature in the Panjabi neutral zone (1992b) and leads to the postural syndrome described by McKenzi (1993) Therefore, the goal of this study was to evaluate the effect of selected components of lifestyle on sitting position.

MATERIAL AND METHODS

The study examined 372 people living and working in the Silesian Voivodeship in Poland. The inclusion criteria were current medical examination certificate that confirmed ability to perform professional work and the lack of locomotor system diseases, surgical interventions and spinal injuries. Participation in the study was voluntary. The study group comprised of 212 women and 160 men aged from 20 to 50 ( ), with people under 40 years of age, accounting for 60.22% of study participants (224 people). Working experience of study participants ranged from 1 to 35 years (16.99). There were 20.43% people with higher education, 49.46% with secondary education, 28.23% people with vocational education and 1.98% with primary education. The research program involved:

- a questionnaire survey with closed-ended questions concerning the elements of lifestyles (Fig. 1)
- measurements of the projection length of the spine in the habitual sitting position and during auto-elongation using the anthropometers with the accuracy of 1 mm. The measurements were performed in the favourite sitting position and the sitting position with the foot rested on the knee. Based on these measurements, the kyphosis

$$K = \frac{w - z}{w} \times 100\%$$

indices were calculated according to the equation.
where w = the projection length of the spine in auto-elongation, z = projection length of the spine in the habitual position.
All the research procedures were approved by the Bioethics Committee for Scientific Research No. 8/2007 and according to the 1978 Declaration of Helsinki, amended in 1983.

Statistical Analysis

The results obtained in the study were used for statistical analysis. The descriptive statistics were used in order to illustrate the study group. Multiple regression analysis was also performed for lifestyle parameters (independent variables) in order to establish the effect on sitting position evaluated from the standpoint of spinal position (dependent variable). Statistical significance wast set at $p<0.05$.

RESULTS

In the study group, 50.27% people considered their work as static, 43.01% of the respondents defined it as static-dynamic and 6.72% regarded it as a having a dynamic character. The time of professional work was 8 hours, with study participants remaining in the sitting position in the leisure time for nearly 7 hours ($\bar{x}$ = 6.98h). Furthermore, the effect of lifestyles of study participants on their favourite sitting position and sitting with the foot rested on the knee was also analysed. Analysis of the sitting position with the foot rested on the knee showed a significant effect of such independent variables as leisure time (β =-0.200, $p<0.001$), time for drinking coffee (β = -0.083, $p<0.030$), sleeping problems (β = 0.133, $p<0.003$), car washing (β = 0.114, $p<0.008$), reading (β = 0.137, $p<0.003$), feasting (β = -0.166, $p<0.001$), working with computer (β = -0.141, $p<0.001$), hanging curtains (β = -0.121, $p<0.008$) and total sitting time (β = 0.567, $p<0.001$) (Fig. 2). A positive effect of such variables as prolonged sitting, reading, sleeping problems and car washing shows that these activities are conducive to hunched sitting position, whereas the reverse negative correlation observed for other variables reflects lower tendencies for kyphotization during sitting with the

foot rested on the knee. Furthermore, kyphotization during sitting in the favourite sitting position was positively affected by sitting with legs crossed ($\beta = 0.255$, $p<0.001$), drinking alcohol ($\beta = 0.099$, $p<0.036$) and total sitting time ($\beta = 0.337$, $p<0.001$), which means that these factors lead to deeper hunching of the body trunk in this position, whereas a reverse relationship was found for favourite activities ($\beta = -0.115$, $p<0.018$), which positively affect the spinal position (Figure 3). The examinations showed a positive, statistically significant effect of the time of sitting during the day on the sitting position. Independent regression analysis for other variables did not show statistically significant differences.

1. What is your education level?
□ university □ secondary school □ vocational school □ primary

2. How long have you been professionally active? ☐

3. Is your professional work:
□ static □ dynamic □ mixed (static – dynamic)

4. How many hours a day do you sit during work? ☐

5. How many hours a do you spend sitting? ☐

6. How many hours a day, on the average, do you spend sitting in non-work activities? ☐

7. What do you most often (most willingly) sit on at home?
□ armchair □ sofa □ stool □ chair (with backrest)

8.How often do you sit crossing your legs?
□ always □ often □ from time to time □ never

9. How much time do you spend drinking coffee every day?
□ much □ occasional cup □ no time at all

10. Do you drink alcohol?
□ no, not at all □ occasionally □ often

11. Do the activities listed below cause difficulties due to spine pain:

	very substantial	**substantial**	**slight**	**none**
a) sleeping through the night	□	□	□	□
b) preparation of a meal	□	□	□	□
c) doing shopping	□	□	□	□
d) time off/relaxing	□	□	□	□
e) washing dishes	□	□	□	□
f) riding a bicycle	□	□	□	□
g) washing the car	□	□	□	□
h) working in the garden	□	□	□	□
i) hobbies	□	□	□	□
j) prolonged reading	□	□	□	□
k) partying	□	□	□	□
l) working with a computer	□	□	□	□
m) watching television	□	□	□	□
n) going for a walk, e.g. to forest	□	□	□	□
o) hanging curtains	□	□	□	□

Figure 1. Questionnaire

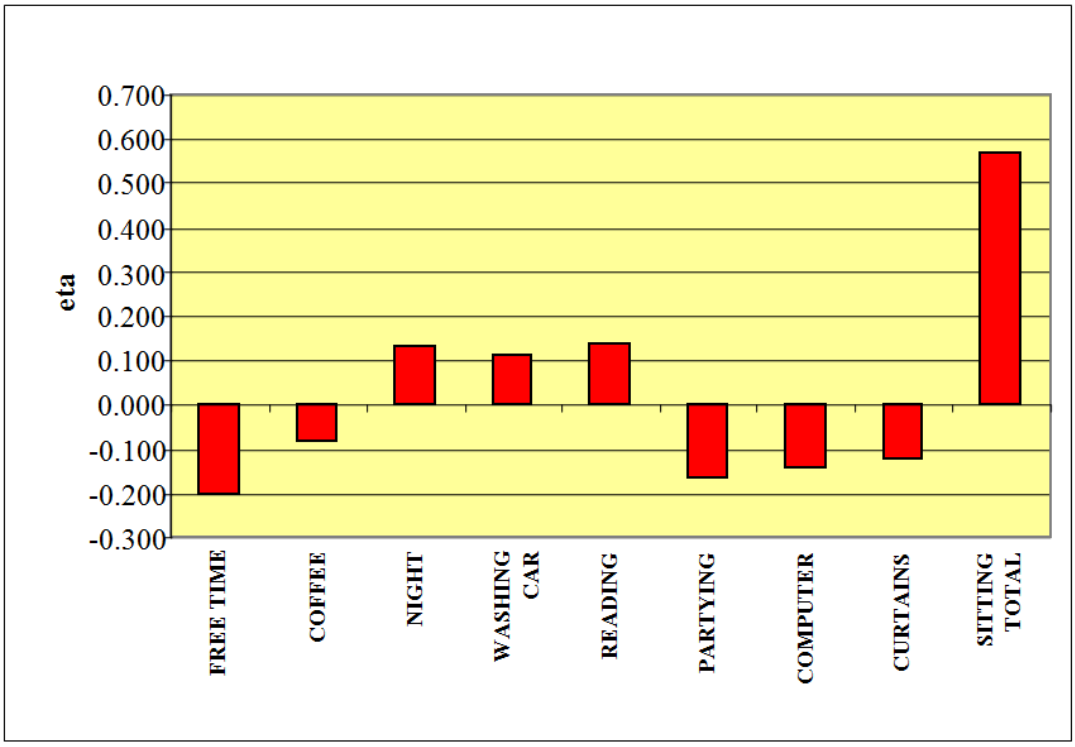

Figure 2. Effect of selected elements of lifestyles on development of kyphosis in the sitting position with the foot rested on the knee

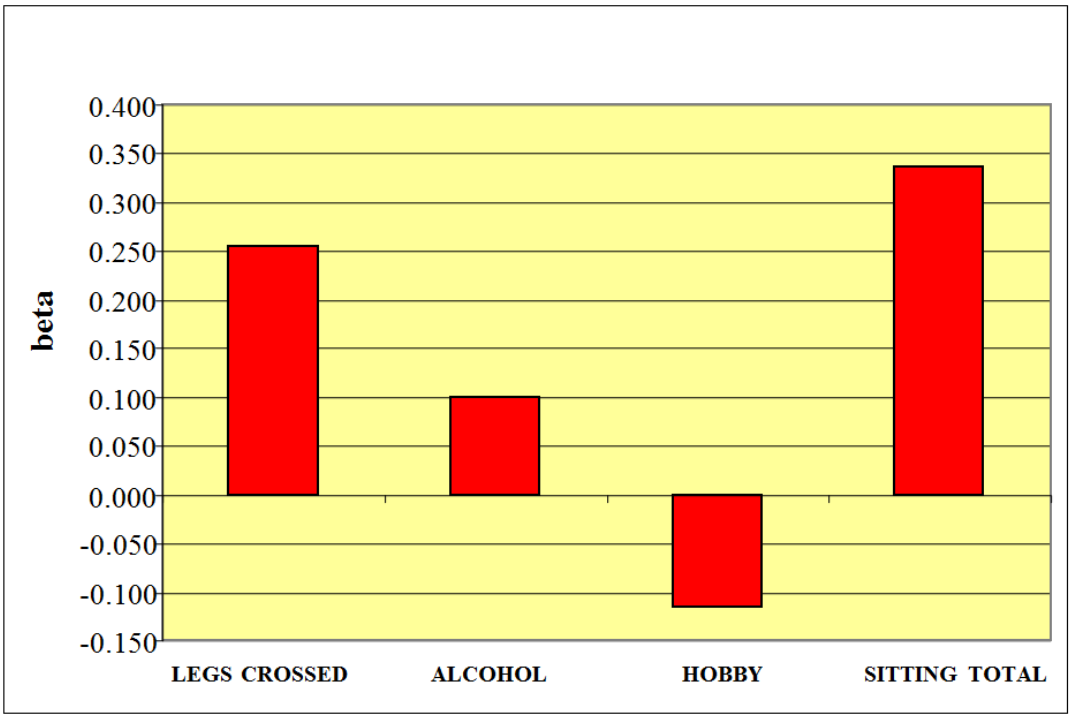

Figure 3. Effect of selected elements of lifestyles on development of kyphosis in the favourite sitting position

DISCUSSION

The sitting position is a natural element of lifestyles from the earliest years of human life. Over the thousands of years of human history, the contribution of sitting position has changed dramatically. However, professional work and leisure time forced people to be involved in multi-variant physical activity while the contribution of sitting position in everyday life was insignificant (Drozdowski, 1999). At the end of the 20th century, the model of human work changed from hard, physical work to the seemingly light mental work, dominated with the sitting position. This fact was supported by this study. The study participants spent long time in the sitting position, both during professional work and in their leisure time. Furthermore, the anatomical and kinematic correlations between individual body segments that describe the sitting position show substantial complexity and allow for the choice of various postural behaviours, especially in the sagittal plane. Zhang and Chaffin(2000) found that this is due to the kinematic redundancy of the locomotor system. According to Paluch (2006), the sitting position depends largely on the spatial geometry. Ergonomists argue that the sitting position is determined by the saddle (Gurr et al., 1998). This study showed a positive effect of the time of sitting during the day on the sitting position. Furthermore, it was also found that prolonged sitting substantially impacts on the quality of the sitting position. More specifically, this element of the lifestyle, which directly and to a largest extends depends on the study participants, determines a maladaptive hunched sitting position. Furthermore, the habitual sitting position of the study participants leads gradually to the feeling of discomfort and back pain. According to many authors, there is the relationship between time of sitting and problems with overloaded spinal column and back pain (Sosin et al.,2007; Lis et al., 2007; Kaczor et al., 2011; Gupta et al., 2015). During prolonged sitting, human body uses the "economical policy" to maintain the muscular contraction as low as possible. Therefore, fast fatigue and failure are soon observed in the core stabilizers, followed by disturbances in sensimotor control and a shift in stabilization towards fascioligamentous structures sensitive to nociception (Betz et al.,2001). This occurs due to the click-clack phenomenon as described by Snijders et al. (2004), leading to compensatory adaptations in spinal curvatures. Therefore, the study participant adopt the habitually hunched (kyphotic) sitting position. In the position of sitting with the foot rested on the knee, kyphotization is connected with time for reading, which is correlated with total time of sitting during the day. The kyphotization in this position is also connected with washing the care, likely to occur in the habitual static forward-inclined posture. This tendency is also attributable to sleeping problems, which, according to Kozłowski et al. (1995), reflect the chronic fatigue. The reverse effect on the hunched sitting position was from the leisure time which, as suggested by its name, does not force any body position in the sagittal plane. Another reverse correlation was also found for feasting time, which is typically associated with relax and movement. The kyphotization is also reduced by hanging curtains, which causes a substantial body trunk auto-elongation and drinking coffee during the day, which, according to Kozłowski (1995), helps increase the fatigue effect. The reverse relationship for this sitting position was also found for working at the computer, which is likely to have been caused by the fact that study participants were both computer users and those who do not use computers. Furthermore, this observation seems to be consistent with the findings of Palmer et al. (2001) and Demure et al. (2000), who demonstrated that there is a specific number of hours of working at the computer where a discomfort and back problems start to occur. In the position of the favourite sitting, the kyphotization is significantly affected by sitting with legs crossed, which, according to Snijders et al. (1995), represents a functional habit that results from the fatigue of abdominal muscles that stabilize sitting position. Kyphotization in the favourite position is also related to drinking alcohol, which, through its relaxing effect and disturbance in postural and motor coordination, makes it easier to position body in the sagittal plane. The reverse correlation with kyphotization in the favourite sitting position was found for hobbies, which are undoubtedly connected with relax and more beneficial position of body segments and spinal position.

In conclusion, the sitting position is mainly affected by prolonged sitting, i.e. the element of lifestyles which can be controlled by study participants. Therefore, health education programs should be implemented to motivate people to be more involved in active lifestyles.

CONCLUSION

1. Of the evaluated components of lifestyles, the most essential effect is from time of sitting during the day.
2. The study demonstrated the need for promotion of healthy lifestyles.

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